ENVIRONMENT PROTECTION ACT 1970

WORKS APPROVAL ASSESSMENT REPORT

Application No.	1002695
Applicant Name	Department of Economic Development, Jobs, Transport and Resources
Address of Premises	West Gate Tunnel (Yarraville)
Proposal	Tunnel ventilation system for West Gate Tunnel Project
Scheduled Category	L03 – road tunnel ventilation systems

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APPENDIX D PROPOSED PLANS

ABBREVIATIONS & GLOSSARY

the Act	*Environment Protection Act 1970*
cl	Clause
CC Act	*Climate Change Act 2017*
CHMP	Cultural Heritage Management Plan
CEMP	Construction Environment Management Plan
DHHS	Department of Health and Human Services
DDO	Design and Development Overlay
EPA	Environment Protection Authority
EPR	Environmental Performance Requirement
EES	Environment Effects Statement
EE Act	*Environment Effects Act 1978*
GHG	Greenhouse Gas Emissions
GLC	Ground Level Concentrations
IAC	Inquiry and Advisory Committee
Km	Kilometres
M	Metres
NGL	Natural Ground Level
PEM	Protocol for Environmental Management
PAH's	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matter
PSA	Planning Scheme Amendment
the Regulations	*Environment Protection (Scheduled Premises) Regulations 2017*
s	Section
SEPP	State Environment Protection Policy
VOC,s	Volatile Organic Compounds

VSD	Variable Speed Drive
WA	Works Approval
WAA	Works Approval Application
WDA	Western Distributor Authority

EXECUTIVE SUMMARY

The West Gate Tunnel Project is a major new freeway project designed to relieve traffic pressure on the Monash/CityLink/West Gate Freeway, the West Gate Bridge and provide a direct freight link to the Port of Melbourne and remove trucks from residential areas in the inner-west.

The project requires the construction of twin tunnels under Yarraville in Melbourne's inner-west and an elevated motorway connecting the West Gate Freeway with the Port of Melbourne, CityLink and the western edge of the central city, delivering an alternative river crossing to the West Gate Bridge.

A Works Approval (WA) pursuant to the *Environment Protection Act 1970* (the Act) and the *Environment Protection (Scheduled Premises) Regulation 2017* (the Regulations) is required for the proposed construction of the tunnel ventilation system associated with the operation of the road tunnels. The environmental segments considered in the application were air quality, greenhouse gas (GHG) and noise.

The tunnel ventilation system is defined as a *scheduled premises* (L03) under the Regulations.

The WA does not extend to any other works associated with the Project, such as the construction of the road network, tunnels, drainage, landscaping, pedestrian, or bicycle works. These works are subject to an Environment Effects Statement (EES) to be determined by the Minister for Planning.

The WA application (WAA) and the EES were subject to a joint advertisement under section 20AA of the Act and the Environment Effects Act 1978 (EE Act).

The submissions received during the exhibition period were considered during assessment of the WAA (where relevant to the proposed installation of the tunnel ventilation system) and subject of an Inquiry and Advisory Committee (IAC), appointed to independently consider the merit of the proposed development.

The findings and recommendations of IAC and the Minister's assessment of the EES was taken into consideration during assessment of the WAA.

With regard to the WAA, the majority of submissions were concerned with the likely environmental implications for biophysical health of the environment and the community resulting from air dispersed from the proposed tunnel ventilation system.

The main issue relevant to the WAA was the likely air quality impacts resulting from the proposed tunnel ventilation stacks and whether pollution control equipment (filtration) should be installed.

The assessment of the WAA concludes that in-stack pollution control equipment is not warranted. This conclusion was additionally reached by the Minister's assessment of the EES.

The Environment Protection Authority (EPA) has comprehensively assessed the likely impacts on air quality, noise and GHG from the tunnel ventilation system and is satisfied subject to conditions the proposal shall comply with the relevant legislation, polices and guidelines. In particular, the project complies with State Environment Protection Policy (Air Quality Management) (SEPP(AQM)).

It is recommended that the WAA be issued subject to conditions.

1 BACKGROUND INFORMATION

In December 2015, the Victorian Government announced its intention to build the West Gate Tunnel Project (the Project).

The key components of the Project include widening of the West Gate Freeway, twin tunnels under Yarraville and an elevated road that connects the West Gate Freeway with the Port of Melbourne, CityLink and the Melbourne city centre to provide an alternative river crossing to the West Gate Bridge.

The Project is intended to:

- relieve traffic pressure on the Monash/City Link/ West Gate Freeway (the M1 corridor – the main connecting route between Melbourne's east and west);
- reduce the City's reliance upon the West Gate Bridge;
- provide a direct heavy vehicle freight link to the Port of Melbourne; and,
- remove significant volumes of trucks from residential areas in the inner-west suburbs.

Pursuant to section 3 of the EE Act, a comprehensive EES for the Project was prepared.

The applicant, the Western Distributor Authority (WDA), is an administrative office within the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) and is responsible for managing the Project on behalf of the State.

A WA in accordance with the Regulations is required for a component of the Project, being the proposed installation of the in-tunnel ventilation system associated with the tunnel portals.

Approval for all other works, including the roads and tunnel and associated works are subject to the Minister's assessment of the EES.

WDA has submitted a WAA for approval.

This report considers the likely impacts of the development on the beneficial uses of the relevant environmental segments having regard to the relevant legislation, statutory and public submissions received, the findings and recommendations of IAC and the Minister's assessment of the Project.

