

8 Noise and Vibration

8.1 Vibration and regenerated noise

60. *The LMA should advise where criteria are exceeded, the technical options available to decrease those levels when quantitatively measured. Explain how "technical viability" (as per page 57 of Technical Appendix K) would be determined.*

The analyses have provided reasonable assurance that the Project can be completed using commonly employed methods of construction without exceedances of the relevant criteria. In the event that it is demonstrated in practice that the modelling has underestimated the level of vibration, several mitigation procedures are available and could include:

- operating the TBM with reduced thrust and / or rotation rate and possibly alternative cutter types;
- reduced operating times for mechanical equipment, in particular during evening periods;
- reduced energy or smaller equipment types and specifications, such as reducing the size and energy delivered to hydraulic hammering equipment;
- alternative equipment types, such as replacing driven piers with bored piers and use of low impact hydraulic hammers.

With respect to drilling and the event that any blasting is required, appropriate mitigation measures would be implemented.

61. *The LMA should advise whether cumulative or sequential impacts have been or should be considered, such as exposure to a number of vibration sources through the life of the project.*

For the purposes of answering this question it has been assumed that two TBMs are ultimately used to construct the tunnelled section of the road.

The possible effects from two TBMs cutting simultaneously and at close distances to each other have been assessed and the findings are presented below. The effects are complicated and depend upon many factors such as the proximity of one or either TBM to the sensitive location, the distance between the TBMs and the frequency and vibration generated by the equipment. These effects have been modelled using a detailed probabilistic model which superimposes vibration pulses, accounting for different travel distances of the vibration, frequency and amplitude levels. The results are presented for two TBMs operating at all different combinations of locations within 100 metres of a property. The conclusions can be summarised as follows:

- the proximity of the nearest TBM to the sensitive receiver is the most influential factor in the level of vibration. Provided the second TBM is further than 40 metres from the closest TBM, the vibration level is not expected to increase by more than a few percent; and
- in the event the two TBMs are operating at the same distance from the sensitive receiver, the level of vibration increases on average by around one third. The phase differences in vibration indicate that whilst likelihood of vibration increasing by 50% can occur, a one third increase is more likely.

There is a threshold value that each impact must register before the effect is considered cumulative. The Performance Requirements limit the level of impact of a single blow to below the threshold value.

Vibration levels based on human comfort are significantly more stringent than those necessary to protect the built environment from structural or cosmetic damage.

Therefore, setting vibration limits for human comfort would in turn enable little or no structural or cosmetic damage to buildings.

62. The LMA should advise how it proposes that the following regenerated noise and vibration matters would be assessed:

a. monitoring of vibration at surface structures, including regenerated noise in occupied buildings;

Vibration monitoring units will be required to assess vibration levels at each of the portal surface working areas and above the tunnel alignment. As one area is completed, the monitoring equipment could be relocated to another area. The number of simultaneous working areas would be defined by the construction working schedule adopted by the contractor.

It is expected that data from each of the monitoring sites would be automatically retrieved by a central computer and the results made available to users after a blast event, or at regular intervals where mechanical equipment is utilised. The monitoring system could allow for access to measured vibration results via a web based interface, giving immediate access to data for authorized users. Vibration statistics, including the number of blasts, average and percentile limits for TBMs and other mechanical equipment, and vibration equation parameters, could also be automatically calculated and made available on-line.

The monitoring system could also be configured to alert relevant personnel immediately by SMS (short messaging service) should the level of vibration exceed a pre-set level. The vibration data could also be forwarded via email to selected persons.

Vibration monitoring locations should be defined according to the proximity of potentially sensitive infrastructure to the construction activities. In addition, monitoring locations should be identified at residential properties to ensure any vibration produced by the activities is not unnecessarily intrusive to occupants along the proposed alignment. Understandably not all properties can be monitored. The following broadly defined monitoring program should be implemented:

<i>Equipment – Source of Vibration</i>	<i>Number of monitors</i>	<i>Sensitive monitoring locations</i>
TBM Eastbound	Four monitors	Monitors advancing with TBM progress to ensure most potentially affected properties are monitored
TBM Westbound	Four monitors	Monitors advancing with TBM progress to ensure most potentially affected properties are monitored
Hydraulic hammers	Two monitors per item of equipment area	Monitor placed near the location of mechanical equipment at the most potentially sensitive location
Cross passages	Four monitors	Monitor placed immediately above the location of each cross passage at the four of the most potentially sensitive locations
Pile driving	Four monitors	Monitor placed near the location of mechanical equipment at the most potentially sensitive location
Heritage	One monitor	Monitor at heritage listed property along tunnel alignment or at portal area, such as at the Shot Tower

Table 7 - Broadly defined monitoring locations

Vibration monitoring will be undertaken outside properties in compliance with Australian Standard AS2187.2 and monitoring equipment will be calibrated annually and conform with the relevant Australian and international standards.

b. monitoring of vibration at buried assets;

Services, such as telecommunications, water assets, high or low pressure gas lines etc, will be monitored using similar equipment to that for other infrastructure. Where the service is buried, vibration sensors may be grouted into a borehole if the service is considered particularly vulnerable to vibration effects. Alternatively, vibration can be measured by placing a sensor on the surface and extrapolating the value, or applying an adjustment to the permissible value based upon the adjusted separation distance between the source and the service. The same monitoring equipment with modems and back to base capabilities should be used.

c. pre-construction, during construction and post-construction condition assessment of structures;

Whilst appropriate vibration limits are fundamental to ensuring that tunnel and portal construction activities can be completed with minimal impact on adjacent residents, business and infrastructure, including both buildings and services, the management of vibration will also encompass other key aspects including:

- Condition surveys of properties, with the level of interrogation based upon:
 - whether “heritage” listed, or the “general” condition of the property; and
 - expected level of vibration (with those properties predicted to receive higher levels of vibration subjected to greater scrutiny).
- Selected vibration monitoring at properties based upon:
 - the expected level of vibration;
 - the potential sensitivity of the property to vibration affects including method of construction, number of storeys, foundation (slab vs piles), condition, and overall sensitivity; and
 - the “susceptibility” of the residents exposed to the vibration with potentially sensitive residents identified.
- Individual liaison with potentially affected property owners through community consultation processes.
- Group presentations demonstrating the relationship between vibration level, perception, superficial and structural damage etc.
- Documented complaints register.

d. decision making on implementing contingency measures to reduce vibration; and

LMA notes that the contractor will be required under the contract and Environmental Management Framework to implement the performance requirements. Performance requirements NV8, NV9 and NV10 and NV11 require the contractor to meet specified vibration limits and to take remedial action if these limits are not met. Management and implementation of specific contingency measures will be the responsibility of the contractor and will depend on the specific circumstances which arise during construction.

The current expectation is that the contract will also require the contractor to undertake noise attenuation measures in advance of construction. This will include temporary noise attenuation at appropriate locations to reduce construction noise impacts on sensitive receptors in accordance with the Minister's approval decision, and temporary buildings to be constructed over tunnel portals to attenuate noise impacts in the surrounding area.

Further to this, the contract is likely to provide that where the State or Independent Reviewer believes that the contractor is causing unreasonable levels of nuisance or interference, they must comply with the direction of the State or Independent Reviewer to stop or change its manner of work and amend the project delivery management plan or any other relevant project plan to remedy the nuisance or interference.

e. decision making on rectification of vibration damaged assets.

The decision making on the rectification of vibration damaged assets will be addressed in the contract to be entered into with the appointed contractor. The contract will provide that the contractor must not damage any property in the vicinity of the construction areas and must promptly repair any such damage and reasonably compensate the affected person where it has legal liability to do so.

The contractor will be required to produce detailed construction management plans containing protocols, to be agreed with the State, for the notification of incidents which, amongst other things, pose a serious risk of damaging or destroying property. The construction management plans must also include procedures relating to survey and condition monitoring.

Site condition surveys undertaken prior to the commencement of construction activities will also provide important baseline information in assessing any vibration damage.

63. *The LMA should advise the standards that should apply to protect the welfare of animals at the Melbourne Zoo?*

Preliminary modelling indicates that given the position of the construction activities relative to the Melbourne Zoo, particularly the southern corner, the vibration generated by the construction will have a negligible effect on the welfare or behavioural patterns of animals housed in the pavilions. The level of vibration from the tunnelling activities is predicted to be minimal and in all likelihood, immeasurable at the southern boundary of the Melbourne Zoo.

There are no specific standards that apply in respect of the protection of the welfare of animals from construction-induced vibration. It is recognised that animals possess some tolerance to vibration as demonstrated through their exposure to vibration from transport.

LMA is aware that Melbourne Zoo has been speaking with international zoos, including a zoo in Oregon, United States, about their experiences in managing impacts from major construction projects.

Recent comments from staff at Melbourne Zoo indicate that they are satisfied with the information available in the CIS, and that regular meetings with LMA are providing a forum to discuss management of any impacts on the Melbourne Zoo. LMA will continue to work with the staff at the Melbourne Zoo to develop a specific program regarding the monitoring and definition of permissible levels of vibration.

8.2 Other project experience

64. *The LMA should advise how experiences in recent major civil construction projects (e.g. CityLink, EastLink) has informed possible construction techniques and vibration modelling estimates for the East West Link – Eastern Section project including:*

- a. what excavation and, if applicable, tunnelling methods were adopted;*
- b. how were vibration and regenerated noise monitored and managed; and*
- c. if the monitoring provided validation of vibration modelling.*

Analyses, predictions and application of detailed 3D models for the assessment of vibration and regenerated noise from the construction methods has been applied for other tunnelling projects of a similar scale and complexity as the East West Link Reference Project. These models have been used to assess drill and blast impacts where blasting has been undertaken, or model and assess the implications of vibration and regenerated noise from mechanical equipment such as a TBM, road header, pile driving, hydraulic hammer, vibratory impactor, roller etc. The results and predictions have enabled working procedures to be developed. Key recent local projects have included the North South Bypass (Clem 7), Airport Link Northern Busway, Eastern Busway, Tintenbar to Ewingsdale and the Legacy Way. Other tunnelling projects in Asia have also been successfully modelled and completed. These projects have been constructed using both drill and blast and a number of different mechanical methods of construction, including TBMs, road headers, vibratory rollers, pile driving, hydraulic hammers etc.

In each of these projects, their proximity to residential, business and service infrastructure has been identified and has been a key component driving the construction schedule, equipment types and the associated monitoring and community liaison programs. In each case, both vibration levels and regenerated noise values have exceeded perceptible values, however with active monitoring and community engagement, the projects have been successfully implemented with an acceptable impact on the amenity of residents and businesses near to the project. The integrity of buildings and continued operation of services has been maintained throughout the project. Vibration criteria proposed for this East West Link Project are consistent with those imposed on these other projects, if not more stringent.

8.3 Noise modelling

65. *The LMA should provide the source of the noise data used for the operational noise assessments, including demonstrating how the vehicle type, speed, and road grade dependency was derived.*

Traffic volumes and vehicle type were obtained from modelling data from the traffic modelling undertaken by Veitch Lister Consulting.

The traffic speeds used in the noise modelling (as shown in Table 3 of Appendix J of the CIS) were obtained from the draft CIS or from posted speeds on existing roads. The road surface was based on the most likely surface – arterial roads and ramps are generally surfaced with dense-graded asphalt and urban freeways in Melbourne are almost always surfaced with open-graded asphalt.

The alignments of the roads included in the noise modelling were provided in the form of three-dimensional AutoCAD drawings. These drawings provide the height of the road above sea level (nominally), and so the gradients of the roads are given by the slopes of the roads in the drawings.

66. *The LMA should provide a flow chart of the noise model that indicates the major elements, including the input requirements, leading to the derivation of noise contours both at ground level and at building façades. This information is to explain the basic steps in determining the characteristics, such as height, extent and acoustic properties, of a sound barrier and how the noise protection provided by that is estimated.*

As outlined in Section 5.1.2 of Appendix J of the CIS, the calculation method was the Calculation of Road Traffic Noise (CoRTN) method, developed in the United Kingdom and specified by VicRoads for traffic noise modelling in Victoria. A copy of the CoRTN document that defines the method is available at http://www.noiseni.co.uk/calculation_of_road_traffic_noise.pdf. Figure 12 included below is from CoRTN and illustrates the method. A brief description of the method is provided following the figure.

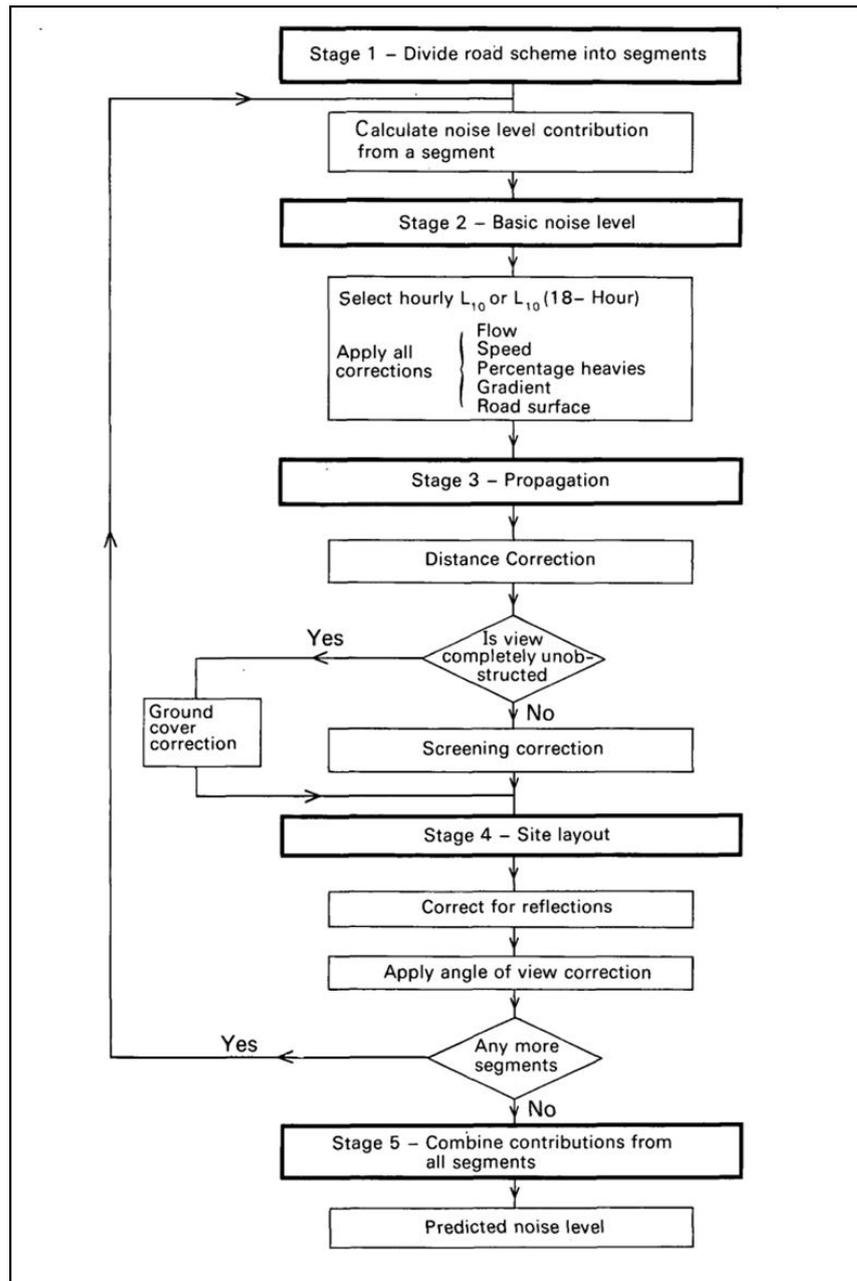


Figure 12: The CoRTN method

Briefly, the method is as follows.