2 DEVELOPMENT PROPOSAL

2.1 PROPOSAL OVERVIEW

The Project comprises three major components:

- the widening of the freeway by two lanes in each direction between the M80 interchange and the West Gate Bridge, providing a total of six lanes in each direction;
- two tunnels (one inbound, one outbound) under Yarraville that would allow for three lanes of traffic in each direction. The tunnels shall extend from the southern portal located west of Williamstown Road to the northern portal located in the vicinity of the intersection of Whitehall Street and Somerville Road, west of the Maribyrnong River; and,
- the Port, CityLink and city connections component, includes a crossing of the Maribyrnong River, connections to the Port of Melbourne, an elevated road along Footscray Road and connections to the city. The city connections include inbound and outbound connections to CityLink, Dynon Road and a connection to an extended and widened Wurundjeri Way.

The Project area is illustrated below in Figure 1.

The Project also includes improvements to the pedestrian and bicycle network, including the extension of the Federation Trail to Hyde Street, an elevated 'veloway' for cyclists above Footscray Road, connection to the Moonee Ponds Creek Trail and new cyclists' bridges over Whitehall Street at Yarraville Gardens, over Footscray Road east of Moonee Ponds Creek and another adjacent to Dynon Road.

The key components of the Project requiring construction (where typical civil and structural works normally associated with major freeway projects shall be undertaken) include the tunnels, elevated structures and surface roads.

The total estimated cost of the Project is $5.5 billion.

It is anticipated that construction on the Project shall commence in 2018 with completion in 2022.

The tunnel component of the works is to commence in 2018 and be completed by 2021.

Tunnelling activities are proposed to be undertaken continuously during this period, 24 hours per day, seven days per week.

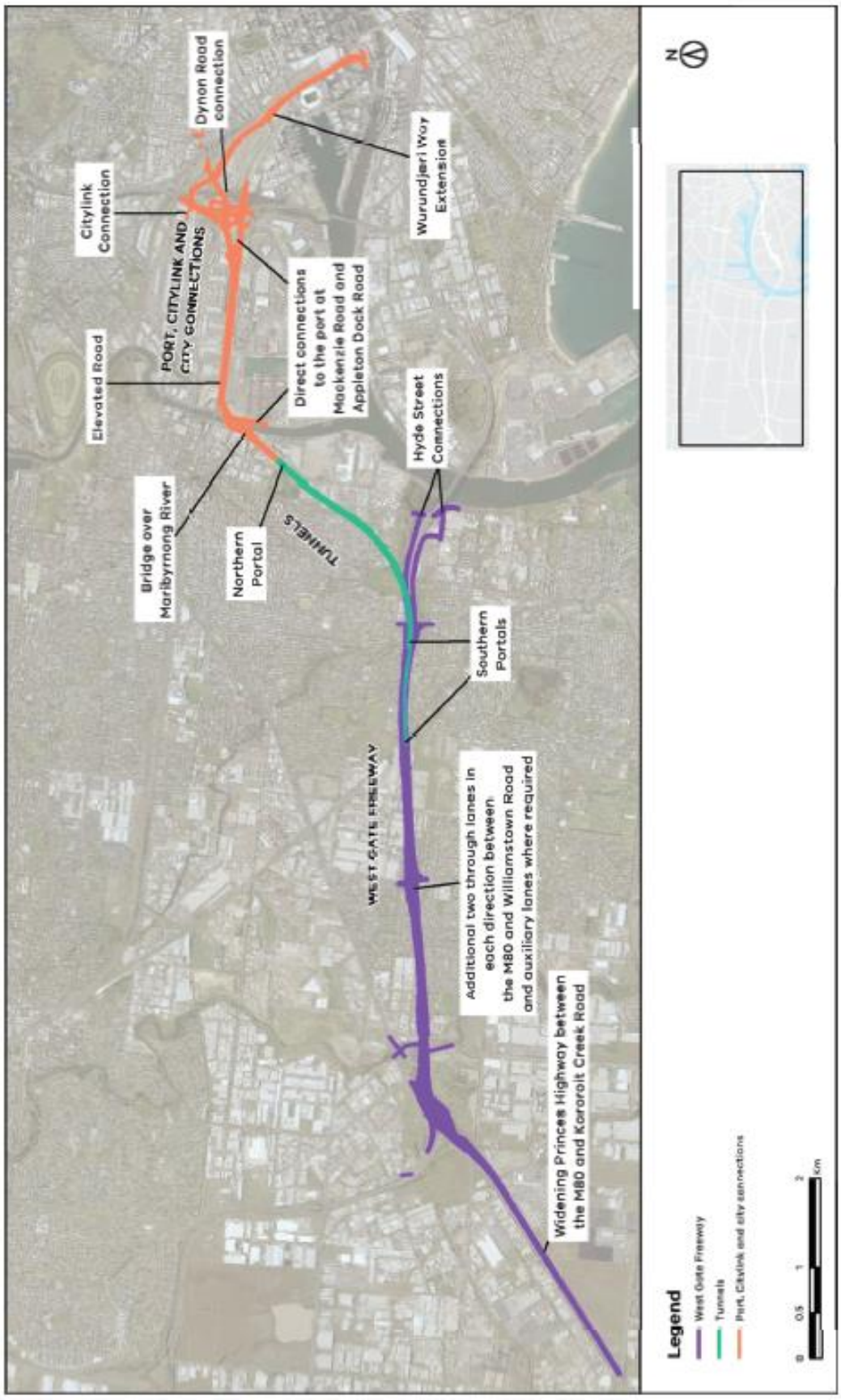

Figure 1: extent of the proposed works (source: applicant).

2.2 TUNNEL WORKS

The tunnel works include:

- twin tunnels catering for three traffic lanes in both directions, constructed using tunnel boring machines;
- cross passages between the two tunnels for access in the case of emergency; and,
- the construction of two 45 metre (m) high ventilation structures associated with each tunnel in proximity to the exits of both tunnels (the portals).

The outbound southern tunnel portal is located approximately 250 m west of the Newport Freight Railway Line on the south side of the existing West Gate Freeway outbound carriageway.

The inbound southern tunnel portal is located approximately 300 m west of Williamstown Road on the north side of the existing West Gate Freeway inbound carriageway.

The northern portal for both tunnels is located 100 m east of Whitehall Street and 330 m north of Somerville Road, west of the Maribyrnong River.

The inbound tunnel is approximately 2.8 kilometres (km) and the southbound tunnel is approximately four km long.

The plates at Figures 2 and 3 below shows the proposed location of the ventilation structures, tunnel and portals in context with the locality.

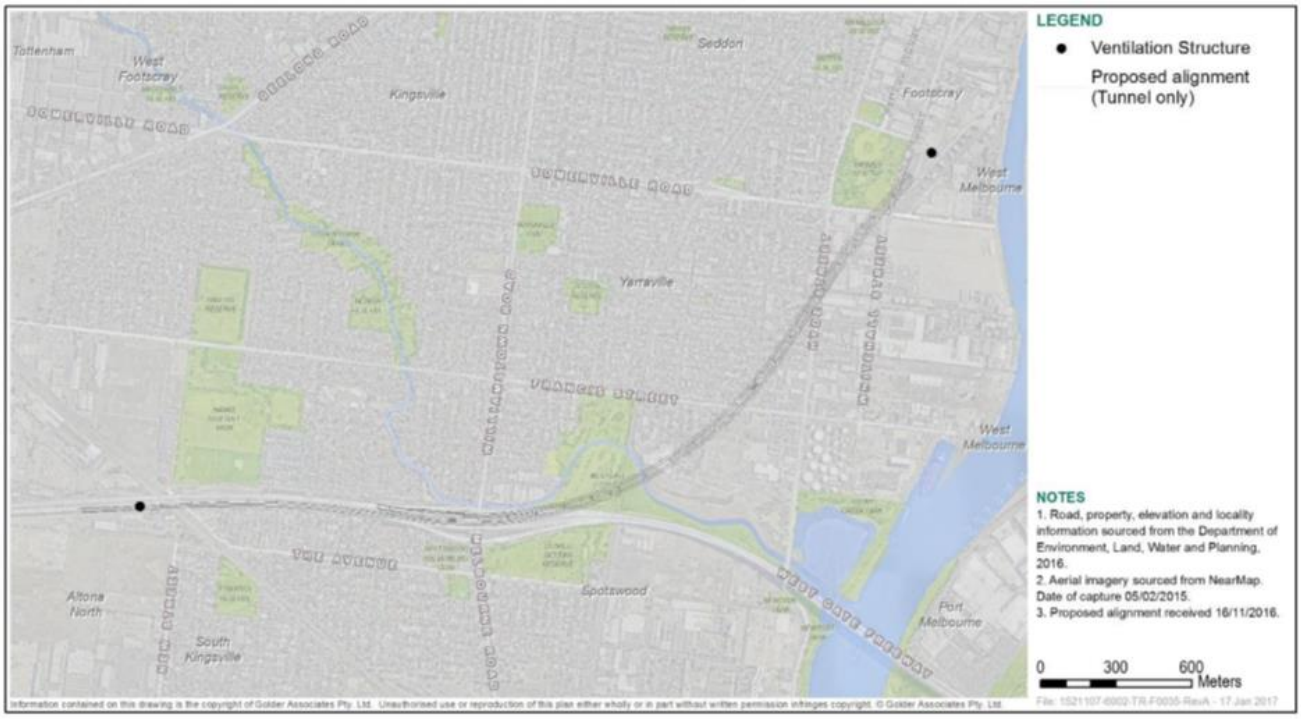

Figure 2: location of proposed ventilation structures (source: applicant).

Figure 3: proposed location of the tunnel and tunnel portal components in context with the locality (source: applicant).

2.3 TUNNEL VENTILATION

The purpose of the tunnel ventilation is to disperse vehicle emissions generated in the tunnel.

The ventilation structures consist of the construction of two tower structures, including: ventilation fans; smoke and tunnel vents and stacks; sampling points; and, outlet dampening structures, constructed within an architecturally designed structure, inclusive of acoustic cladding.

The ventilation structure is designed as part of a complete combined portal supporting the tunnel ingress/egress canopy.

The ventilation fans are to be fitted with variable speed drives. Variable speed drives reduce the speed of the fan to match the exhaust requirements to the exhaust needs.

The fans are to be controlled such that all vitiated air flowing through the tunnel in direction of traffic, plus incoming air downstream from the portal, is captured and dispersed from the ventilation structure.

The tunnel ventilation system has been designed to achieve compliance with the relevant acoustic requirements, zero portal emissions and to remove air from the tunnels to meet the in-tunnel air

quality standards for carbon monoxide (CO) and nitrogen dioxide (NO_2), including provision for the retrofitting of pollution control equipment if required.

An assessment of the impacts of the tunnel ventilation is discussed in greater detail below in Section 5 of this report.

Figure 4 below shows the proposed cross-sectional design of the ventilation structures.