The roads are broken down into short segments (Stage 1 in Figure 12). With modern noise modelling, the road is broken into hundreds of segments in order to obtain a high level of detail. For each segment, the calculation is in three steps:

1. Noise emission (Stage 2 in Figure 12). This is how much noise is being generated by traffic on that road segment.
2. Noise propagation (Stage 3 in Figure 12). This is the effect of distance, ground surface and intervening objects such as barriers.
3. Site layout effects (Stage 4 in Figure 12). This is the effect of the receiver site, including the effect of reflections from the facade of the building (generally a house or apartment building).

The noise level at each receiver location is then the combined total of the noise level from all the segments (Stage 5 in Figure 12). To generate noise contours, the noise level is predicted at a grid of receiver locations either on the ground (for the noise contour plots) or on the facades of the buildings (for the facade noise maps).

The inputs are shown in Table 8 below.

Step	Inputs
1. Noise emission	Traffic volume ('flow') Traffic speed Traffic composition ('percentage heavies') Road gradient Road surface type
2. Noise propagation	Distance from the road segment to the receiver The nature of the ground between the road segment to the receiver (characterised as 'hard', 'soft', or some combination) The location and height of any obstructions such as noise barriers relative to the road segment and the receiver (more details below)
3. Site layout	The presence of reflecting facades The angle of view that the road segment presents at the receiver

Table 8: Noise modelling inputs

The steps in calculating the effect of noise barriers are illustrated in Figure 13 below, taken from the cover of CoRTN.

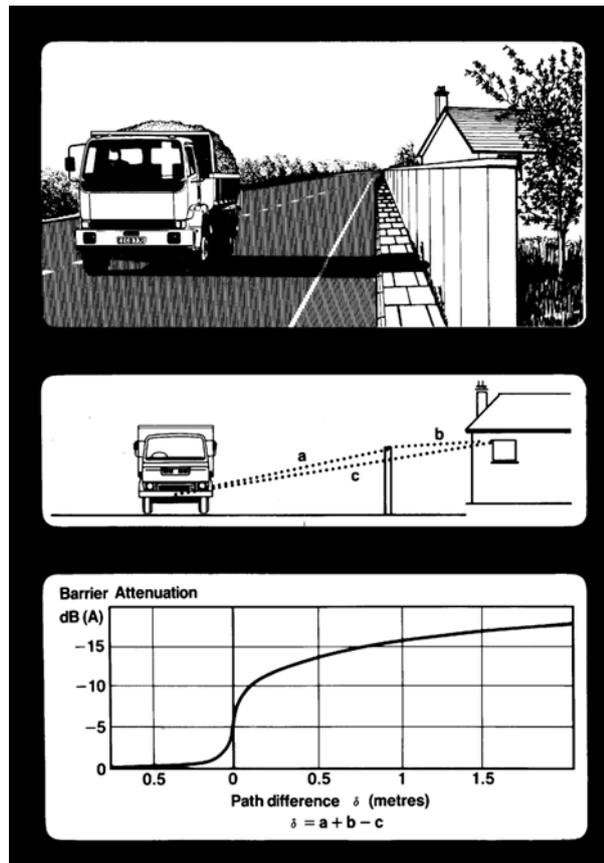


Figure 13: Calculating the effect of noise barriers

The barrier attenuates sound by causing the sound to bend over the top of the barrier. The degree of bending of the sound is quantified in terms of the 'path difference' – this is the extra distance that the sound has to travel to get over the barrier ($a + b$ in Figure 6) compared to the direct distance from source to receiver (c in Figure 13).

To achieve compliance in the model with the target noise levels, the barrier heights and locations are adjusted until the combined total noise level at every noise-sensitive building is equal to or less than the target.

67. *The LMA should provide information on the sensitivity of the noise model output to changes in input data. This should include, but need not be limited to, traffic volumes and compositions (including the heavy vehicle component), road grades, speeds and variations on those, and road surface.*

Table 9 below shows the consequent variation in output for a range of arbitrary variations in inputs.

Input	Possible variation	Consequent variation in output
Traffic volume	±20%	±1dB
Traffic speed	±20%	±1-2dB
Traffic composition (percent heavy vehicles)	±5%	±1dB
Road gradient	±1%	±1dB
Road surface type	Contractor may use stone mastic asphalt rather than	1-2dB

	open-graded asphalt	
Distance to the receiver	±20%	±1dB
Ground properties	Ground between source and receiver at 50m distance may be 35% hard rather than 50%	1dB
Noise barrier height	±1m on a 4m barrier	±1dB
The presence of reflecting facades	Reflecting facade not present	Reduction of 2-3dB
The angle of view that the road segment presents at the receiver	±1°	A small fraction of 1dB

Table 9: Sensitivity analysis

68. *The LMA should provide evidence from a small number of examples of validation of the noise model drawn from other major road projects. This should compare predicted noise exposures with after commissioning measures. Where the post commissioning traffic volume and composition has differed from that used in the assessment, the modelled results should be provided with that change made to the model input. The validation evidence should include situations where no noise barrier was proposed or constructed and situations where a noise barrier was provided on the basis of the noise assessment.*

Validation of noise models is undertaken:

- through scientific studies of the accuracy of the calculation methods;
- on a project-by-project basis prior to noise barrier construction on existing roads; and
- following completion of road construction projects.

Scientific studies

The most recent and relevant scientific study was undertaken by Marshall Day Acoustics, the UNSW Department of Transport Engineering and RMIT University. The work was commissioned in 1997 by VicRoads and published in Austroads Publication No. AP-R277/05 *Modelling, Measuring and Mitigating Road Traffic Noise* (2002). This is the only validation study in Australia undertaken entirely at actual dwellings. Measured and modelled noise levels were compared over a total of 87 days at 19 sites adjacent to freeways or limited-access rural highways in and near Melbourne. The study found that CoRTN was conservative in 93% of cases. In other words, the measured noise level was lower than the modelled noise level 93% of the time.

Prior to noise barrier construction on existing roads

Because CoRTN is so conservative, it is common practice when designing noise barriers for existing roads to compare measured and modelled noise levels on a project-by-project basis and if the measured noise levels are found to be consistently different from the modelled noise levels, to calibrate the noise model in order to improve its accuracy under local conditions. This kind of validation is only done on a project-by-project basis as the difference between measured and modelled noise levels is generally due to site conditions and a calibration undertaken at one location may not apply to other locations.

Table 10 below provides a sample of the calibration outcomes for a selection of recent Marshall Day Acoustics projects.

Road	Date of model calibration	Measured noise levels were lower than modelled noise levels by
Calder Highway, Diggers Rest	2013	0-4dB
Hume Freeway, Beveridge	2013	0dB
Hume Freeway, Wallan	2012	0dB
Hume Freeway, Lalor	2012	3-4dB
Geelong Ring Road, Lovely Banks	2011	1dB
Geelong Ring Road, Highton	2011	2-4dB
Hume Freeway, Epping	2010	0-2dB

Table 10: Noise model calibration outcomes on recent Marshall Day Acoustics projects

Following completion of road construction projects

Noise measurements undertaken following the completion of road construction projects are used to confirm compliance with the noise limits and to validate the project design. This type of validation compares measured noise levels against predicted noise levels based on **forecast** traffic.

To validate the model, as opposed to the project design, it is necessary to compare the measured noise levels with modelled noise levels based on **actual** traffic. This is not usually undertaken, as the compliance approach is sufficient on a project basis. However, in 2008 Marshall Day Acoustics was commissioned by VicRoads to undertake noise monitoring at several locations after the completion and opening of the Pakenham Bypass. The noise monitoring locations were entered into the noise model and the existing noise level was modelled based on the 2008 traffic data. The modelled noise level was compared to the measured noise level to assess the accuracy of the noise model. Table 11 below provides a comparison of the measured and modelled noise levels.

Address	Modelled	Measured	Difference
165 Henry Road, Pakenham	65	57	8
207 Oakview La, Nar Nar Goon	65	60	4
230 Ryan Road, Pakenham	66	57	9
155 Cardinia Road, Officer	65	60	5
185 Rix Road, Officer	69	63	6
183 Rix Road, Officer	67	61	6
200 Officer South Road, Officer	68	60	8
90 Mt Ararat Road, Pakenham	65	62	3
320 Henry Road, Pakenham	66	59	7

Address	Modelled	Measured	Difference
59 Ryan Road, Pakenham	67	60	7
160 Mt Ararat Road, Nar Nar Goon	58	55	3
200 Henry Road, Pakenham	64	58	6
40 Pinehill Drive, Pakenham	63	54	9

Table 11: Comparison of measured and modelled noise levels - Pakenham Bypass

The reason the modelled noise levels are higher than the measured noise levels is because the sites are generally quite distant from the road, and CoRTN's underestimation of ground effect is compounded at greater distances. For example, 230 Ryan Road is approximately 500 s from the freeway centreline.

The significant level of conservativeness at high distances is not generally an issue, as noise barriers are generally designed to protect residences closer to the road. For example, the 19 dwellings in the VicRoads-commissioned study were 20-120m from the road.

8.4 Construction noise

69. *The LMA should advise how it is proposed that the following construction noise matters would be assessed:*

a. monitoring of noise at sensitive receptors both before and during construction of the East West Link - Eastern Section;

b. decision making on unacceptable construction noise and times; and

c. actions to reduce noise as needed.

It will be the contractor's responsibility to determine how compliance with the EPA requirements will be achieved. What follows is one possible scheme.

Noise monitoring

- Prior to commencement of construction, identify by site inspection the residences that are likely to be the worst affected, and, if necessary, undertake noise modelling to clarify.
- Undertake noise measurements at various selected residences prior to construction to establish baseline conditions.
- Once construction has commenced, monitor noise levels at selected residences and / or at reference locations (see below) to determine if the EPA noise threshold levels are exceeded.

Unacceptable construction noise and times

- Prior to construction, agree with EPA Victoria what actions are required if the noise threshold levels are exceeded. Possible actions are discussed below.
- Using the baseline noise measurements, determine the noise threshold levels in accordance with the EPA guidelines.
- Prior to construction, model noise levels to:
 - determine in advance which construction activities may exceed the EPA thresholds; and
 - identify reference locations for noise monitoring. These can be at nearby residences, or can be locations where the modelling

indicates a known relationship between the measured noise level and the noise level at the residences likely to be worst affected.

- If modelled or measured noise levels exceed the EPA thresholds, undertake the agreed actions.

Actions to reduce noise

Actions to reduce noise can include:

- where feasible, install permanent noise attenuation in advance of construction works;
- provide temporary noise attenuation at appropriate locations to reduce noise to sensitive receptors;
- inform the community to provide advance warning of times when noisy activities will occur to allow residents to plan around disturbance; and
- for those residents most likely to be affected, provide temporary relocation during noisy times.

These actions should be read in conjunction with relevant performance requirements such as NV1 in the CIS.

In addition, LMA has required the bidders to construct acoustic sheds at both tunnel portals during the construction phase to mitigate a range of impacts including noise, light spill and dust.

8.5 Operational noise

70. *The LMA should advise how it is proposed that the following operational noise matters would be assessed:*

a. monitoring of noise at sensitive receptors post-commissioning of the East West Link - Eastern Section; and

b. decision making on mitigation measures that may be required for noise exceedance.

It will be the contractor's responsibility to determine how compliance with the operational performance requirements will be demonstrated. However, it is standard practice on major road construction projects for these matters to be handled as follows:

- a detailed noise model is prepared by the contractor's acoustic consultant at the detailed design stage to design the noise barriers. The model is independently reviewed and checked;
- once the road is open and operating under normal conditions, noise levels are measured at a number of locations. The locations are selected based on the design-stage model, generally these are residences identified as likely to be the most affected;
- the measured noise levels are adjusted for the future (design) traffic conditions and compared with the noise limits. If the measured noise levels show compliance, then it is generally agreed that the post-construction monitoring has demonstrated compliance. Analysis of the modelled noise levels can assist in determining the certainty of compliance;

- post-construction noise monitoring is then undertaken on an on-going basis. Such noise monitoring generally takes place:
 - in response to complaints; and
 - following any changes to the road operations that have the potential to increase noise levels.
- If exceedances of the noise limits are found post-construction, the following actions may be taken:
 - if the excess is 1-2dB, note that additional mitigation will be required in the future and if there are works on the road ensure that the additional mitigation measures are implemented when the works occur; and
 - if the excess is 2dB or more, implement additional mitigation works immediately.

71. The LMA should provide the following documents:

- (a) a technical note discussing the geological history of the area (GHD, dated 10 June 2013);**

Contained in **Appendix O** of this document.

- (b) Suskind, D.E. (2000), Vibrations from blasting, International Society of Explosive Engineers DIN450.2 (1975);**

"Vibrations from blasting" by David E Siskind and the International Society of Explosive Engineers is a 120 page book published in 2000. It is currently out of print, but LMA will seek to obtain a copy at the earliest opportunity for the Committee's reference.

It should be noted that the DIN450.2 reference is incorrect and copyright would prevent an electronic version of the document being included on the Committee's web site.

- (c) The German National Standard DIN 4150-2, "Structural vibration - Human exposure to vibration in buildings" (English version); and**

LMA will purchase a copy of the German National Standard DIN 4150-2 for the Committee's reference.

It should be noted that copyright would prevent an electronic version of the document being included on the Committee web site.

- (d) Memo from Melbourne Water (Ned Powell) to Brian O'Driscoll dated 12 March, 2013 discussing the East West Link NYM.**

Contained in **Appendix P** of this document.

9 Groundwater and contamination

9.1 Groundwater and contamination reports

72. *The LMA should provide the following documents:*

- a. *A geological plan or plans of the East West Tunnel alignment at A0 or A1 sheet size, showing the inferred geology at the tunnel horizons;*
- b. *Geological sections of the respective East West Tunnel alignments at A0 or A1 sheet size, showing the inferred geology and the groundwater level indicated at the location of all the geotechnical investigation drillholes;*
- c. *AECOM 2013 Mitigation of Risks Posed by Contaminated Groundwater Whilst Under Alexandra Parade. Draft Options Review, Draft Report prepared for LMA (Appendix M, Section 16 References, p 134);*
- d. *GHD 2013c East-West Link – Eastern Section Contaminated Land Assessment, Report prepared for LMA (Appendix M, Section 16 References, p 135);*
- e. *Leonard, J., 2006, Hydrogeology of the Melbourne Area, Australian Geomechanics Journal, Vol. 41, No. 3 (Appendix M, Section 16 References, p 135);*
- f. *SKM 2013a, East-West Link Hydrogeological Investigation – Draft Factual Report, in VicRoads, March 2013, East-West Link Tunnel Project Interim Geotechnical Investigation Factual Report, Technical Report GE094-13 prepared for LMA (Appendix M, Section 16 References, p 135);*
- g. *SKM 2013b Deep Leads in the vicinity of the East-West Link, Report prepared for LMA (Appendix M, Section 16 References, p 135); and*
- h. *The interpretative hydrogeological report by SKM, not available for review in the CIS (Appendix M, Section 4.3.1, p 10 para 3).*

These documents are included in **Appendix Q** of this document, except for the document requested in (d), which is included in Technical Appendix N of the CIS.

9.2 Groundwater characterisation

73. *The LMA should advise whether the representation of the depth to groundwater, as indicated by Figure 14-2, accounts for the topography (Vol. 2, Ch. 14, Section 14.1.2 (p 4)).*

LMA advises that the map in Figure 14-2 considers topography (that is, the depth below land surface).

9.3 Risk issues

The risk assessment process has been applied to many potential scenarios facing tunnel construction and subsequent operation with respect to groundwater and contamination issues. The LMA should provide advice on:

74. *Whether resolution of these issues is required in Table 14-1 and Appendix M Section 6 (Table 8). Particular examples are:*

- (a) *Vol. 2, Ch. 14, Section 14.2.1, (p. 9). (Compare Likelihood for GW003 and C001);*

GW003 relates to dewatering of ground resulting in subsidence / damaged structures. C001 relates to excavations which may affect the health of workers.