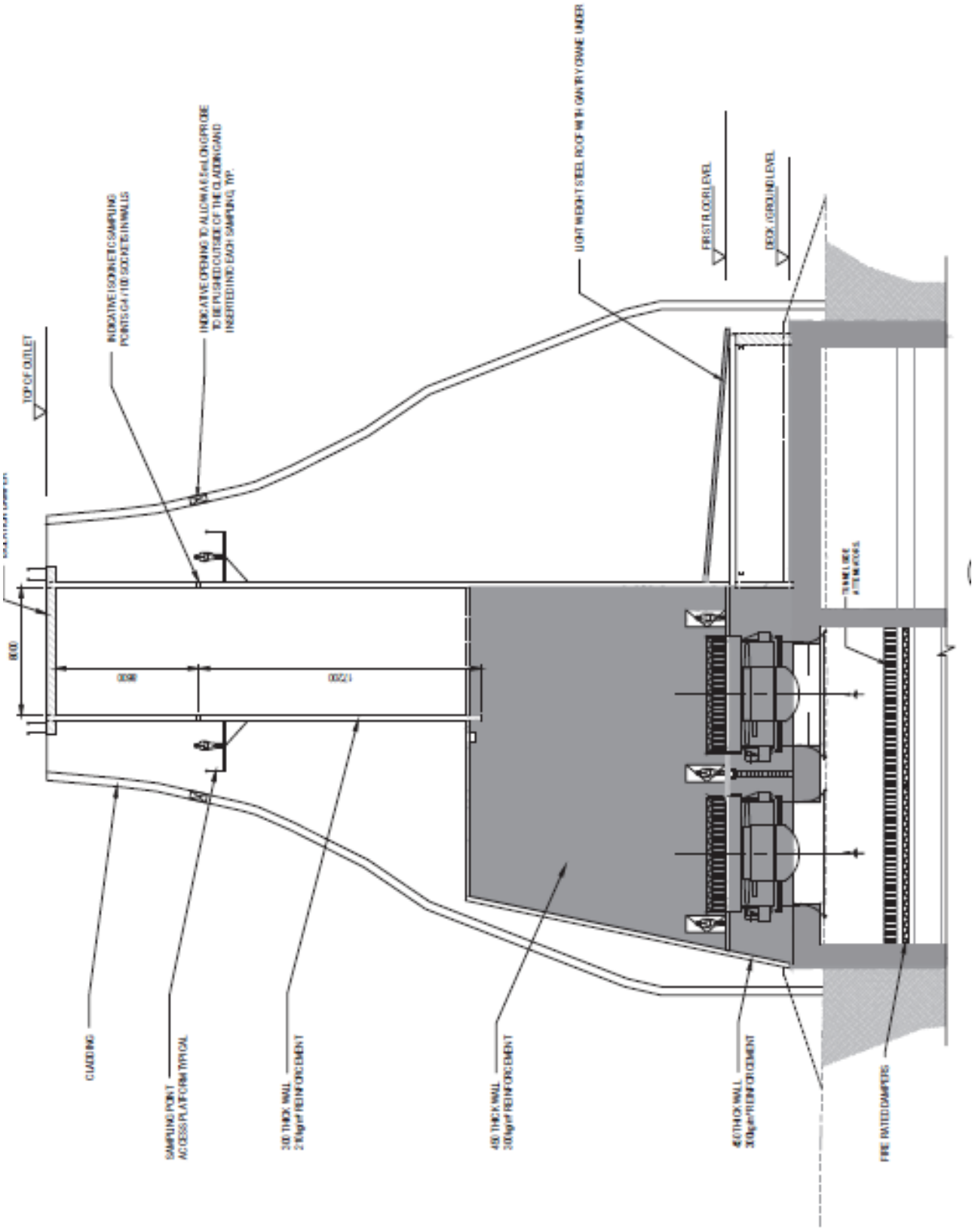

Figure 4: Indicative cross-sectional design of the ventilation structure inclusive of fans (source: applicant).

2.4 LAND USE PLANNING

On 18 December 2015, the Minister for Planning (the Minister) declared the proposed works to be "public works" for the purposes of the EE Act by Order published in the Government Gazette dated 23 December 2015 (the Order).

Section 4(1) of the EE Act provides that prior to commencing any *public works* to which the EE Act applies, the proponent must cause an EES to be prepared and submitted to the Minister for the Minister's assessment of the environmental effects of the works.

The key statutory approvals required for the Project are as follows, with a range of other specific approvals likely to be required for different elements of the Project.

Planning Scheme Amendment

A draft Planning Scheme Amendment (PSA) under the *Planning and Environment Act 1987* was exhibited with the EES.

The proposed Amendment to Melbourne, Port of Melbourne, Wyndham, Brimbank, Hobsons Bay and Maribyrnong Planning Schemes, shall introduce a site-specific control under clause 52.03 for the Project and introduce an Incorporated Document, exempting the Project from the requirements of any provision of the Scheme that would otherwise require a planning permit. The Minister is to be the responsible authority for the purpose of administering the Incorporated Document under the terms of the proposed PSA.

The Amendment additionally introduces a Design and Development Overlay (DDO) over the proposed tunnel locations in the Hobsons Bay and Maribyrnong Planning Schemes to protect these locations from encroachment.

The PSA and DDO shall be dealt with by the Minister during determination of the Project EES.

Cultural Heritage Management Plan

A Cultural Heritage Management Plan (CHMP) is required under the *Aboriginal Heritage Act 2006.*

The CHMP was approved on the 6 September 2017.

Environment Protection Act 1970

A WA is required under the Act, being works that are defined as a *scheduled premises* at section L03 (road tunnel ventilation systems) of Schedule 1 of the Regulations*.*

Since lodgement of the application the Regulations have been amended (25 June 2017). The amendment does not affect the statutory pathway of the Project.

Under the Act, the extent of the works to be considered by the EPA, with relevance to the *scheduled premises*, consists only of the installation of the in-tunnel ventilation system at the southern and northern portals.

The WA does not extend to any other works associated with the Project.

2.5 SITE ANALYSIS

The Project is located in a highly-urbanised area of Melbourne which includes long-established residential areas, shopping and commercial centres, industrial precincts, parks, reserves and community and recreational facilities.

As shown above at Figure 1, the Project's corridor extends from Laverton North, Altona North and Brooklyn in the west, through South Kingsville, Spotswood, Yarraville and Footscray, and across the Maribyrnong River to the Port of Melbourne, Docklands, West Melbourne and the western end of Melbourne's CBD.

The tunnel portals are to be constructed within the existing road corridor.

The land use pattern in the vicinity of the southern portal primarily consists of residential suburban land to the north and west, with commercial/industrial activities in the suburbs of Brooklyn and Laverton North. South of the project area (that is, south of the West Gate Freeway) lies a mixture of residential (South Kingsville and parts of Altona North) and light commercial and heavy industry (oil, gas and glass) in the eastern part of Spotswood and western area of Altona North.

In the vicinity of the northern portal, the land use pattern primarily consists of the mixed residential and industrial areas of Footscray, Yarraville and West Melbourne, bordered by the suburbs of Kensington, North Melbourne, West Melbourne, the Port of Melbourne, and the commercial end of Docklands and Melbourne's CBD.

Given the urban setting of the Project, there are many sensitive receptors in the vicinity of the of tunnel portals and the tunnel ventilation structures, including schools, kindergartens and childcare facilities, residential properties, aged care facilities and hospitals.

An assessment of the likely impacts of the tunnel ventilation system on sensitive receptors is dealt with below in Sections 3 and 5 of this report.

The topography of the project area is generally flat with elevations less than 20 m above sea level within two km of the Yarra River.

Moving away from the project area by 10 km, the land gently rises approximately to 20 m to the west of the Yarra River, 40 m to the north and north-west, 60 m to the north-east, and 30 m to the east. To the south, the land slopes gently down towards the sea level of Port Phillip Bay.

2.6 TRACK RECORD

For the purposed of the Act, the applicant is considered to be a fit and proper person.

With regard to the track record of the existing road tunnels in Melbourne, there are currently two road tunnels (CityLink and EastLink) incorporating ventilation systems licensed by the EPA.

The EPA's record keeping system indicates that there are no recorded incidents of pollution complaints associated with the operation of the existing tunnel ventilation systems.

Additionally, there is no record of any compliance action having been undertaken by the EPA regarding the operation of the existing tunnel ventilations systems.

Since operation of the tunnels a review of the ambient air quality impacts of the approved ventilation systems has been completed, as discussed below.

- CityLink Review

Review of air quality monitoring data prepared by the applicant relating to the tunnel stacks for the CityLink project was completed by the EPA on September 2004.

The review included comparing air quality data from the tunnel stacks, ambient air monitoring in proximity to the stacks and data from the EPA network across Melbourne.

Results of the comparison were:

- emissions from the stacks continue to be well below the licence limits for CO, NO_2 and particles;
- levels of particles with diameters less than PM_{10}, $PM_{2.5}$ monitored at three air quality sites in vicinity of the ventilation stacks show a similar pattern to the EPA network, albeit at higher levels. No significant change has been detected in the levels relative to the EPA network since the opening of the tunnels;
- while exceedances of the particles intervention levels have occurred, the primary cause of these exceedances (dust storms and bushfires) have been unrelated to the operation of CityLink;
- CO and NO_2 levels monitored show a similar pattern to those in the EPA network; and,
- Similar results were found in the EPA's 2002 review.

The 2004 review updated previous air monitoring data review covering the period 1997 to 2002. Over time the development has not caused any breach of the licence limits. The 2004 review concluded that no impact has been detected associated with CityLink on local air quality in the vicinity of the project.

Since this review ambient air monitoring has ceased.

- EastLink Review

Review of air quality monitoring data prepared by the applicant relating to the EastLink tunnel ventilation stacks was completed by the EPA on June 2011 and September 2009.

Similarly, to the CityLink review, the assessment was done comparing stack emissions and ambient air quality data recorded by ambient air quality monitoring stations in vicinity of the ventilation stacks with the broader EPA air quality monitoring network.

The review included an assessment of the PM_{10}, $PM_{2.5}$, NO_2, CO and air toxics (inclusive of Benzene the only parameter included on the EPA licence).

The review found that the development was operating within the prescribed EPA air emission licence limits.

The EPA review concluded that:

- there were three monitoring stations operated over two years, providing good quality data to consider local air quality impacts;
- a comprehensive analysis of the results from the three Eastlink ambient stations did not find any significant impact from EastLink stacks or portals on ground-level concentrations of PM_{10}, NO_2 or CO;
- a review of the limited evidence for $PM_{2.5}$ and air toxics found that the tunnel emissions did not result in any breaches of air quality criteria;
- regarding PM_{10} comparative results, the only days showing a breach of the 24-hour intervention level were days of major pollution events affecting all of Melbourne, such as bushfire smoke and dust storms and not associated with motor vehicle pollution;
- the evidence indicates that no significant ground level or local air quality impacts from the EastLink stacks has been found; and
- pollutants from the two tunnels are being effectively dispersed.

Whilst the review found some quality assurance issues were identified with monitoring, overall the review of the ambient monitoring results at sites near the EastLink ventilation stacks did not find any evidence of significant impacts from the stacks on local air quality and demonstrated that the stacks are operating effectively to allow ambient monitoring to cease.

The review conducted in September 2009 of both the ground level ambient air quality and ventilation stack monitoring demonstrated compliance with all the annual average relevant criteria except $PM_{2.5}$ due to the exceedance corresponding with bush fire periods in Victoria.