The likelihood of depressurisation of compressible sediments resulting in subsidence and infrastructure damage from dewatering during construction (risk no. GW003) is very unlikely as existing and project-specific performance requirements detailed in Technical Appendix M to the CIS (at page 55) are comprehensive.

The likelihood of construction workers being exposed to potential contaminants in soil and rock saturated with contaminated groundwater during excavation (risk no. C001) is likely.

These risk issues are different and can be addressed by different performance requirements. There is no inconsistency between the likelihood ratings.

(b) *Vol. 2, Ch. 14, Section 14.2.1, (p. 9). (Compare impact of C001 with Consequence of “Minor”);*

The consequence of construction workers being exposed to potential contaminants in soil and rock saturated with contaminated groundwater during excavation (risk no. C001) was assessed as minor when addressed by appropriate performance requirements.

This included initial performance requirements, based on standard environmental protection measures that are typically incorporated into construction contracts for road projects, and some additional project-specific performance requirements (refer to Technical Appendix N of the CIS at page 20).

Both the initial performance requirements and the final project-specific performance requirements have been included in the Environmental Management Framework for the project. The project-specific performance requirements in the Technical Appendix N of the CIS were refined, consolidated and the language developed to be output focused and these are the final performance requirements in Volume 2 Chapter 17 of the CIS.

(c) *Vol. 2, Ch. 14, Section 14.2.1, (p. 9). (Compare Likelihood of depressurization settlement assessment (“Very Unlikely”) with other Melbourne experience);*

The potential for depressurisation of compressible sediments to result in subsidence and infrastructure damage (GW009) was assessed in section 14.2.1 of the CIS as “very unlikely”. Because the consequence of this event occurring was assessed as “moderate” the residual risk rating for this impact is “medium”.

It is important, in examining different projects in Melbourne, to appreciate the different geological conditions in which the projects were undertaken. Some examples of comparable projects undertaken in Melbourne are discussed below:

CityLink – The geological setting is highly conducive to settlement with compressive sediments (Coode Island silt). This was recognised during the design phase and required significant numerical modelling to aid design, and monitoring programs (groundwater and ground movement).

Mullum Mullum Tunnel – The geological setting of this project is not conducive to settlement, as tunnelling was largely through bedrock.

Sewer Construction Project (South Melbourne) -- Tunnelling for a major sewer replacement was undertaken through Port Melbourne and South Melbourne within the sediments of the Yarra Delta. The sediments included the Coode Island silt and were accordingly highly conducive to settlement. During this project, groundwater monitoring identified drawdowns associated with the shaft construction. This monitoring triggers contingency actions in terms of the dewatering, and more frequent groundwater and settlement monitoring.

In the case of East West Link the majority of tunnelling would be through bedrock. Palaeochannels underly Newer Volcanic basalt between Hoddle Street and Rathdowne Street, and therefore there is an expectation that the basalt rock would act as a raft and mitigate against ground movements. From around Rathdowne Street to the eastern end of Royal Park, the geological formation is Melbourne Mudstone with groundwater at lower levels. Across Royal Park to the west and extending to the Upfield rail line, the Silurian bedrock in the upper 15-20 metres is of lower strength

and deep groundwater levels. The bedrock in this area is unlikely to be of adequate strength to enable tunnel to be mined.

Some judgment is required in the risk assessment process.

For the reasons described above the LMA remains of the view that the likelihood of subsidence and infrastructure damage is very unlikely. Even if that likelihood rating was upgraded to "unlikely", however, the final risk rating for this activity would remain as 'moderate'.

(d) Vol. 2, Ch. 14, Section 14.2.1, (p. 10). (Compare Consequence as "Insignificant" with Likelihood as "Likely");

Three activities on the page referred to (CIS Volume 2, Chapter 14, Section 14.2.1 at page 10) have a consequence rating of 'insignificant' and a likelihood of 'likely'. These activities are:

- excavation of contaminated soil / rock during construction;
- excavation of contaminated soil / rock during the construction of ventilation structures and tunnel portals; and
- accumulation of explosive gases in the tunnel and the ventilation shafts from encountered soil and groundwater contamination zones.

Consequence and likelihood ratings are independent from one another.

The likelihood is a rating of how likely the risk or hazard is to occur and result in harm to the environment, and the consequence rating is an assessment of the consequences of this harm. A consequence rating of 'insignificant' and a likelihood of 'likely' results in a 'low' risk rating.

LMA remains of the view that the 'low' risk ratings are appropriate in respect of the three defined activities.

(e) Vol.2, Ch.14, Section 14.2.1, (pp. 10 & 11). (No mitigation measures);

Mitigation measures are not specified on the pages referred to (CIS Volume 2, Chapter 14 Section 14.2.1, pages 10 and 11).

As explained in CIS Volume 2, Chapter 14, Section 14.2.1, page 8, the consequence, likelihood and risk ratings listed in Table 14-1 reflect residual outcomes expected to occur following implementation of the performance requirements.

The final performance requirements are in Volume 2 Chapter 17 of the CIS. Potential mitigation measures, in the form of initial and project-specific performance requirements, are provided in Technical Appendices M and N to the CIS.

(f) Vol. 2, Ch. 14, Section 14.2.1, (p. 11). ("High" Risk rating without mitigation measures);

Mitigation measures were proposed (refer Technical Appendix N of the CIS at page 28) for risk no. C010, being "risk to human health and the environment during removal from the tunnel construction area and potential to contaminate other areas." There was no improvement in the residual risk rating of risk no. C010 with the application of the proposed mitigation measures because the existing performance requirements listed are comprehensive, and the proposed mitigation measures will not result in a material reduction in the risk level. Additional mitigation measures were therefore not considered necessary. For further detail refer to the response to Item No 74(j).

(g) Vol. 2, Ch. 14, Section 14.2.1, (p. 11). (Likelihood given as "Unlikely" when other Melbourne experience has exhibited clogging of drainage systems);

It has been assumed that this Request refers to GW016, being "contaminated groundwater is drained into the operating tunnel, potentially impacting health of maintenance workers. Composition of groundwater results in an increased risk of clogging of tunnel drainage systems". Accordingly, while the risk of clogging remains, tunnel designers should have a better understanding of likely treatments and mitigation measures.

The probability of an "unlikely" event is between 5 - 25%. LMA remains of the view that this is an appropriate probability of occurrence.

(h) (Vol. 2, Ch. 14, Section 14.2.1, (p. 11)) (Risk No. GW016 mitigation measures);

GW016 is largely a risk associated with the tunnel design.

Characterisation of groundwater quality (including aggressive constituents and constituents with clogging potential) need to be considered in the design. This ultimately has an impact on a) tunnel durability b) drainage system engineering (sizing and maintenance) and c) water treatment design and sizing. Mitigation measures would include a rigorous characterisation of the groundwater chemistry, its aggressiveness, and compatibilities with construction materials. A competent contractor would include these as part of their design quality assurance / quality control and longevity / life cycle checks.

(i) Appendix M, Section 6, pp. 54-62. (No improvement in Risk rating despite mitigation measures); and

In some cases the application of mitigation measures has reduced the consequence of an event occurring, however, this may not have changed the overall risk ranking.

Refer also response to 74e.

(j) Appendix N, Section 6, pp. 20-28. (Table 8 C– particularly C005 and C010 -No improvement in Risk rating despite mitigation measures.

There has been no improvement in the risk rating of Risks C005 (Excavation of contaminated soil / rock during construction) and C010 (Transportation of contaminated rock) in Table 8 with the application of the proposed mitigation measures because the existing performance requirements listed in the Table are comprehensive, and the proposed mitigation measures will not make a material reduction in the risk level. As such, the risks associated with excavation and transportation of contaminated soil / rock are inherent to the project. Notwithstanding this, the proposed additional measures are important in that they will assist in achieving a better understanding of the risks and the requirements for management of the contaminated material that will be encountered.

The risk rating of risks C005 and C010 may be able to be reduced when the construction methodology has been defined and an assessment of the soil and groundwater contamination along the route where excavation will take place has been carried out. For example, if the outcome of this assessment shows that the extent of contamination encountered does not involve large volumes of material or the material that has been identified can be readily managed. Until this further assessment work has been completed, the risks as documented in the CIS are considered appropriate.

9.4 Soil contamination

75. *The LMA should advise whether the volume of potentially contaminated soil will require stockpiling prior to transport and disposal. If so, where is stockpiling likely to occur and what mitigation measures will be implemented to minimise community exposure to potentially contaminated soil?*

The preferred approach is that material that is to be excavated be characterised in-situ (ie prior to excavation) by sampling and analysis so that the requirements for management of spoil and its disposal or reuse can be determined prior to excavation. This will allow trucks to be loaded directly during excavation works and material transported to its end destination, minimising the need for intermediate storage and double handling. In the case of groundwater and wet material (slurry), an assessment prior to generation of the material may be able to show that the resulting concentrations will be so diluted through the works processes that reuse or disposal of water or separated solids is not limited by contamination.

The implementation of the preferred approach will be dependent on access and timing constraints, and may not be possible or practical in some works areas. Because of this, it can be expected that some stockpiling of spoil for characterisation purposes will be required during construction.

An estimate of the order of magnitude of the volumes of spoil likely to require stockpiling has been carried out to confirm that it should be able to be readily accommodated within the project boundary. This estimate is provided in Table 12, and indicates the volume of contaminated soils that are likely to require disposal to a suitably licensed landfill. Soil contamination is most likely to be encountered in the cut and cover areas (Precincts 1 and 3); contaminated soil and acid sulphate soils can also be expected in Precincts 4, 5 and 6, although the volumes are likely to be less than those in the cut and cover areas.

Table 12 Estimated volume of contaminated soil requiring disposal

Area of Cut and Cover (m ²)	Estimate Quantity of Contaminated Soil (m ³)
75,000	3,000 - 4,000
<p>Assumptions:</p> <ul style="list-style-type: none"> - Total surface area of cut and cover is approx. 75,000 m² - 10% of excavated area to 0.3 m depth is contaminated - 1% of excavated area to 1.0 m depth of soil is contaminated - 0.1% of excavated area to 5.0m depth is contaminated 	

The estimate suggests that in the order of 3,000 – 4,000 m³ of contaminated soil may be encountered and require off-site disposal. While this is estimate is based on judgment and has a high degree of uncertainty, it does suggest that the volumes of soil likely to require off-site disposal are not very large, and the volumes that are likely to require intermediate storage should be able to be managed within the project area. In reaching this conclusion, it is noted that the contaminated material arising will occur over the time that the works take place in each area, and the storage volume at any one time will only be a portion of the total indicated in Table 1. Whether storage in a shed will be required depends on the nature of the material (dust and odour potential) and there is potential that a shed will be required to store at least some of the

material. The location of the storage area (or areas) will depend on the works area, construction methodology and timing.

It should be noted that these estimates relate to contaminated material, and do not include non-contaminated spoil, which will involve a far greater volume.

The criteria used to determine whether spoil is able to be reused within the project area, or whether it requires off-site disposal, will be an important cost factor for the project. The contamination criteria on which “clean fill” is based are stringent, and in some locations naturally occurring material may have concentrations of constituents that fall outside the clean fill criteria. Whether natural or contaminated material that has concentrations of constituents that exceed the clean fill criteria is able to be reused within the project area will depend on the level of contamination, the suitability of the location proposed, and whether the proposed location can be considered to be part of the site from where the material originates, thus meeting regulatory requirements. Off-site disposal will incur the waste levy (with the magnitude depending on the level of contamination), although as the State receives the levy it may be able to be viewed as cost neutral. Because the volume and potential cost of reuse or disposal of contaminated spoil can be a major factor for the project, the basis for characterising, reuse and off-site disposal needs to be explored and agreed with EPA Victoria during the procurement of the project.

9.5 Performance requirements

76. *In relation to performance requirements, the LMA should advise:*

(a) *Whether the use of fluids for artificial recharge (GW2) can be explained in more detail (Appendix M, Final Performance requirements, Code GW2, p. iv Executive Summary);*

Artificial recharge is a contingency action applied to mitigate against falling groundwater levels. If artificial recharge is to be undertaken, the fluids need to be of a quality that is equal to or better than the native groundwater (i.e. so as to ensure that groundwater beneficial uses are not compromised).

(b) *Whether the groundwater impacts are mandatory or are they guidance to contractor(s) and it would be up to them to determine the best approach subject to legislative and other requirements (Appendix M, Final performance requirements, p.ix);*

The performance requirements are mandatory.

However, to a certain extent, the mitigation measures are flexible. In many cases the Groundwater Impact Assessment contained in Appendix M of the CIS has provided a list of the potential mitigation measures which the contractor may elect to adopt. However, the contractor may elect to develop its own mitigation measures (subject to legislative and other requirements).

(c) *What other requirements are intended (Appendix M, Final performance requirements, Executive Summary p. ix para 2);*

Other requirements include:

- consultation with Stakeholders (e.g. monitoring programs);
- consultation with the Community, (e.g. identifying specific / sensitive structures /or environments that require monitoring);
- consultation with the EPA (e.g. management of the identified groundwater plumes emanating from the Fitzroy Gasworks); and

- construction technical specification.

These requirements are considered reasonable and it is assumed that a competent contractor would adhere to them or that they would otherwise be imposed through the processes described in the Environmental Management Framework.

(d) Whether the general statements given as the last paragraph of the Conclusion (Vol. 2, Ch. 14, section 14.0 (p.27) will be stated more explicitly in the Performance Requirements;

Following review and consideration of the submissions, amendments to the wording of some of the performance requirements are likely to be proposed, and these will be circulated on 20 February 2014.

(e) Whether the intervention contingency measures should be indicated as part of Performance Requirement GW4 (Table 14-2, Vol. 2, Ch 14, Section 14.8 (p. 24)); and

Contingency planning should be undertaken as part of preparing a monitoring program. For example, contingency planning may provide an extensive list of action items that could be considered and adopted as appropriate if falling levels were identified. This approach would encourage a timely response and also ensure that the contractor was prepared and has considered potential risks in advance and how best to mitigate or rectify and issues that did arise.

(f) Whether the Performance Requirements listed in Table 18 are binding (Technical Appendix M, section 7.5, pp79-83) or only those given in Chapter 17 (Vol. 2).

Both the initial performance requirements and the final project-specific performance requirements have been included in the Environmental Management Framework for the project. The project-specific performance requirements in Technical Appendix M of the CIS were refined, consolidated and the language developed to be output focused and these are the final performance requirements in Volume 2 Chapter 17 of the CIS.

10 Social and Business

10.1 Actions to minimise social impacts

77. *The LMA should advise whether the Social Impact Assessment considered or evaluated options put forward by stakeholders during project development to modify the Reference Project in order to minimise potential social impacts during construction and operation. If so, what modifications were made?*

Minimising social impacts of the Reference Project was a fundamental consideration in the decision to place the vast majority of the Project in tunnel, notwithstanding the significant additional costs associated with this length of tunnel.

The Social Impact Assessment (**SIA**) identified potential impacts from the Reference Project during construction and operation and considered how these impacts could be minimised. Potential impacts and mitigation measures were identified using previous experience and specialist knowledge, with consideration of the results of the environmental specialist investigations, and through stakeholder consultation undertaken for the SIA and CIS. Stakeholders that were consulted included community members, community organisations, other organisations (such as the Melbourne Zoo) and the applicable approval authorities, including EPA, Melbourne Water, Heritage Victoria, VicRoads and DTPLI.

In order to minimise the potential impacts, and with consideration of potential mitigation measures suggested by stakeholders, the following was undertaken:

- An Urban Design Framework was developed in consultation with DTPLI and the State Government architect to articulate urban design principles and the urban design quality of project outcomes expected for the project; and
- The draft performance requirements were made more specific, so that the final performance requirements address issues and incorporate mitigation measures that were raised during stakeholder consultation, including:
 - Minimising loss of car parking (in performance requirement T1)
 - Management of any temporary or partial closure of traffic lanes along local roads, including provision for suitable routes for vehicles, cyclists and pedestrian to maintain connectivity for road and shared path users (in performance requirement T2)
 - Maintaining access to the Melbourne Zoo and State Netball and Hockey Centre (in performance requirement T2)
 - Restricting the number of local roads to be used for construction-related transportation to minimise impacts on amenity, including truck movements along Manningham Street / Oak Street north of Ross Straw Field (in performance requirement T2)
 - The reinstatement of access if disrupted (in performance requirement T2)
 - Preventing parking on local roads or use of public car parks including those at the Melbourne Zoo and State Netball and Hockey Centre (in performance requirement T2)
 - Design to protect amenity of potentially affected residents, open space, community and commercial facilities by meeting the Urban Design Framework including the urban design principles (performance requirement LU2)

- Design permanent and temporary works to minimise footprint and disturbance, and maximise connectivity to public open space, particularly in Royal Park and along Moonee Ponds Creek and Merri Creek, to the Principal Bicycle Network and Community facilities (performance requirement LV3)
- Develop and implement management measures for construction works within proximity of the Melbourne Zoo (in performance requirement NV13)
- Design to demonstrate how the Urban Design Framework, including the urban design principles, has been met to minimise light spillage and protect the amenity of adjacent land uses, including the Melbourne Zoo (performance requirement L1).

The final design to be delivered by the contractor may vary from the Reference Project. However, the final design must be delivered in compliance with the performance requirements set out in the CIS. As described above, the project boundary was modified and the performance requirements (including the Urban Design Framework) were developed in response to feedback from consultation with stakeholders.

10.2 Acquisition and property condition assessments

78. *In relation to acquisition and conditions assessments, the LMA should advise:*

- (a) *Whether the proposals for property conditions assessment can accurately record property condition prior to construction and provide a sound basis for any required restitution;***

It is accepted and confirmed from other projects that when the level of vibration is perceived to affect residential amenity, complaints regarding damage will increase, even though the level of vibration falls well below that capable of causing the reported damage. It is therefore reasonable to base the extent of condition surveys on a level of vibration considered “*acceptable*” to the vast majority of persons occupying premises around the construction area. In all instances however, the level of vibration must be kept below a value representing the onset of damage.

Humans are very sensitive to vibration, but are poorly equipped to distinguish between different levels or intensity of disturbance. Human perception to vibration is difficult to classify since a person’s perception will vary according to their sensitivity and the duration, amplitude and frequency of vibration and when and how often it occurs. However, levels of vibration and the associated human response have been documented by several groups and are widely accepted on an international basis. Of these, the Australian Standards, British Standard and German Standard are widely referenced. The standards are comprehensive and recognise that vibration can be detected by its occupants, and further, it can affect them in many ways.

The extent of area for the properties that might be subject to a condition survey can be determined based upon the expected level of vibration induced by the construction activities. There are two standard approaches to assess property conditions prior to construction and either can be applied:

- the extent of a condition survey can be established on the basis of the expected level of vibration induced by the construction activities. All properties subjected to a level of vibration exceeding this value would have a condition survey completed; and
- alternatively, condition surveys are undertaken on the basis of a fixed distance from the construction activities. In this case as an example, all properties within 50 metres of the activities are surveyed.

The objective of a condition survey report is to provide an indicative representation of the condition of the infrastructure prior to the commencement of any earthworks / construction activities: and hence, ensure that the contractor applies best practices that minimise the risk of damage to adjacent properties and/or services. The condition survey therefore protects the property owner against inappropriate construction activities, as well as protecting the contractor against misappropriate claims. The condition survey will be prepared to meet these objectives.

It is expected that the contract to be entered into with the appointed contractor will require the contractor to undertake condition surveys to accurately record the condition of existing assets and infrastructure prior to the commencement of construction activities. It is proposed that these surveys be undertaken for all assets that are reasonably accessible within 50m of construction activities (with the prior approval of the relevant property owner and/or occupier). It is also proposed that the condition surveys be carried out by an independent qualified assessor and the results provided to the owner, the State and the Independent Reviewer under the contract following completion.

The method for undertaking the condition survey will be a matter for the contractor, with available methods including the following:

- written summary reports;
- high resolution digital still photographs;
- high resolution digital video footage.

Written summary reports for buildings provide an indicative assessment of the overall condition of the building noting, in particular, any major defects or observable problems.

The interior and exterior of properties can also be digitally photographed using a high resolution digital camera. Further, the condition of the interior and exterior of properties can be captured using a high resolution digital video.

Should a complaint regarding damage be received, a review of both the photographic and video records can then be undertaken to determine whether the defect existed prior to the commencement of the works. If the defect cannot be assessed as existing prior to the works, the general condition of the infrastructure should be reviewed to determine whether similar defects existed prior to the works. Understandably, not all defects can be photographed, and in particular with residential properties, privacy must be respected and often walls are covered with personal effects which prevent photographing. It is also accepted that defects occur as a result of environmental changes (temperature, humidity, water and ground displacement etc.) and will occur even in the absence of any construction activities.

(b) Why other properties for example, but not limited to University College and the former College Church in Royal Parade do not appear to be considered in Table 4-3.

It is confirmed that Table 4.3 in Volume 1, Chapter 4 of the CIS includes all private and public properties within the project boundary. For the tunnel section of the Project in Precinct 2, stratum acquisition would only be required. Therefore, there would be no permanent surface acquisition to any heritage properties including University College or the former College Church in Royal Parade.

To clarify further, it should be noted that part of the land within the project boundary on the SP AusNet West Melbourne Terminal Site in Precinct 5 (specifically, the strip of land within the project boundary to the west of the East West Link structure) would be

occupied temporarily to facilitate construction activities and would not be permanently acquired.

10.3 Traffic and social impact

79. *The LMA should provide information on the expected duration of diversions along Wellington and Gold Streets.*

On page 39 of Technical Appendix P to the CIS, the SIA states:

“A pedestrian crossing in Gold Street would be closed for safety reasons during construction of the project. Access to Clifton Hill Primary School would be affected, and pedestrians and cyclists would most likely experience a short-term detour via Wellington Street”.

The need to provide safe and convenient access to the Clifton Hill Primary School will be paramount and would also need to take into consideration the activities that occur at the Clifton Hill Primary School outside of normal school hours and term time. On the same page, the SIA states:

“Construction of the project would limit access along and across Hoddle Street, Alexandra Parade and surrounding streets. Partial temporary closure and / or diversion of traffic along Wellington Street is anticipated due to cut and cover construction of the tunnel portal, and may affect cyclists. Temporary access constraints may increase congestion on local road, particularly north-south roads.”

These paragraphs summarise some of the impacts on local access that could result in a social impact. Further detail about potential full or partial street closures and diversions can be found in section 11.2 of the Traffic Impact Assessment (Technical Appendix E of the CIS).

The actual traffic management measures put in place will depend on the final design, so Performance Requirement T2 requires that traffic management plans must be developed to “minimise disruption to motor vehicle traffic, parking, bicycle and pedestrian movements during construction in consultation with relevant road management authorities”.

To clarify the impacts identified for the Reference Project, Hoddle Street could need to be temporarily closed to enable placement of bridge beams over Hoddle Street for the overpass structure. This would need to be occur over a very short period and outside of peak hours, potentially on a weekend and / or at night. Furthermore, since construction of the overpass needs to occur before any work can start on the cut and cover section of the tunnel, it could not coincide with any closure of Wellington Street or the Gold Street pedestrian crossing.

Any potential diversion of traffic away from Hoddle Street would be during non-peak periods, for limited duration and would require significant traffic management measures put in place. Diversions would be to other north-south arterials over a wide area, so only local traffic would be diverted along Wellington Street. Any temporary closure, whether full or partial, of either Wellington Street or the Gold Street pedestrian crossing, will need to be accompanied by appropriate diversions.

80. *The LMA should provide an assessment in terms of social impact (including safety) as well as noise, and air quality for the diversion along Wellington Street.*

As noted above, any potential diversion of traffic away from Hoddle Street would be during non-peak periods, for limited duration and would require that significant traffic management measures be put in place. Diversions would be to other north-south arterials over a wide area, so only local traffic would be diverted along Wellington Street.

The diverted traffic along Wellington Street would not be likely to exceed current peak hour volumes.

81. *The LMA should provide an assessment of the social impacts on the residents of the Debney Park Estate and mitigation measures that can be put in place to minimise these impacts.*

The Debneys Park or Flemington Estate (**Estate**) is located on Racecourse Road, Flemington and in Precinct 3 – Royal Park (Western Portal) of the project. As stated in the Social Impact Assessment (**SIA**), it houses some 3,500 residents living in four high-rise towers and 12 low-rise buildings owned and managed by the Office of Housing. The Estate adjoins Debneys Park which includes the Flemington Community Centre (**Community Centre**); a major playground (comprising three age-specific play spaces); Flemington Community Garden (used by public housing residents); one sports oval (for soccer and cricket), one sports pavilion and two tennis courts.

Works identified in the Reference Project that would impact on the Estate include or would involve:

- flyover ramp / viaduct abutting the existing CityLink;
- temporary use of a 1.35 hectare strip of Debneys Park adjacent to CityLink as a construction site, with public access restricted to a specific area of the park, which will result in two children's playgrounds being unavailable (these will be relocated prior to construction in this area) and access to the Community Centre disrupted;
- permanent acquisition of 0.02 hectares of Debneys Park to accommodate the pylons to support the viaduct;
- the flyover ramp / viaduct would cross over the playgrounds, cast shadow over a section of the Flemington Community Garden for a short period of the day during some periods of the year and not directly impact on the Flemington Community Centre;
- short-term closure of tram routes along Flemington Road disrupting Tram Route 55 and 59 to enable viaduct construction; and
- short-term closure and / or detour of pedestrian and bicycle routes as part of the Moonee Creek Trail including links to Flemington Station and Mount Alexander Secondary College.

Social Impact of Air Quality, Noise and Vibration

The social impact of the project's construction and operation on environmental health issues, including air quality, noise, light and vibration are addressed by the relevant performance requirements outlined in Volume 2, Chapter 17 of the CIS and are based on recommended standards.

Social Impact on Neighbourhood Amenity including Community Safety

The Urban Design Framework is to be applied to all project precincts and addresses issues related to changes in visual amenity of the built environment and landscape including public open space / facilities.

Relevant to the Estate are the design principles for bridges and elevated road structures; noise barriers; pedestrian and bicycle connections; lighting; planting and vegetation; materials and finishes, and the public realm. The Urban Design Framework makes specific reference to the design issues and opportunities for public open space at Debneys Park, including the children's play areas, community gardens and Community Centre (CIS Technical Appendix C: pages.32 to 33).

In relation to concerns about safety risks in the Estate from vehicle crashes on the viaduct, the viaduct must comply with the current Bridge Design Code AS-5100 2004.

The personal safety of Estate residents near construction traffic has been addressed by the Traffic report (Technical Appendix E of the CIS) with performance requirement T2 requiring traffic management measures for motor vehicle traffic, parking, bicycle and pedestrian movements.

Community and personal safety in the flyover ramp / viaduct area are addressed by the Urban Design Framework which incorporates principles related to crime prevention and community safety in the built environment.

Social Impact on Public Open Space and Community Facilities

Flemington Community Centre provides education, early learning support, health promotion, skills and employment services, social support services and social engagement, and is used daily and for extended hours with a range of service providers/volunteers involved.

Like many community facilities, the social capital that both public housing residents and volunteers have invested in the Community Centre is significant, and with 76,000 users per annum and its specific focus on the needs of public housing residents, it is critical to these residents.

The Community Centre is located outside the project boundary. There will be minor impacts on the Community Centre from construction noise and dust, and partial shadowing once the viaduct is built, but it is expected that the Community Centre will be able to continue operation during construction.

Should the final design present more significant impacts, LMA will consider options for maintaining the Community Centre's operation including possible relocation.

If this is required, the relocated Community Centre would be developed in consultation with Flemington Estate residents, the City of Moonee Valley and the Office of Housing, with facilities of the same or higher standard.

Debneys Park playgrounds will be significantly impacted by the construction and operation of the new viaduct and will need to be relocated by the Project before construction begins in this area.

The relocation of these play spaces to another site within Debneys Park will need to be undertaken in consultation with the Office of Housing, City of Moonee Valley and Flemington estate tenants (including children and youth).

Flemington Community Garden is located outside the project reference area but is expected to be slightly impacted by construction noise and dust, and partial shadowing once the viaduct is built. Consistent with the Social Determinants of Health, the social impact on the gardens is assessed as minimal. The mitigation measures in the SIA require the contractor to consult with the Office of Housing, City of Moonee Valley, Estate residents regarding redesign / relocation.

The social capital and community value of all of these facilities is recognized as a contributor to community wellbeing and health of public housing residents.

Social Impact on Traffic and Transport

Estate residents require ongoing access to pedestrian / bicycle routes and public transport during construction and operation. During construction, the Project will result in short term interruptions to tram routes along Flemington Road (including Route 57 which services Newmarket Plaza and Route 59 to Mount Alexander Secondary College) while pedestrian / bicycle routes along Moonee Ponds Creek Trail may also be temporarily changed.

Performance requirement T3 addresses minimising disruption to tram routes along Flemington Road. It is considered the responsibility of Public Transport Victoria to ensure users, including Estate residents, are notified and alternative transport options identified. For pedestrian / bicycle routes, this is addressed in performance requirement T2 for routes along roads while the Urban Design Framework provides for pedestrian / bicycle routes with specific requirements identified.

Potential Mitigation Measures

Potential mitigation measures that could be put in place to address the social impacts on residents living at the Estate include:

- relocation of the Debneys Park playgrounds to another site within Debneys Park, undertaken in consultation with the Office of Housing, City of Moonee Valley and Flemington estate tenants;
- consultation with relevant sporting facilities, community facilities including the Community Centre, and councils to explore potential relocation / design improvements of equal or improved access and quality. This would ensure sporting, community and recreational needs are addressed during both construction and operation of the project. Where possible, relocation / redesign is to be undertaken prior to closure of the facility for public use;
- establishment of a community advisory group prior to construction is being considered, which would provide a forum for information sharing between councils, agencies and key community organisations across the Project during construction;
- establishment of a community grant program to operate during construction of the Project to fund community support activities and small capital works targeting community, sporting and recreation facilities in the local region as defined in the social impact assessment;
- a graffiti removal program where the contractor undertakes regular graffiti removal on project infrastructure during both construction and operation; and
- ensure the Office of Housing and the Estate tenants are identified as relevant affected stakeholders in the community and business involvement plan.

LMA is currently considering potential amendments to the performance requirements which could assist to mitigate the impacts of the Project on the residents of the Estate.

Added Social Value

Consistent with leading practice social impact assessment, opportunities exist to address the social needs of the Estate which are not related to mitigating negative social impacts of this project. These voluntary opportunities may be taken up by the contractor and / or be included by the government as specific tender requirements. This would add to the community benefits of the project. These might include initiatives such as apprenticeships / skills training for public housing residents as part of the project construction workforce.

82. *The LMA should provide an outline of the measures that will be put in place to minimise the impact of the closure of the Upfield Rail Line and alternative public transport options.*

Works need to occur where East West Link (Eastern Section) crosses the Upfield rail line at the western portal.

In Precinct 5, the only potential impact to the Upfield rail line is the future grade separation from Arden Street, which is only considered necessary when the Arden Street ramps are built in the future. However, it should be noted that the grade separation does not form part of the East West Link (Eastern Section) project, LMA is not seeking approval for this work and it would not be undertaken within the project boundary.