Conclusion

The review of the ventilation stacks for the EastLink and CityLink tunnels showed that local air quality in vicinity to the stacks was not adversely affected post operation of the tunnel ventilation systems.

2.7 MINISTER'S EES ASSESSMENT

On 27 November 2017, the Minster for Planning approved the Project EES subject to Environmental Performance Requirement's (EPRs).

The conclusions of the Minister's assessment where relevant to segments of the environment considered under the WAA and an EPA comment are detailed below at table 1.

Table 1: Conclusions of the Minister's assessment and an EPA comment.

Minister's Conclusions	EPA Comment
Noise and Vibration • Construction noise resulting from the project will be manageable in accordance with appropriate standards. Recently applied standards for the Melbourne Metro Rail Project provide an appropriate benchmark for standards on this project, except where project differences dictate otherwise. • Construction vibration impacts can be managed through implementation of measures to achieve compliance with recommended EPRs. • Established policy standards and guidelines should mostly provide for operational noise management within acceptable parameters. Some additional measures reflecting the special nature of the project and its environmental setting are needed to achieve acceptable environmental outcomes.	Noted. The WA is conditioned with the requirement for: • a CEMP to be provided to the EPA prior to the commencement of works; • a final design of the ventilation system showing compliance with SEPP N-1; and, • a monitoring plan for noise including periods before and after the commencement of the tunnel operation.
Air Quality The air quality impacts of project construction should be managed by the application of relevant best-practice construction practices**.**	Noted. The WA approval is conditioned with the requirement for a CEMP to be provided to the EPA prior to the commencement of works.
Air Quality EPA should determine the works approval application with due regard for the policy principles,	Noted.

beneficial uses, indicators and objectives articulated in relevant SEPPs. In particular, I do not concur with IAC's recommendation that pollution control (filtration) equipment should be installed in the tunnel ventilation system from the outset. Rather, I support making provision for retrofitting of such equipment if a suitably targeted air quality monitoring program shows that air quality in the vicinity of the ventilation if warranted.	The WAA has been considered with regard to the relevant legislation as detailed in Section 5 of this report. The EPA is satisfied in this case, that pollution control equipment (filtration) is not required. This is detailed in Sections 3 and 5 of this report. The WA is conditioned with a requirement to ensure that the final detailed design of the ventilation system includes provision for conceptual retrofitting of pollution equipment should it be warranted.
Air Quality I support the IAC recommendations on NO_2 objectives for in-tunnel air quality.	Noted. This requirement is included in the EPR in-tunnel air monitoring requirements. The WA is conditioned with the requirement for an in-tunnel air quality monitoring plan to be submitted to the EPA, prior to operation.
Air Quality Appropriate warning systems should be installed in the tunnels to warn users about protecting in-vehicle air quality while passing through the tunnels.	Noted. This is considered to be a matter for the applicant to implement prior to operation. A warning system is planned for the tunnels including digital signage and audio messaging should it be required.
Air Quality Monthly publication of data on an appropriate website would be better than quarterly publication, given the level of community interest in air quality and the known air quality issues in the vicinity of the project.	Noted. In contrast to the Ministers recommendation, it is considered that the provision of daily publicly available ambient air quality data rather than monthly reporting, is warranted in this case. A WAA condition has been imposed requiring a plan detailing this requirement prior to operation of the development.
Air Quality A 'smoky vehicle' enforcement program is desirable and be appropriately integrated as a whole of government approach to the issue, noting that the responsibility for compliance and enforcement rests with EPA and VicRoads.	Noted. This matter is not considered to be within the scope of a WA. Further consultation between VicRoads and the EPA shall be required to be undertaken. Additionally, it is noted that the approved EPRs contain a requirement for roadside air quality management strategy. EPR AQ7 states: "Develop and implement a roadside air quality mitigation strategy, to the satisfaction of the EPA, for specific locations, where post-construction monitoring shows a significant deterioration in air quality as a

	result of the Project." It is considered that this strategy may contribute and inform the development of a 'smoky vehicle' enforcement program.
GHG The proposed EPRs, subject to proposed amendments recommended by IAC, provide sufficient basis for achieving best practice GHG abatement over the project's lifestyle.	Noted.
Human Health • The project can be delivered within acceptable criteria for impacts on human health. • Health outcomes will be contingent on air quality and noise mitigation, and to a lesser degree on social impact. • Environmental standards for the project will adequately manage the potential environmental effects on human health	Noted.

The EPA's assessment of the proposal is generally consistent with the Minister's assessment of the EES, except with regard to the imposition of the appropriate period associated with the recording of publicly available ambient air quality data resulting from the Project. As discussed above, the Minister has recommended the monthly reporting of this data rather than quarterly as proposed. In contrast, the EPA recommends that the data should be made available daily for the community. It is considered that, the daily availability of air quality data is in the public interest and is consistent with the purpose of the Act.

It is noted that prior to determination of the WA, gazettal of the PSA is required. At the time of completing this assessment report, the PSA was not approved and gazetted. The final WAA determination shall not occur until such time that the PSA is gazetted.

2 PUBLIC AND REFERRAL COMMENTS

3.1 PUBLIC CONSULTATION OVERVIEW

In consideration of the overall Victorian government planning approvals strategy for the Project, EPA agreed to a joint advertisement of the EES and WAA as requested by WDA, pursuant to s20AA of the Act.

Under s19B(3B) of the Act:

'If an application for a works approval is to be jointly advertised under section 20AA with a notice relating to the same proposal under the Environment Effects Act 1978 … comments by any person or body interested in the application must be made as a submission on the environment effects statement or be included in any submission on the environment effects statement.'

In this regard, the EPA's provision to hold a s20B conference was waived, with submissions regarding the WAA recorded against the EES.