The works at the western portal will be dependent on the final design. Based on the Reference Project, and taking into consideration the measures adopted for other road rail grade separation projects in Melbourne, it is envisaged that there would be a number of temporary rail occupations at night time or at weekends to prepare the site. There would most likely be one longer occupation during an off-peak period (such as in January) to install a new railway bridge and re-instate the line. Further night-time occupations may be necessary to finalise the works and construction can then continue at the portal without further disruption of the rail line.

Similar works have been undertaken on projects such as the Regional Rail Link, EastLink and Peninsula Link, but construction methodologies vary according to the scope of works and site conditions. Often a new rail bridge is constructed adjacent to the existing railway and then jacked into place during the major occupation. On the EastLink project the Ringwood rail line was closed twice to undertake these works. For Peninsula Link the shutdown occurred over a long weekend.

Rail occupations need to be coordinated with VicTrack, PTV and the operator (MTM) and are tightly controlled. Major shut downs are often coordinated with other maintenance and construction works elsewhere on the rail line. Any rail occupations that disrupt passenger services will require replacement bus services.

Performance requirements T3 and T4 require that measures are developed and implemented to minimise disruption of all rail and tram lines.

83. *The LMA should provide information on the numbers of construction truck movements on local roads and the hours that these might occur.*

Construction truck movements are discussed in further detail in section 11.4.2 of the Traffic Impact Assessment (Technical Appendix E of the CIS).

The actual truck movement routes and numbers will depend on the final design and traffic management measures proposed by the contractor, so it is not possible to be definitive about the numbers of truck movements at this time.

Site access to the works along CityLink may be required from local streets but this would generally be limited to light vehicles undertaking auxiliary works associated with fencing and noise walls.

It is expected that all site access to the works from Council controlled roads would be only undertaken with Council agreement.

The potential for the impacts of construction truck movements to be significant is recognised in the CIS. By far the greatest volume of movements will be associated with haulage and disposal of tunnel spoil and a number of alternative haulage routes are considered. The preferred option would be to construct the CityLink ramps early, enabling use of these during construction and avoiding the use of the local road network.

The number of truck movements will vary over the life of the project, reaching a maximum while the tunnel is being excavated and bored. Peak truck movements will depend on the excavation and tunnel boring rates that can be achieved, which in turn are dictated by factors such as ground conditions, the tunnel boring machine design and surface vibration.

84. *The LMA should provide information on any traffic management or other mitigation measures that will be put in place to minimise these impacts.*

The actual traffic management measures put in place will depend on the final design, so Performance Requirement T2 requires that traffic management plans must be developed to:

“minimise disruption to motor vehicle traffic, parking, bicycle and pedestrian movements during construction in consultation with relevant road management authorities Restricting the number of local roads to be used for construction-related transportation to minimise impacts on amenity, including truck movements along Manningham Street / Oak Street north of Ross Straw Field”.

Furthermore, performance requirements NV6 and AQ7 require that construction activities must be managed in accordance with EPA publications 480 "Guidelines for Major Construction Sites" and 1254 "Noise Control Guidelines", which provide guidance on matters such as working hours and air quality.

85. *The LMA should provide an assessment of the air quality impacts, in particular PM₁₀ and PM_{2.5}, from these construction truck movements on local residents.*

The scoping directions for the CIS did not identify reduced air quality from construction activity as a key risk and did not require air quality assessment studies for construction traffic.

The risk assessment undertaken as part of the CIS identified dust as the only risk to air quality from construction activities, since the impact of emissions from construction traffic would be minimal. Accordingly, air modelling has not been undertaken for construction traffic and LMA is not aware of any project where this has been undertaken.

Performance Requirement AQ7 has been developed to manage the risks to air quality from construction activities.

11 Environmental Management Framework

11.1 Risk assessment process

86. *The LMA should provide an overview of the risk assessment methodology and how it accords with relevant Australian Standards.*

The risk assessment process used by LMA for the Comprehensive Impact Assessments, followed *AS/NZS ISO 31000:2009 Risk Management Principles and Guidelines*. This risk management process has been widely adopted throughout Australia and has also been adopted by the International Standards Organisation (ISO).

The following section explains how the risk assessment process used by LMA followed this framework (as shown in Figure 14)⁴².

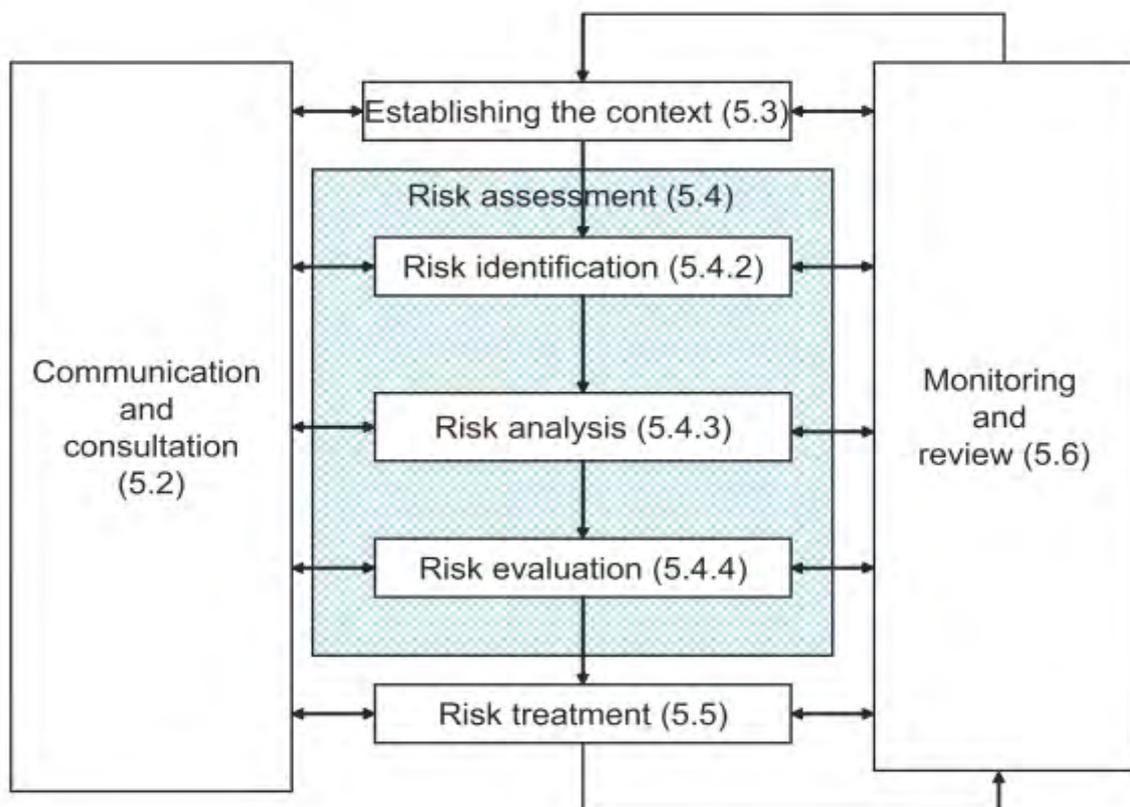


Figure 14 Risk Management Process

1) Communication and Consultation – The risk assessment process involved members of the CIS team, specialists and representatives from government agencies through the risk assessment and through subsequent reviews. This high level of engagement was so that the CIS benefitted from the wealth of diverse experience and gained consensus and buy-in from the relevant stakeholders.

2) Establishing the context – LMA provided a reference project with fly throughs, comprehensive mapping as well as the list of overall objectives of the project, to provide the context and scope for the assessment. The consequence criteria was developed, reviewed and agreed to by specialists and LMA during this phase.

⁴² *AS/NZS ISO 31000:2009 Risk Management Principles and Guidelines*.

- 3) Risk Identification – Specialists conducted an initial risk identification which formed the basis of the facilitated Risk Assessment Workshop. Using an impartial facilitator is adopted by many leading organisations to allow for thorough questioning of potential issues. The Workshop also included specialists and key regulatory stakeholders.
- 4) Risk Analysis –The risks were fully described during the workshop, including the activities that could cause the risk and a description of the consequences if it were to occur and which precincts could potentially be affected. Each risk was then rated based on the likelihood of the consequence occurring (with existing performance standards in place).
- 5) Risk Evaluation – Each risk was then discussed as to whether the risk could be feasibly reduced through identifying additional performance standards or through further understanding by means of additional specialist surveys or studies.
- 6) Risk Treatment – If deemed to be feasible risk treatment actions were identified in the form of additional performance standards to be met in subsequent phases of the project.
- 7) Monitoring and Review – The risk assessment was monitored and reviewed throughout the CIS process whenever new surveys, specialist reports or relevant information became available. Each review included consulting and communicating changes with the relevant stakeholders.

11.2 Performance requirements and suggested conditions

87. *The LMA should consider the proposed conditions and Performance Requirements as suggested by various submitters, seek to meet with those parties as necessary, and circulate a revised version that identifies areas of agreement and disagreement as appropriate, at the same time as the circulation of expert evidence.*

LMA is considering the proposed conditions and performance requirements as suggested by various submitters, and will be seeking to meet with those submitters who have advised Ms Moysey that they wish to meet with LMA.

Following those meetings and further consideration of the proposed conditions and suggested performance requirements, a revised version of the performance requirements will be circulated on 20 February 2014. This revised version will include all submitter suggestions that LMA agrees to.

11.3 Outline EMPs

88. *The LMA should advise whether the compliance requirements for the PPP availability model is available for consideration by the Assessment Committee (Vol. 2, Ch. 17, Section 17.1 (p. 1)), given that it is understood that outline EMPs have been sought in the bidding process to demonstrate compliance with all aspects of the EMF.*

The Request for Proposal documents were provided to shortlisted respondents on 31 October 2013 (RFP). These documents remain confidential and the subject of negotiation, and are therefore unable to be provided to the Committee.

However, LMA can confirm that the compliance requirements for the PPP model to be adopted, are consistent with those compliance requirements set out in the Environmental Management Framework (EMF) in Volume 2 Chapter 17 of the CIS.

Specifically, the contract to be entered into with the contractor will provide that the contractor must:

- A. deliver the Project in accordance with the performance requirements (which it is acknowledged are to be finalised during the CIS process), regardless of any specific design solutions adopted; and
- B. comply with all relevant environmental laws, approvals and approval conditions including the Planning Minister's Approval Decision, Applicable Approvals and all other statutory approvals required for the Project; and
- C. prepare and implement an Environmental Management System and Environmental Management Plans including Construction EMP and Operations EMP, both of which must be consistent with the Approval Decision and comply with the finalised performance requirements and other approvals and approval conditions.

The following EMF governance arrangements will also be included in the contract

- A. an Independent Reviewer is to be selected by the State, before being jointly appointed by the State and the successful contractor;
- B. the environmental management system and associated environmental management plans prepared by the successful contractor are to be reviewed by LMA and the Independent Reviewer and provided to the Minister for Planning for approval; and
- C. the contractor must engage a suitably qualified environmental auditor, who is independent of the contractor (and sub-contractors) to:
 - (a) during construction, carry out monthly environmental audits of implemented worksite environmental management plans, including the effectiveness of the plans and the operation of the environmental management system; and
 - (b) during operation, carry out quarterly environmental audits of the operations environmental management plan, including the effectiveness of the plan and the operation of the environmental management system; and
 - (c) provide results of the environmental audits to the State.

It is expected that the contractor will also be required to appoint a suitably qualified environmental management representative with authority and responsibility for issues relating to environmental management through the design and construction of the Project, who must review the outcomes of all environmental audits and ensure the issues identified are addressed. This representative will also be required to approve all amendments to the environmental management plans in response to any items raised by the State or the Independent Reviewer.

11.4 Emergency management

89. *The LMA should provide advice on emergency management design elements that may be required in the tunnel in the event of fire or other incidents.*

In relation to emergency management in the tunnel, the project contract documentation requires that the tunnels must provide for:

- the safe and efficient movement of traffic;
- the continuous control of internal air;
- mechanical ventilation and smoke control systems;
- emergency egress from all areas of the tunnels; and
- effective incident management.

The contract documentation references Australian and overseas design standards to achieve a level of safety that is consistent with Best Industry Practices.

Vehicles carrying dangerous goods will not be allowed to use the tunnels. Over-height vehicle detection systems, tunnel information signage, CCTV and tunnel portal barriers are required.

The specification addresses tunnel fire and life safety requirements such as:

- infrastructure fire resistance;
- equipment fire rating;
- smoke management system;
- fire suppression, including hydrants, hose reels and a fixed water-based system;
- fire protection water supply;
- emergency egress from vehicular tunnels;
- egress to a point of safety;
- access for Emergency Services;
- normal operation, emergency and exit lighting;
- emergency exit signage;
- illuminated and reflective signage and markers;
- linear thermal detection;
- an Emergency Services communication system, including emergency phones, help phones and a public address system;
- uninterruptible power supply for essential equipment;
- control systems, including redundancy provisions;
- security systems and alarm switches on doors and service cabinets;
- drainage with flame traps and hydrocarbon sensors in the pump wells; and
- monitoring and recording of all fire protection functions.

Appendix A LMA response to Moonee Valley City Council's proposed transport impact mitigation measures (Item 8d)

Each of the items raised in Section 3.1 of the MVCC submission has been given an individual item number, for ease of reference.

Item	Proposed intervention/mitigation	LMA response
	Ormond Road Interchange	
T-MVCC -01	<ul style="list-style-type: none"> An alternative design that would reduce the land take required would be merge the northbound merge of the East West Link onto CityLink to occur further south either just south or north of the Ormond Road overbridge (without first merging with the existing northbound Ormond Road on-ramp to CityLink). From a traffic management and congestion management point of view, the two entries to CityLink need to be separated and the Ormond Road (CityLink) on-ramp needs to be ramp metered. 	<ul style="list-style-type: none"> Consideration needs to be given to the current location of the Flemington Road on-ramp and existing bridge structures. The suggested alternative entry ramp layout is not possible, due primarily, to geometric design requirements and constraints. The length available for the northbound entry ramp merge prior to the Ormond Road bridge is approximately 600m. This is less than half the length of 1,250m required for a two lane entry ramp merge (as per Figs V11.9 & V11.10 in the VicRoads Supplement to the Austroads Guide to Road Design - Part 4C). Although a one lane entry ramp could physically fit within the available space, it would not have sufficient capacity for the required traffic volumes. A key concern would also be the three entry ramps in close proximity (from Flemington Road, East West Link and Brunswick Road). This would create undesirable weaving movements and unsafe practices at the merge points. This option was considered early in the design development, but quickly discounted for reasons of safety and functionality. East West Link will form part of the wider managed motorway network, so metering will be required on the Ormond / Brunswick Road entry ramp.
T-MVCC -02	<ul style="list-style-type: none"> The existing intersection between Ormond Road and CityLink could also be relocated slightly to the east, and the geometry tightened, to bring it closer to CityLink, thereby reducing the impact on Ormond Park and allowing the existing parking and buildings to be retained. 	<ul style="list-style-type: none"> Relocation of the intersection to the east would require construction of the interchange on structure and connection to the existing structure. It could entail reconfiguration of the existing Brunswick / Ormond Road interchange to maintain efficient operation (due to traffic signal layout and operation) and modification of the existing structure to achieve required sight distances. The cost of these works would be significant.

	Ormond Road (west of CityLink)	
T-MVCC -03	<ul style="list-style-type: none"> To mitigate against the adverse impact on other users of Ormond Road (such as cyclists and pedestrians), and to discourage through traffic exiting from the ramp by changing the form of the road, Ormond Road could be reconfigured. For example, this could include one traffic lane in each direction with cycle lanes in each direction and parking limited to one side of the road (currently permitted on each side). 	<ul style="list-style-type: none"> The provision of a new cycle lane does not appear to be consistent with agreed Network Operating Plans or provide connectivity into the cycle network. LMA would support the initiative to remove parking on one side of the road to assist in traffic flow through this area.
	Mt Alexander Rd / Ormond Road intersection	
T-MVCC -04	<ul style="list-style-type: none"> To mitigate the likely increase in travel times for tram users, tram priority measures could be put in place. This could potentially be achieved by splitting the tram tracks at the intersection to provide for right-turn lanes for vehicles between the pairs of tracks. As the right turn from the north is minimal, the right turn could be banned, and tram 'superstop' installed between the tram tracks. 	<ul style="list-style-type: none"> Intersection analysis of the Mt Alexander Road / Ormond Road intersection indicates that this intersection is not likely to operate at a significantly lower level of service with the introduction of the East West Link. LMA would however welcome reasonable considerations for minor improvements at this intersection if they can be achieved reasonably within the available land. However, any major proposed changes, such as those provided by Moonee Valley regarding tram operations, would need to be dealt with by VicRoads and Yarra Trams. It is envisaged that the proposed layout changes would require a large amount of land acquisition either side of Mount Alexander Road to provide sufficient space for separated tram tracks and therefore may not be possible.
	Flemington Junction Area	
T-MVCC -05	<ul style="list-style-type: none"> The CIS has failed to consider mitigation measures to address the impact on other traffic movements, tram routes 59 and 57, pedestrians and cyclists. Mitigation measures could include changes to the intersection of Boundary Road and Racecourse Road to improve traffic flow, reduce tram delays and improve pedestrian amenity. Grade separation and/or rerouting of one or both of the tram lines from the intersection of Elliot Avenue and Flemington Road should also be considered to reduce delays. 	<ul style="list-style-type: none"> This complex intersection was modelled using microsimulation in the CIS. This information is contained within Appendix B of Appendix E of the CIS. This modelling indicated satisfactory performance of the intersection and no adverse impacts on trams. Further to this, these aspects are addressed through Performance requirement T1. Grade separation of tram lines would increase impacts on Royal Park and Flemington Road.
	Mount Alexander Road	

T-MVCC -06	<ul style="list-style-type: none"> • Traffic volumes on Mount Alexander Road would increase with the construction of the proposed scheme, particularly in the southbound direction south of Ormond Road. • At the intersection of Mount Alexander Road and Ormond Road, this would have a negative impact on other users, with a likely increase in journey times for Route 59 trams. • To address this impact, there may be potential to provide a peak hour tram 'fairway' with central super stops at some locations. • Improvements for cyclists, who also would be impacted by increases in traffic volumes, may also be feasible (both with and without tram priority). 	<ul style="list-style-type: none"> • Tram travel times of Route 59 along Mount Alexander Road have been assessed for the peak directions, between CityLink and Dean Street. The counter peak directions have sufficient capacity along Mount Alexander Road and therefore it has been assumed that the additional traffic due to East West Link should not impact the operation of the trams. • The southbound direction in the AM peak is considered the peak direction. The results indicate that tram travel times are anticipated to increase by approximately 30 seconds between 2031 without East West Link and 2031 with East West Link. There is negligible difference for the tram travel time whether the Ormond Road off-ramp from East West Link is included or not. This is due to the ramp only being orientated for the northbound direction and therefore does not affect the peak direction during the AM peak. This travel time assessment does not consider the intersection improvements at Mt Alexander, Flemington Road and the CityLink offramp which are expected to provide significant travel time benefits through this intersection for the Southbound movement. • The northbound direction in the PM peak is considered the peak direction. The results indicate that tram travel times are anticipated to increase by approximately 45 seconds when East West Link is operational in 2031 without the Ormond Road off-ramp. However if the Ormond Road off-ramp is included within the East West Link design the tram travel times decrease by approximately 35 seconds.
	Mount Alexander Road / Kent Street intersection	
T-MVCC -07	<ul style="list-style-type: none"> • Kent Street and Mount Alexander Road form part of Melbourne's over-dimensional vehicle route network. • With the increased traffic volumes on Mount Alexander Road as a result of the project, it will become more difficult for over-dimension vehicles to exit from Kent Street. • To address this problem, the intersection could be redesigned to incorporate traffic signal operation, with the inclusion of the Wellington Street traffic signals. 	<ul style="list-style-type: none"> • OD routes are designated for their clearance to obstructions and not necessarily based on traffic volumes. • It is expected that the volume of OD vehicles would be very low, as is currently observed. • The potential slight delay to the occasional OD vehicle is reasonably acceptable and LMA do not believe that action is required.

Appendix B LMA response to Moonee Valley City Council's Open Space Design Interventions and Mitigation Requirements (Item 8e)

Each of the items raised in Appendix A of the MVCC submission has been given an individual item number, for ease of reference.

Moonee Ponds Creek Linear Park

Item	Proposed intervention / mitigation	LMA response
	Mitigation requirements	
MPC-MR-01	<ul style="list-style-type: none"> Develop a new Master Plan for Moonee Ponds Creek Linear Park with Council, surrounding municipalities and the community to guide future works throughout this corridor. Consultation, design and final construction to be undertaken within 5 year construction period of East West Link. 	<ul style="list-style-type: none"> Development and implementation of a new Master Plan is beyond the scope of the Project or reasonable mitigation. However, LMA could consider participating in any of the proposed processes to update or redevelop any future Master Plan.
MPC-MR-02	<ul style="list-style-type: none"> Provide a linear park experience through installation of public art, viewing decks and linger nodes that promote the journey along the Creek. Engage with Council and the community in the development of these spaces and associated improvements to amenity. 	<ul style="list-style-type: none"> A useful suggestion and potential design opportunity which could be considered as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-MR-03	<ul style="list-style-type: none"> Restoration of the Moonee Ponds Creek to reduce sound amplification and increase habitat value as outlined in the Moonee Ponds Creek Strategic Plan 2011 and Melbourne Water Healthy Waterways Strategy. 	<ul style="list-style-type: none"> Noise attenuation and landscaping will be in accordance with the performance requirements Restoration of Moonee Ponds Creek would be considered an upgrade, rather than a mitigation, and outside the scope of the project. Furthermore, restoration of Moonee Ponds Creek would have implications for the capacity of the creek during high flow events, potentially leading to increased occurrence of flood events.
MPC-MR-04	<ul style="list-style-type: none"> Upgrade width of concrete path to 3m and provide barrier fencing where required. Ensure viewlines are met and provide clear transition between shared pathways, the street network and neighbouring municipalities including Racecourse Road, Mount Alexander Road and the Capital City Trail. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider request where existing infrastructure needs to be replaced, but elsewhere as a design opportunity.
MPC-MR-05	<ul style="list-style-type: none"> Provide wayfinding and emergency signage to promote access to and from local neighbourhoods and make it easy to direct emergency services when required. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).

Item	Proposed intervention / mitigation	LMA response
MPC-MR-06	<ul style="list-style-type: none"> • Cantilever sections of bike path on structures including at crossing points along Moonee Ponds Creek to increase opportunities for open space and connect to adjoining shared pathways and street networks. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-MR-07	<ul style="list-style-type: none"> • Improve amenity of underpasses at Mt. Alexander Road, City Link, and Ormond Road. • Consider wall treatments & upgraded lighting to improve amenity. • Raise levels to prevent flooding. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS). • Flooding is addressed in performance requirements for Surface Water.
MPC-MR-08	<ul style="list-style-type: none"> • Minimise spatial impacts of new structure at ground level (eg. align existing and new piers) and optimise siting and design of new structures to support positive use of undercroft spaces. 	<ul style="list-style-type: none"> • This appears to be consistent with performance requirements for Surface Water and the Urban Design Framework.
MPC-MR-09	<ul style="list-style-type: none"> • Improve access and outlook to green space for surrounding residential area including improvements to street trees and amenity of street landscapes. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-MR-10	<ul style="list-style-type: none"> • Provide high quality sound tubes along entire Creek interface to provide both audio and visual amenity along the path. 	<ul style="list-style-type: none"> • Noise attenuation of public open space is not required under the VicRoads policy • Noise mitigation is addressed in the performance requirements.
	WSUD Opportunities	
MPC-WO-01	<ul style="list-style-type: none"> • Locally harvest, clean and detain stormwater currently discharging into Moonee Ponds Creek to lessen flow rates and enable the overall naturalisation of the Creek from the existing concrete channel and develop a riparian character for the waterway. 	<ul style="list-style-type: none"> • Stormwater collected from East West Link must be treated in accordance with VicRoads Integrated Water Management Guidelines (performance requirement SW3).
MPC-WO-02	<ul style="list-style-type: none"> • Within the East West Link boundary, approximately 11 drainage outlets have been identified within Moonee Valley that discharges into Moonee Ponds Creek. • Stormwater treatment of these outlets, such as wetlands, bioretention basins and raingardens would improve streamside condition along the most urbanised sections of the Moonee Ponds Creek. • This would improve abundance, distribution and diversity of frogs, as outlined in the Melbourne Water Healthy Waterways Strategy. (page 163). 	<ul style="list-style-type: none"> • Drainage outlets should be managed by relevant drainage authority. • Frog habitats identified in the Melbourne Water strategy are outside the project boundary (and some distance to the north – refer Fig 5.12 on p168).

Item	Proposed intervention / mitigation	LMA response
MPC-WO-03	<ul style="list-style-type: none"> Improve flood barrier / berm treatment to support positive visual and physical shared user path connection into wetland / creek. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS). Flooding is addressed in the performance requirements for Surface Water.
	Design Interventions	
MPC-DI-01	<ul style="list-style-type: none"> Reconfigure Evans Street access path due to widening of City Link, as part of the East West Link project. 	<ul style="list-style-type: none"> Evans Street is not impacted by the project. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-DI-02	<ul style="list-style-type: none"> Modify Evans-Hope pedestrian bridge and associated access ramp to provide space for a shared path. 	<ul style="list-style-type: none"> The Evans-Hope pedestrian bridge is not impacted by the project. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-DI-03	<ul style="list-style-type: none"> Provide new shared path through Bent Street Reserve, and provide connection to Moonee Ponds Creek from Wilson Street. 	<ul style="list-style-type: none"> The Bent Street Reserve is not impacted by the project Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-DI-04	<ul style="list-style-type: none"> Provide shared path pedestrian underpass beneath Wilson Street. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-DI-05	<ul style="list-style-type: none"> Extend shared path along existing road and road reserve to provide access to the Moonee Ponds Creek Linear Park. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-DI-06	<ul style="list-style-type: none"> Provide off-road cyclist and pedestrian path beneath Dean Street Overpass impacted by East West Link. Regrade hairpin turns along approach to East West Link overpass. 	<ul style="list-style-type: none"> Reinstatement of infrastructure will be in accordance with the performance requirements. Any upgrade to existing infrastructure to be considered as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).

Item	Proposed intervention / mitigation	LMA response
MPC-DI-07	<ul style="list-style-type: none"> • Provide cyclist and pedestrian connection to Ormond Road. • Raise level of the Shared Path beneath the Ormond Road underpass for flood protection, potentially as a raised / cantilevered structure. • Remove proposed Ormond Rd off ramp or move east. • Move Ormond Road on ramp east. 	<ul style="list-style-type: none"> • Shared path proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS). • Refer T-MVCC -02 in relation to re-alignment of Ormond Road ramps.
MPC-DI-08	<ul style="list-style-type: none"> • Undertake works in light of the Travancore Park Feasibility and Options Study. • Construct an additional pathway and relocate playground. • Realign shared pathway, potentially as a cantilevered structure off road infrastructure to offset loss of open space and provide connection to local streets. • Consider shared path link to Royal Park. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-DI-09	<ul style="list-style-type: none"> • Realign the path on the south approach to increase radius of curve and improve sight lines, as part of bridge widening works, to accommodate East West Link interchange. 	<ul style="list-style-type: none"> • Consider during detailed design.
MPC-DI-10	<ul style="list-style-type: none"> • Provide cyclist and pedestrian connection from Moonee Ponds Creek Linear Park to Mt Alexander Road, including provision of on road cycle lanes. 	<ul style="list-style-type: none"> • Consider during detailed design.
MPC-DI-11	<ul style="list-style-type: none"> • Provide walking and cycling connection between Capital City Trail (Royal Park) and outbound platform directly to Racecourse Road, including bridge structure from Debneys Park to Flemington Bridge Station. • To connect to Moonee Ponds Creek Path, Flemington Community Centre and the broader Flemington Neighbourhood. 	<ul style="list-style-type: none"> • Consider during detailed design.
Associated Works		
MPC-AW-01	<ul style="list-style-type: none"> • Upgrade and replace existing Montague Street Boardwalk to improve width and sightlines for cyclists and pedestrians. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
MPC-AW-02	<ul style="list-style-type: none"> • Construct a new off-road shared path along the Moonee Ponds Creek between Vanberg Road and Primrose Street to close the gap in the path network. 	<ul style="list-style-type: none"> • Outside the project boundary.

Item	Proposed intervention / mitigation	LMA response
MPC-AW-03	<ul style="list-style-type: none"> Implement findings of safety audit. 	<ul style="list-style-type: none"> Road safety audits are required under Performance Requirement T5. In accordance with the Austroads guidelines, the findings of the audit must be considered by the designer, but there is not (and should not be) a requirement to implement the findings of a safety audit.

Debneys Park Playspace

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	
DPP-MR-01	<ul style="list-style-type: none"> Additional land to compensate for the loss of open space created by the overpass. 	<ul style="list-style-type: none"> Impacts on Debneys Park will be mitigated in accordance with the performance requirements.
DPP-MR-02	<ul style="list-style-type: none"> Develop a Master Plan with Council and the community to guide future works. Consultation, design and final construction to be undertaken within 5 year construction period of East West Link. 	<ul style="list-style-type: none"> Development and implementation of a new Master Plan is beyond the scope of the Project or reasonable mitigation. However, LMA could consider participating in any of the proposed processes to update or redevelop any future Master Plan.
DPP-MR-03	<ul style="list-style-type: none"> Reconfiguration of space to mitigate impact of overpass, including relocation of play space to the southern edge of Debneys Park oval and away from overpass structure. All changes will require consultation with the community and Council. 	<ul style="list-style-type: none"> Agreed, subject to final design, and addressed in the performance requirements.
DPP-MR-04	<ul style="list-style-type: none"> Replacement of Flemington Community Centre. 	<ul style="list-style-type: none"> Not necessary based on Reference Project.
DPP-MR-05	<ul style="list-style-type: none"> Reinstate the bridge connection between Flemington Bridge Station and Debneys Park, which was constructed during the CityLink works to provide alternative access to train station. 	<ul style="list-style-type: none"> Agreed, subject to final design, and addressed in the performance requirements.
DPP-MR-06	<ul style="list-style-type: none"> Potential structures that could be located directly under overpass (to be confirmed and consulted with the community) include: <ul style="list-style-type: none"> Relocated Tennis Courts; Synthetic Soccer Pitch; Skate and BMX Track; Cantilevered pathways; or Ropes course. 	<ul style="list-style-type: none"> Agreed, subject to final design, and addressed in the performance requirements. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
	WSUD Opportunities	
DPP-WO-01	<ul style="list-style-type: none"> Utilise harvested water to increase amenity within the playspace whilst providing an irrigation source for the sports fields. (Debneys Park Water Stormwater Harvesting Project, AECOM, 2010). 	<ul style="list-style-type: none"> Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).

Debneys Sports Precinct

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	
DSP-MR-01	<ul style="list-style-type: none"> Develop a new Master Plan with Council and the community to guide future works. Consultation, design and final construction to be undertaken within 5 year construction period of East West Link. 	<ul style="list-style-type: none"> Development and implementation of a new Master Plan is beyond the scope of the Project or reasonable mitigation. However, LMA could consider participating in any of the proposed processes to update or redevelop any future Master Plan.
DSP-MR-02	<ul style="list-style-type: none"> Reconfiguration of precinct with the replacement of the Flemington Community Centre and playspace whilst providing for the sporting requirements of the Moonee Valley community. (See also Social Impacts). 	<ul style="list-style-type: none"> Refer to DPP-MR-03 and DPP-MR-04.
DSP-MR-03	<ul style="list-style-type: none"> Harvest, clean and reuse water from existing catchment and overpass structure within a wetland / retention basin arrangement. Basin to provide aerating fountain to mitigate noise generated from the overpass. Harvest water to irrigate Debneys Park oval. (Debneys Park Water Stormwater Harvesting Project, AECOM, 2010) 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).