Rather than a s20B conference, an Inquiry authorised pursuant to s9(1) of the EE Act and an Advisory Committee under s151 of the *Planning and Environment Act 1987,* was convened to consider the likely environmental effects of the Project.

The Inquiry and Advisory Committee: *"the West Gate Tunnel EES Inquiry and Advisory Committee (IAC)",* held a 6-week hearing from 14 August to 19 September 2017 to consider the respective EES submissions.

Prior to the IAC hearing, Conclaves of Experts for air quality, noise, human health, traffic and design were directed to convene and consider the relevant issues and report to the IAC by way of an expert submission. The EPA was invited to attend the air quality, noise and health Conclaves.

The material in the WAA is largely that used in the EES in relation to air quality, noise and GHG emissions. Consequently, IAC did not undertake a separate analysis of the WAA.

An assessment of the IAC recommendations (relative to the WAA) is detailed below in Section 3.2.

An assessment of the public submissions received against the EES (relevant to the WAA) is discussed below in Section 3.3.

It is important to note that the EPA also made its own submission to the EES through the public exhibition process. This submission is not part of the WAA process. An independent probity assessment of the EPA's statutory assessment and inter-government advisory role has been undertaken, this matter is dealt with below in Section 3.4.

Notwithstanding the joint advertising and IAC review process, the EPA forwarded a copy of the application to the relevant statutory referral bodies. An assessment of these referrals is discussed below in Section 4.

3.2 WEST GATE TUNNEL EES INQUIRY AND ADVISORY COMMITTEE

On the 23 October 2017, IAC made its findings and recommendations into the EES.

With regard to the likely air quality impacts of the Project, IAC recommended the following:

1. *additional air quality modelling on some surface roads;*
2. *the installation of tunnel pollution control equipment (via an EPR);*
3. *monitoring and mitigation strategies through the EPR; and,*
4. *the State ensure it continues to maintain best practice in terms of air quality standards.*

An assessment of these recommendations is detailed below where relevant to the WAA.

1. Additional air quality modelling on some surface roads

This is not considered to be a requirement of the WAA.

The WAA only relates to the installation of in-tunnel ventilation.

It is considered that this recommendation relates to the likely non-exhaust emissions resulting from surface roads serving the proposed development, particularly along Millers and Geelong Roads, which are predicted to experience an increase in traffic.

IAC stated that it would be prudent to model roads where there are likely to be significant increases in traffic to ensure that significant or orders of magnitude changes in non-exhaust emissions for the Project (as compared to Non-Project cases) are unlikely, and that this type of modelling may help target achievable mitigation measures.

It is considered that this is a matter for the applicant to resolve and is not within the scope of the WAA.

2. Installation of tunnel pollution equipment (via EPR) for the tunnel ventilation systems.

It is understood that emissions from the tunnel ventilation structures shall contribute only a small part of the overall Project emissions.

The significant majority coming from direct surface and road emissions.

The combined impacts of tunnel ventilation and surface road emissions are relatively minor compared to the existing background concentrations within the project area. However, IAC considers that the Project should adopt a more sensitive approach given:

- *'the existing air quality context (background) in proximity to the Project; and,*
- *every opportunity to improve air quality should be adopted, noting that an objective of SEPP AQM is to '…drive continuous improvement in air quality and achieve the cleanest air possible having regard to the social and economic development of Victoria' (cl6(b))'.*

In this regard, IAC recommends that the installation of pollution control equipment in the tunnel ventilation system is a feasible, specific and practical measure that can be taken to modify the project and be implemented at the construction phase, rather than just provided for, noting that the dispersed pollution generated by vehicles and treating the point source of pollution at the ventilation stacks is:

'…*a demonstrably superior outcome that is appropriate in the context of existing poor air quality in the area'.*

The Area

Where IAC refers to '…*existing poor air quality in the area'*, it is considered that the *'area'* referred to by IAC is the Brooklyn area, which is close to the ventilation stack for the southern portal.

A concern of the IAC is that this area already suffers poor air quality and the air quality of the area resulting from the project should not be worsened, even if marginally.

The main concern with air quality is the cumulative impact of PM_{10} emissions, as it has been demonstrated that the Project complies with the relevant statutory emissions requirements for all pollutants except PM_{10}. The graph in Figure 5 shows the background of the area with regard to the air quality standard for PM_{10}.

The graph shows since 2009 to 2017, that during each 12 month period (as a culmination of the number of calendar days each year), PM_{10} background emission levels already exceed the statutory threshold for at least 10 or more days per year. Whilst, the graph shows that the exceedance trend has been generally falling since 2009-10, in 2016 to 2017 the exceedances remained above 10 days.

Contributors to poor air quality in the area and elevated existing background levels are considered to be mainly dominated by direct surface and road emission sources, with poor air quality along some major roads, primarily in the Brooklyn area due to the impacts from one specific local industrial area**.**