Dehli Reserve

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	
DR-MR-01	<ul style="list-style-type: none"> Treatment of East West Link overpass to mitigate sound travelling into park. 	<ul style="list-style-type: none"> Noise attenuation will be in accordance with the performance requirements.
DR-MR-02	<ul style="list-style-type: none"> Ensure continuation of Moonee Ponds Creek Linear Park and shared pathway between Travancore Park and Delhi Reserve. 	<ul style="list-style-type: none"> Existing paths to be maintained.

Travancore Park

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	

Item	Proposed intervention / mitigation	LMA response
TP-MR-01	<ul style="list-style-type: none"> Develop a new Master Plan for Travancore Park with Council and the community to guide future works. Consultation, design and final construction to be undertaken within 5 year construction period of East West Link including items below. 	<ul style="list-style-type: none"> Development and implementation of a new Master Plan is beyond the scope of the Project or reasonable mitigation. However, LMA could consider participating in any of the proposed processes to update or redevelop any future Master Plan.
TP-MR-02	<ul style="list-style-type: none"> Way finding signage throughout park to direct pedestrians and cyclists to Moonee Ponds Creek Linear Park and surrounding streets 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
TP-MR-03	<ul style="list-style-type: none"> Improve shared user path within Travancore Park and provide transition of trails between adjoining streets including Mooltan Street and surrounds to account for bicycle and pedestrian use 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
TP-MR-04	<ul style="list-style-type: none"> Undertake stormwater treatment initiatives from stormwater flow from East West Link and surrounding drainage infrastructure. Two drainage outlets have been identified at the Travancore Park location, which could be treated to slow flows into Moonee Ponds Creek and enable naturalisation of Creek environs by reducing velocity and capacity required of the existing Creek. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS). Drainage outlets should be managed by relevant drainage authority
TP-MR-05	<ul style="list-style-type: none"> Minimise spatial impacts of new structure at ground level and screen with dense vegetation irrigated or passively irrigated from harvested and treated stormwater 	<ul style="list-style-type: none"> Addressed in the performance requirements and Urban Design Framework. Proposal is prescriptive – consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
TP-MR-06	<ul style="list-style-type: none"> Optimise siting and design of new structures to support positive use of undercroft spaces, including cantilevered pathways as part of the Moonee Ponds Creek Trail which could increase open space opportunities within Travancore Park. 	<ul style="list-style-type: none"> Addressed in the performance requirements and Urban Design Framework. Proposal is prescriptive – consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).

Item	Proposed intervention / mitigation	LMA response
TP-MR-07	<ul style="list-style-type: none"> Provide a seamless linear park experience adjacent to the creek corridor and continue this into Travancore Park and connections to Fenton Street Reserve and associated Hockey facility. 	<ul style="list-style-type: none"> Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
TP-MR-08	<ul style="list-style-type: none"> Improve interface between Travancore Park and Moonee Ponds Creek Linear Park to support positive visual and physical shared user path and connections into wetland / creek area. 	<ul style="list-style-type: none"> Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
TP-MR-09	<ul style="list-style-type: none"> Undertake reconfiguration and relocation of playspace as per Moonee Valley Playspace Plan which reports to upgrade the facility from a minor to medium playspace. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
TP-MR-10	<ul style="list-style-type: none"> Maintain dog off lead provision at Travancore Park and consider relationship with shared pathways and playspace location. 	<ul style="list-style-type: none"> Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).

Fenton Street Reserve

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	
FSR-MR-01	<ul style="list-style-type: none"> Develop a new Master Plan for Fenton Street Reserve with Council, stakeholders and the community to guide future works. Consultation, design and final construction to be undertaken within 5 year construction period of East West Link. 	<ul style="list-style-type: none"> Development and implementation of a new Master Plan is beyond the scope of the Project or reasonable mitigation. However, LMA could consider participating in any of the proposed processes to update or redevelop any future Master Plan.
FSR-MR-02	<ul style="list-style-type: none"> Relocate playspace to more suitable position away from road infrastructure. 	<ul style="list-style-type: none"> This reserve is outside the project boundary so the playspace will not be directly impacted.

Item	Proposed intervention / mitigation	LMA response
FSR-MR-03	<ul style="list-style-type: none"> Reinstatement of Moonee Ponds Creek Linear Park to connect Fenton Street Reserve with Travancore Park. Requires the reinstatement of public land south of Fenton Street which has been identified for site access and storage. 	<ul style="list-style-type: none"> Agreed, subject to final design, and addressed in the performance requirements.
FSR-MR-04	<ul style="list-style-type: none"> Sound mitigation is required due to proximity of East West Link and interface with Fenton Street Reserve, especially to continue function of the facility as an outdoor sporting reserve. Increased noise levels may impact on the capacity of the reserve to deliver this service. 	<ul style="list-style-type: none"> Noise attenuation will be in accordance with the performance requirements.
FSR-MR-05	<ul style="list-style-type: none"> Periodic (monthly) maintenance of each synthetic, including cleaning, grooming, infill and surface spraying to combat effects of construction. 	<ul style="list-style-type: none"> Dust management during construction will be in accordance with the performance requirements.
FSR-MR-06	<ul style="list-style-type: none"> Replacement of both synthetic pitches at conclusion of construction period of East West Link. 	<ul style="list-style-type: none"> Providing dust management during construction is undertaken in accordance with the performance requirements, this will not be necessary.

Brisbane Reserve

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	
BR-MR-01	<ul style="list-style-type: none"> Remove proposed off ramp to Ormond Road or re-align to the east. 	<ul style="list-style-type: none"> Refer T-MVCC -0.2
BR-MR-02	<ul style="list-style-type: none"> Earthworks to provide a vegetated buffer and decrease scale of sound wall. 	<ul style="list-style-type: none"> Proposal to be considered during detailed design. Proposal would limit opportunities to relocate the intersection to the east (refer T-MVCC -02) and would increase road footprint.
BR-MR-03	<ul style="list-style-type: none"> Provide a shared path connection linking Ormond Road to Moonee Ponds Creek Trail. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).

Item	Proposed intervention / mitigation	LMA response
BR-MR-04	<ul style="list-style-type: none"> Brisbane Reserve has drainage outlets which could be harvested and treated to irrigate landscape and improve quality of Moonee Ponds Creek waterway. 	<ul style="list-style-type: none"> Proposal is an upgrade, rather than mitigation. Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS). Drainage outlets should be managed by relevant drainage authority.

Essendon Community Gardens

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	
ECG-MR-01	<ul style="list-style-type: none"> Remove proposed off ramp to Ormond Road or re-align to the east to prevent loss of land at the Essendon Community Garden. 	<ul style="list-style-type: none"> Refer T-MVCC -02
ECG-MR-02	<ul style="list-style-type: none"> Develop a new Master Plan for Essendon Community Garden with Council to guide future works within this area. Consultation, design and final construction to be undertaken within 5 year construction period of East West Link. Items to include but not limited to: relocation of existing pavilion, shed and rainwater tanks and the inclusion of solar panels. 	<ul style="list-style-type: none"> Development and implementation of a new Master Plan is beyond the scope of the Project or reasonable mitigation. However, LMA could consider participating in any of the proposed processes to update or redevelop any future Master Plan.
ECG-MR-03	<ul style="list-style-type: none"> Soil testing and monitoring to ensure Essendon Community Gardens is suitable to function for growing food. 	<ul style="list-style-type: none"> Construction activities will not impact suitability of soil for growing food.
ECG-MR-04	<ul style="list-style-type: none"> Restoration and landscaping of Moonee Ponds Creek corridor to reduce noise generated from traffic using East West Link. 	<ul style="list-style-type: none"> Noise attenuation and landscaping will be in accordance with the performance requirements.

Ormond Park

Item	Proposed intervention / mitigation	LMA response
------	------------------------------------	--------------

Item	Proposed intervention / mitigation	LMA response
	Mitigation Requirements	
OP-MR-01	<ul style="list-style-type: none"> • Undertake new Master Plan through the review of Ormond Park Master Plan with Council and the community to guide works to be completed within the 5 year construction period of East West Link. • These could include the items below. 	<ul style="list-style-type: none"> • Development and implementation of a new Master Plan is beyond the scope of the Project or reasonable mitigation. However, LMA could consider participating in any of the proposed processes to update or redevelop any future Master Plan.
OP-MR-02	<ul style="list-style-type: none"> • Provision of elements to improve access to and use of the reserve for local residents including: <ul style="list-style-type: none"> ○ New playspace ○ New vehicle entrances ○ Shelter and BBQ facilities ○ Circuit track around sporting fields with a series of fitness stations. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
OP-MR-03	<ul style="list-style-type: none"> • Provide pedestrian zone with designated crossing within shared zone to connect Moonee Ponds Creek Linear Park. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
OP-MR-04	<ul style="list-style-type: none"> • New entrance to Moonee Ponds Creek Linear Park including pedestrian bridge link across Moonee Ponds Creek to Holbrook Reserve to provide connections to the broader open space network. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS).
OP-MR-05	<ul style="list-style-type: none"> • Water treatment initiatives from stormwater flow from surrounding drainage infrastructure. • These would slow flows into Moonee Ponds Creek and enable naturalisation of Creek environs by reducing velocity and capacity required of the existing drainage system. • Ormond Park has capacity to harvest and treat stormwater for irrigation of the sports grounds and to minimise flows into the Moonee Ponds Creek. 	<ul style="list-style-type: none"> • Proposal is an upgrade, rather than mitigation. • Consider as a design opportunity in the context of the Urban Design Framework (Refer to Appendix C of the CIS). • Drainage outlets should be managed by relevant drainage authority.
OP-MR-06	<ul style="list-style-type: none"> • Maintain dog off lead provisions in parkland. 	<ul style="list-style-type: none"> • Project will have no impact on dog off lead provisions.

Item	Proposed intervention / mitigation	LMA response
OP-MR-07	<ul style="list-style-type: none"> • Re-alignment of the existing Ormond Road on-ramp to the east. 	<ul style="list-style-type: none"> • Refer T-MVCC -02.
OP-MR-08	<ul style="list-style-type: none"> • Provision of elements to provide for sporting clubs: <ul style="list-style-type: none"> ○ Realign street car parking and reconfigure internal carparking to provide efficiency and increase open space. ○ New sporting pavilion for Moonee Valley Sporting Club. ○ New soccer pavilion at Fairbairn Park or Cross Keys Reserve and reconfigured sporting grounds, varying on impact of East West Link layout. 	<ul style="list-style-type: none"> • Impacts on Ormond Park and sporting facilities will depend on the final design • Reconfiguration and reinstatement works will be undertaken in accordance with the performance requirements.

Appendix C

Drawings and screenshots from Urban Circus Model showing indicative elevations (Item 11)

Appendix D

Memorandum comparing actual and forecast daily traffic on Peninsula Link (Item 16)

Appendix E Table showing VLC Predictions and Actual Traffic Volumes on Australian Roads (Item 16)

Appendix F Delay and queue length data for Hoddle Street Interchange (Item 22)

Appendix G Consistency between the Reference Project and the documents listed in Appendix F, Part 3.4 of the CIS (Item 37)

Policy / Strategy Title	Response
City of Melbourne	
<p><i>Arden-Macaulay Structure Plan (2012)</i></p>	<p>The Arden-Macaulay Structure Plan (AMSP) does not yet form part of the Melbourne Planning Scheme. It was adopted by the City of Melbourne in February of 2012 and is the subject of Amendment C190 to the Melbourne Planning Scheme. That amendment has progressed to a hearing before a planning panel which has been adjourned pending completion of this assessment process.</p> <p>The AMSP provides a vision to guide urban renewal which will accommodate both residents and employment opportunity within the precinct over the next 30 years.</p> <p>The East West Link Reference Project passes through the AMSP area just west of centre and along the western side of the CityLink viaduct and Moonee Ponds Creek corridor.</p> <p>Notably, the AMSP document does not make any reference to the East West Link project or the <i>Eddington Report</i> of 2008 which investigated and made recommendations (including an indicative alignment) for an east-west 'cross city' connection.</p> <p>The Reference Project provides opportunity for heavy vehicle movements to be reduced from the local street network which may contribute to enhanced pedestrian (walkability) and bicycle safety through the neighbourhoods which is an objective / issue that should be addressed in the urban renewal process – these are objectives of the AMSP.</p> <p>In addition, the Reference Project would not impact upon the ultimate ability of the AMSP to deliver on its overarching directions to:</p> <ul style="list-style-type: none"> • <i>Develop Arden Central as a new extension of Melbourne's Central City</i> • <i>Develop three new local centres within a mixed use neighbourhood.</i> • <i>Expand transport connectivity to and within Arden-Macaulay.</i> • <i>Upgrade the Moonee Ponds Creek parkland corridor and establish five new parks.</i> • <i>Make Arden-Macaulay energy, water and waste efficient.</i> <p>The principal departures of the Reference Project from the AMSP relate to:</p> <ul style="list-style-type: none"> • <i>The proposed lineal open space reserve (Public Park and Recreation Zone) along the west bank of Moonee Ponds Creek (impacts of new viaduct over river environs / usability of open space).</i> • <i>Impacts of the planned viaduct on land to be developed for multi story mixed use purposes (associated amenity impacts of the above ground structures).</i> <p>In response, the implementation of the Urban Design Framework in the final project design would assist the project integrate appropriately with the AMSP precinct via measures including:</p>

	<ul style="list-style-type: none"> • <i>Minimising spatial impacts of new structure at ground level (e.g. align existing and new piers).</i> • <i>Improving access and outlook to green space, street trees and street landscape for residents.</i> • <i>Developing riparian and wetland character, and extend planting.</i> • <i>Improving amenity of shared user paths and linkages across the creek – possibility of using the elevated infrastructure.</i> • <i>Improving flood barrier / berm treatment to support visual and physical connections into wetland / creek area.</i>
<p><i>Inner Melbourne Action Plan (2005)</i></p>	<p>This strategy is a collaborative partnership between the Cities of Melbourne, Port Phillip, Stonington, Yarra and Moonee Valley, with the aim of <i>‘strengthening the liveability, attraction and prosperity of the region’</i>.</p> <p>The project (and intent of the wider EWL) is generally consistent with this document insofar as the following strategies are identified as a means of achieving the vision articulated in the IMAP:</p> <ul style="list-style-type: none"> • <i>Minimise the growing impact of traffic congestion.</i> • <i>Facilitate the growing importance of the Inner Melbourne Region as south-east Australia's freight hub.</i> <p>Chapter 7 of the CIS and Technical Appendix E to the CIS provide a detailed description of how the project will achieve these objectives.</p>
<p><i>Royal Park Master Plan (1988)</i></p>	<p>The Royal Park Master Plan (RPMP) was prepared in 1998. It is a reference document under the Melbourne Planning Scheme.</p> <p>Key objectives of the plan include to:</p> <ul style="list-style-type: none"> • <i>evoke the original Australia landscape character of land and space, using the important qualities of the Park that are already present</i> • <i>physically unite the presently separated areas of the Park and establish a circulation system that serves and supports the park...</i> • <i>respect the cultural and historical heritage of Royal Park in keeping with its landscape objectives.</i> <p>The Master Plan does not contemplate the construction of a tunnelled roadway in the alignment proposed, the proposed interchange at Elliott Avenue, or the tunnel portal and viaduct structures at Ross Straw Field. The Reference Project necessarily constitutes a departure from the RPMP in these respects. Aspects of the Urban Design Framework have been specifically formulated with a view to ameliorating the impact of the project on Royal Park. The following design opportunities are specifically identified in this respect:</p> <ul style="list-style-type: none"> • <i>Create positive, memorable arrival / exit experience for road users at the escarpment portal.</i> • <i>Incorporate high quality, sensitive architectural and urban design of structures to respond to the parkland and residential interfaces.</i> • <i>Minimise park impact by redesigning the park layout to reinstate active and passive play areas and wetland functions.</i> • <i>Utilise future park layout and the elevated road infrastructure to improve the shared user path connections across Ross Straw Field to the Moonee Ponds Creek Trail.</i> • <i>Extend and improve shared user paths, connect Capital City Trail to the Moonee Ponds Creek Trail.</i>

	<ul style="list-style-type: none"> • <i>Optimise the useability of areas under the elevated infrastructure for wetlands, shared user paths and other passive recreational uses.</i> • <i>Use spaces immediately adjacent to elevated infrastructure to support tall vegetation, thereby bringing the park to the freeway.</i> • <i>Minimise the impact on landscaped escarpment areas.</i> • <i>Integrate artwork and Indigenous heritage interpretive signage.</i> <p>There are also opportunities for areas of Royal Park, not directly impacted by the Reference Project, to be enhanced as a component of the project in keeping with the vision articulated in the RPMP.</p>
<p><i>Transport Strategy (2012)</i></p>	<p>The Transport Strategy (2012) was approved by Council on 8 May 2012. It is not part of the Melbourne Planning Scheme. The Transport Strategy specifically addresses the scope for an East West Link of the type proposed (though not on the specific terms of the Reference Project) (at 50):</p> <p style="padding-left: 40px;"><i>The Victorian Government East West Link proposal has significant implications for meeting the demands for east-west road travel across the metropolitan area and more locally for the functioning of public and private transport and mobility on the road network in the municipality's north and for the location and quality of urban renewal in the municipality.</i></p> <p>It recognises that “east-west through traffic in the northern part of the city is not being well provided for by the Hoddle Street and Alexandra Parade / Macarther Road by-pass links” and that “[h]igh quality road and rail connections to and from the port are essential for its growing operation” (at 50).</p> <p>Ultimately, however, the strategy neither supports nor opposes the East West Link proposal, resolving instead that the Council “consider the Government’s [proposal] when details are known to make sure that it achieves the City of Melbourne’s transport and urban development objectives”. The Strategy does go on to cite the “council’s resolution of June 2008 opposing the use of any parkland for the purposes of any road works or associated activities” (at 53).</p>
<p>City of Moreland</p>	
<p><i>Moreland Integrated Transport Strategy (2010 - 2019)</i></p>	<p>The Moreland Integrated Transport Strategy, which has been adopted by Council but is not referenced in the Moreland Planning Scheme, contains the following four overarching objectives:</p> <ul style="list-style-type: none"> • <i>To achieve a shift toward more environmentally sustainable travel modes</i> • <i>To support social equity and ensure viable transport options for all sectors of the community</i> • <i>To improve safety in all modes of transport to support an active and healthy community</i> • <i>To support economic activity by providing for multi-modal transport links supporting all forms of commerce in the City</i> <p>Given its alignment, the reference project would not directly affect the achievement of these objectives in the City of Moreland.</p> <p>The reference project may be argued, more generally, to be inconsistent with the first of the stated objectives insofar as it promotes car based travel. This fails to recognise, however, the improvements to the operation of the public</p>

	<p>transport network that will accrue as a consequence of the redirection of traffic into the Link.</p> <p>There can be no doubt that the project is otherwise consistent with each of the remaining three overarching objectives of the Strategy.</p>
City of Yarra	
<i>Strategic Transport Statement</i>	<p>The Strategic Transport Statement, which is a reference document in the Yarra Planning Scheme, “aims to meet the transport needs of residents, businesses, visitors and commuters [within the City of Yarra] while minimising the negative impact of cars on Yarra’s community” (at 3). The Statement “is not intended to be a comprehensive transport strategy but a broad statement of Council’s transport policy intent” (at 3).</p> <p>The Statement documents a number of “transport objectives and actions”, some of which are inconsistent with the proposal. These include to:</p> <ul style="list-style-type: none"> • <i>Lobby the Victorian Government to redirect resources being used in new freeway building to more sustainable transport.</i> • <i>Lobby the Victorian Government not to build or extend freeways or tollways.</i> • <i>Work with VicRoads against road widening in the City of Yarra.</i> • <i>Work with VicRoads so that no new slip roads are created in the City of Yarra.</i> <p>The proposal is otherwise generally consistent with the principles set out in the Statement (to the extent that they are relevant).</p>
<i>Smith Street Structure Plan (2008)</i>	<p>The Smith Street Structure Plan (SSSP), which is listed as a policy reference under Schedule 10 to the Design and Development Overlay of the Yarra Planning Scheme is intended to provide ‘<i>a long term vision and direction on how the area should be managed into the future.</i>’ The SSSP includes objectives, strategies and actions to manage change in and around Smith Street. The SSSP addresses land use activities, public spaces (parks and footpaths), transport (accessibility and mobility) and built form (guidance for new development).</p> <p>The study area extends east and west of Smith Street and is bounded to the north by Alexandra Parade.</p> <p>As the Reference Project nominates the project as being within a tunnel throughout the entirety of the Smith Street study area, the project would not adversely impact upon the objectives of the SSSP.</p>
<i>Smith Street Activity Centre Structure Plan – Transport and Parking Framework (2008)</i>	<p>The Transport and Parking Framework forms part of the SSSP and the same conclusions should be drawn concerning the consistency of the reference project with that framework.</p>
<i>Johnson Street Local Area Plan (2011)</i>	<p>A Draft Local Area Plan (LAP) was prepared by Yarra City Council and released for public consultation in June 2012. The Plan has not been adopted in final format by Council and does not form part of the Yarra Planning Scheme.</p> <p>Its purpose is ‘<i>to guide and manage future change in the study area. The plan focusses on the key issues affecting the street environment in Johnston Street such as land uses, the public realm and built form, street interfaces, as well as traffic, movement and access throughout the study area.</i>’</p> <p>The study area extends beyond the Johnston Street corridor itself to the north</p>

	<p>and south. The northern most boundary of the study area is the Eastern Freeway on the eastern side of Hoddle Street.</p> <p>The Reference Project does interface with Precinct 5 (Hoddle Street / Victoria Park Station) of the LAP at its north-west extremity where it is noted that <i>'the future of this area will be determined in part by the future use of the railway land and the remaining industrial uses in the area, which may limit development opportunities'</i>.</p> <p>The vision for Precinct 5, as articulated in the LAP, is for :</p> <p><i>'new office and residential development [to be] focussed around Victoria Park Station. New pedestrian footpaths and a public space link the station to Johnston Street, Hoddle Street and the revitalised Victoria Park. New active uses revitalise the Hoddle Street frontage and the edge to Victoria Park. A new taller scale of development along Hoddle Street contributes to the new wide boulevard character of the street'</i>.</p> <p>The Reference Project would not prejudice the implementation of this strategy.</p>
<p><i>Yarra River Policies and Planning (2004)</i></p>	<p>The Department of Sustainability and Environment commissioned a review of the existing policies and planning controls for the Yarra River corridor between Punt Road and Burke Road in 2004. <i>Review of Policies and Controls for the Yarra River Corridor: Punt Road to Burke Road: Consultant Report (June 2005)</i> is a reference document under the Yarra Planning Scheme.</p> <p>The purpose of the project was to 'review and recommend changes to existing local policies and planning controls in order to ensure protection of the river corridor from inappropriate use and development, protection and enhancement of natural and cultural heritage and access to recreational open space'.</p> <p>There have been no further changes or updates to this policy since 2005.</p> <p>The Reference Project does not impact upon the Yarra River environs, nor on the implementation of these policies.</p>
<p><i>Yarra Urban Design Strategy (2011)</i></p>	<p>This local level strategy, adopted by Council in June 2011 as a guide for planners, designers and decision-makers, identifies the intersection of Hoddle Street and Eastern Freeway-Alexandra Parade as one of a number of 'Entry' sites into the municipality.</p> <p>The strategy recognises that:</p> <p><i>'Entry locations help in defining Yarra's image as well as with orientation. Some locations are already well defined, while others remain as left over spaces after road works. Being at the edge of the municipality they are often forgotten spaces'</i>.</p> <p>In this location (at Strategy 7.1 – Enhanced quality of Yarra's urban form and character) Hoddle Street and Alexandra Parade are designated as Main Road / Boulevards, with the design intent being 'coherent built form with improved access that enhances the character of the tree lined avenues'.</p> <p>The brick shot tower structure off Gold Street and Alexandra Parade is also referenced here as a landmark, with the design intent being 'new development that respects the visible landmark quality of the element'.</p>

	<p>While Alexandra Parade will continue to be a strong east-west traffic corridor, the redirection of a significant proportion of through traffic will open up the following design opportunities recognised in the Urban Design Framework:</p> <ul style="list-style-type: none"> • <i>Replacement of existing sound walls along the northern end of Bendigo Street.</i> • <i>Construction of new 'green wall' / sculptural noise walls integrated with any elevated structure.</i> • <i>An elevated shared use path, with sweeping views and optimising connectivity.</i> • <i>Integrated screening on any elevated shared path for safety and to limit overlooking.</i> • <i>Creation of a wider park for local residents (Hoddle Street / Bendigo Street environs).</i> <p>The realisation of these types of design opportunities, consistent with the implementation of the broader urban design principles articulated within the Urban Design Framework, would be consistent with the outcomes envisaged by the Yarra Urban Design Strategy.</p>
<p><i>Business and Industrial Land Strategy (2012)</i></p>	<p>This local strategy, adopted by Council on 5 June 2012, applies to the existing Commercial 1 and 2 and Industrial 1 and 3 Zones within the municipality (other than to the established retail areas that are otherwise the subject of structure plans or local area plans.</p> <p>Of greatest relevance to the Reference Project, these areas are located on the east side of Hoddle Street (north and south of Alexandra Parade) and at the north-west corner of Hoddle Street and Alexandra Parade. Other areas are located north and south of Alexandra Parade around the Smith Street intersection and moving west towards Brunswick Street.</p> <p>The principal impact of the project upon these areas will occur during construction, during which parts of these areas will accommodate the realignment of Alexandra Parade and parts will be used for laydown / construction depot purposes.</p>
<p><i>Yarra Industrial and Business Land Strategy Review (2004)</i></p>	<p>The purposes of the Yarra Industrial and Business Land Strategy Review, a reference document under the Yarra Planning Scheme, are set out below:</p> <ul style="list-style-type: none"> • <i>to review trends in industrial and business activity on the future use and development of land zoned Industrial 1 and 3, and Business 3 and 4 in the municipality of Yarra; and</i> • <i>to make recommendations regarding the future use and zoning of such land.</i> <p>The Reference Project would require the demolition of existing commercial development on Commercial 2 zoned land on the north side of Alexandra Parade (generally between Smith Street and Wellington Street). The land would be made available to the market for redevelopment upon the completion of the construction of the project.</p> <p>The Reference Project would accordingly not impact upon the implementation of this strategy in the longer term.</p>

<p><i>Housing Strategy (2010 - 2013)</i></p>	<p>The City of Yarra Housing Strategy was adopted by the Council in October 2012. It considers Yarra's capacity for housing growth and identifies areas capable of accommodating increased residential growth.</p> <p>The Reference Project, due to its location within an inner city urban context, will result in the loss of some residential development (both during the construction and operation phases of the project). Notwithstanding this, the project has the ability to act as a catalyst for urban renewal along the majority of its alignment within the City of Yarra, by improving the amenity of Alexandra Parade and its immediate surrounds.</p> <p>The project would not compromise the ability of any of the "strategic redevelopment sites" identified within the Strategy to be redeveloped to their full potential. Indeed, the Reference Project would be generally consistent with the intent of the strategy, as it would provide further strategic opportunities for urban renewal post-construction.</p>
<p><i>North Fitzroy Gasworks Precinct Urban Design Framework (2008)</i></p>	<p>The North Fitzroy Gasworks Precinct Urban Design Framework (UDF), adopted by Council on 21 October 2008, provides guidance in respect of the future land use and development of the former Gasworks site. It envisages, in broad terms, that the site will be redeveloped for a mixed use purpose.</p> <p>The North Fitzroy Gasworks Precinct UDF articulates the following objectives in respect of the ultimate redevelopment of the site:</p> <ul style="list-style-type: none"> • <i>Respond to Queens Parade and Alexandra Parade with built form that contributes to their significance as formal boulevards, and land uses that suit the varied traffic and environmental conditions along them.</i> • <i>Address Smith Street to strongly encourage the use of tram services in connection with development of the site, and to contribute to the streetscape character and vitality of the activity strip along the length of Smith Street.</i> • <i>Improve pedestrian and bicycle access into and through the precinct to support its development and to integrate activity in the area with surrounding neighbourhoods.</i> • <i>Accommodate community facilities meeting strategic needs of the wider area.</i> • <i>Create useful public spaces to meet local needs, to improve their amenity and usability.</i> • <i>Capitalise on significant development opportunities created by excavation for site remediation purposes and by the buffer created by wide roads north and south of the former Fitzroy Gasworks site.</i> <p>Whilst the Gasworks site will be required as a lay down area during the construction of the project it is envisaged that it will ultimately be released upon the completion of construction and be eligible for redevelopment in accordance with the North Fitzroy Gasworks Precinct UDF.</p>

Appendix H Images from Urban Circus Model showing overshadowing effects (Item 43)

**Appendix I Contour plots and time series plots for Clifton Hill Primary School
(Item 47)**

Appendix J Contour plots and transect plots for Alexandra Parade (Item 48)

Appendix K Contour plots and transect plots for Ormond Road (Item 49)

Appendix L Contour plots and time series plots for elevated receptors (Item 50)

Appendix M Contour plots and transect plots showing effect of gradient (Item 51)

**Appendix N Contour plots and time series plots for Zoo and Children's Hospital
(Item 59)**

Appendix O Technical note discussing the geological history of the area (Item 71a)

**Appendix P Memo from Melbourne Water (Ned Powell) to Brian O'Driscoll
dated 12 March 2013 discussing the East West Link NYM (Item
71d)**

Appendix Q Documents requested in Item 72, including:

- a) A geological plan or plans of the East West Tunnel alignment at A0 or A1 sheet size, showing the inferred geology at the tunnel horizons;**
- b) Geological sections of the respective East West Tunnel alignments at A0 or A1 sheet size, showing the inferred geology and the groundwater level indicated at the location of all the geotechnical investigation drillholes;**
- c) AECOM 2013 Mitigation of Risks Posed by Contaminated Groundwater Whilst Under Alexandra Parade. Draft Options Review, Draft Report prepared for LMA (Appendix M, Section 16 References, p 134);**
- d) GHD 2013c East-West Link – Eastern Section Contaminated Land Assessment, Report prepared for LMA (Appendix M, Section 16 References, p 135);**
- e) Leonard, J., 2006, Hydrogeology of the Melbourne Area, Australian Geomechanics Journal, Vol. 41, No. 3 (Appendix M, Section 16 References, p 135);**
- f) SKM 2013a, East-West Link Hydrogeological Investigation – Draft Factual Report, in VicRoads, March 2013, East-West Link Tunnel Project Interim Geotechnical Investigation Factual Report, Technical Report GE094-13 prepared for LMA (Appendix M, Section 16 References, p 135);**
- g) SKM 2013b Deep Leads in the vicinity of the East-West Link, Report prepared for LMA (Appendix M, Section 16 References, p 135); and**
- h) The interpretative hydrogeological report by SKM, not available for review in the CIS (Appendix M, Section 4.3.1, p 10 para 3).**