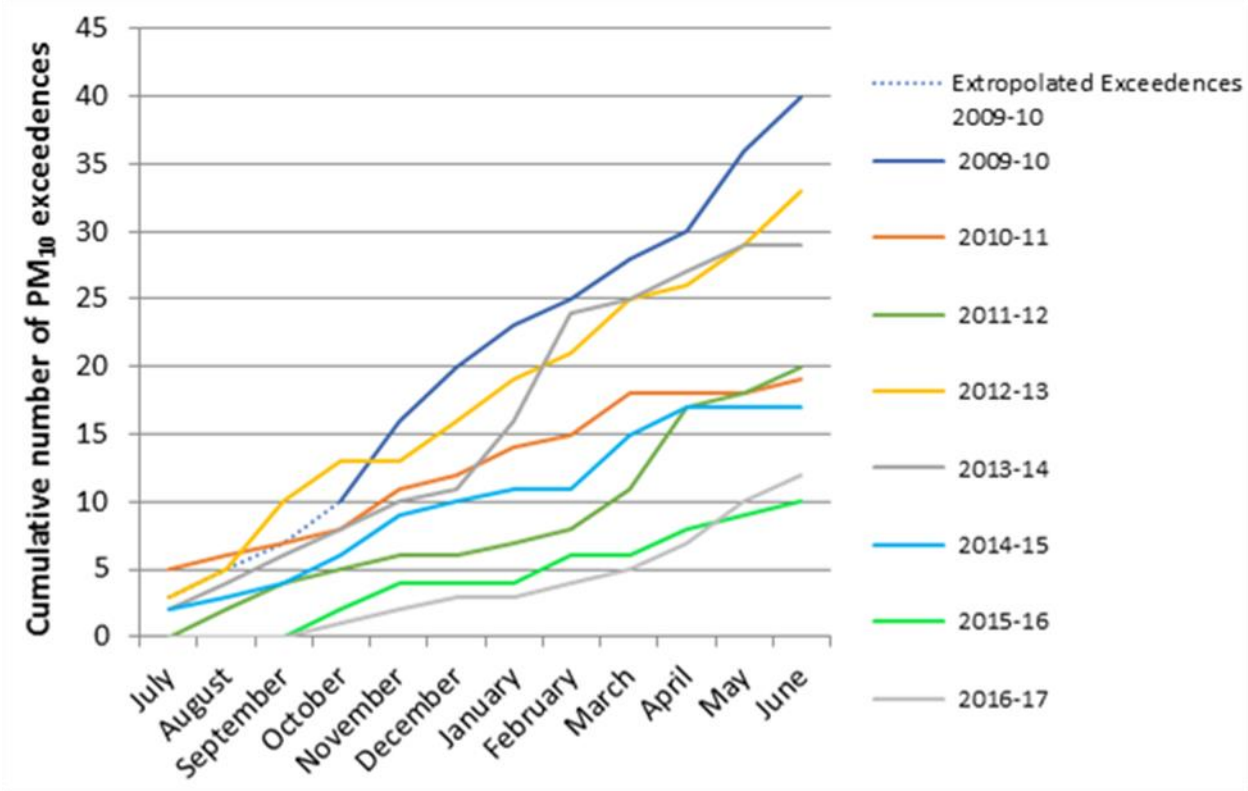

Figure 5: cumulative number of PM10 exceedances (Source: EPA, Brooklyn Consultative Reference Group (BCRG) community forum 2/2017)

Modelling

It is noted, that modelling for the air quality assessment was initially done when the southern portal was further east of the current location and general representative background data was considered. In this case, local air quality data from Footscray was the data available over the 5-year period to enable modelling to be undertaken. This was supported by comparing air monitoring data at five additional local air monitoring stations to Footscray. The comparative study showed that the Footscray data was generally representative of the local background for the air quality assessment. Whilst, Brooklyn was not included in the comparison, the modelling is considered to be valid.

This conclusion was one of the findings of IAC, where it stated that *"based on the evidence the use of the Footscray data as background is accepted by the IAC".*

Policy

Notwithstanding the cumulative PM_{10} design criterion has not been met due to the existing statutory exceedance of the background levels of the area, it is considered on balance that the proposal meets the intent of the SEPP(AQM), for the following reasons:

- prevailing hourly PM_{10} background levels are the main contributor to the predicted cumulative PM_{10} levels exceeding the design criterion. The contribution for the proposed tunnel emissions is small. Ventilation stack emissions during projected 2022 and 2031 traffic volume operations were predicted to contribute up to 7% of the design criterion, when the cumulative PM_{10} levels exceeded the design criterion. The predicted tunnel emissions will rarely contribute to hourly events exceeding the hourly design criteria;
- SEPP(AQM) specifies that for cases where the design criteria are not met, a health risk assessment may be done to show that there will be no adverse health impacts from the proposal. A human health risk assessment was prepared for this project. The assessment evaluated the changes in air quality from the whole project and concluded these changes would not result in measurable adverse changes to the health of the community;
- the PM_{10} 24-hour average stack ventilation emissions were estimated to contribute less than 0.2% of the SEPP(AAM) 24-hour average air quality guideline; and,
- previous local ambient air monitoring undertaken after construction and during the early years of operation of the CityLink and EastLink tunnels has not measured significant changes in the local air quality, indicating the impacts from these tunnel ventilation systems to be insignificant.

Air Pollution Control Filters

Considering compliance with SEPP(AQM) and the likely small contribution of the Project's PM_{10} emissions compared to the existing background of the locality, it is considered that air pollution control equipment (air-filters) would unlikely have a material effect on improving air quality in the subject area, noting that:

- the IAC report recommends installing pollution control equipment in the tunnel ventilation system to improve air quality, but acknowledges that available controls may not be as economically efficient as other measures (p138, IAC report dated 23 October 2017);
- there is potential for other pollution abatement programs using proven approaches and technologies which are likely to have a greater impact and at considerably lower cost (including those identified by the IAC) than the installation of pollution control equipment;

- contributors to poor air quality in the area are considered to be dominated by direct surface and road emission sources, with comparatively minor contributions from the proposed tunnel ventilation system;
- the poor air quality along some major roads is primarily in the Brooklyn area, due to impacts from one specific local industrial area;
- Brooklyn air quality impacts occur during northerly winds in this area, however the proposed ventilation stack emissions are downwind of this affected area and unlikely to contribute to local impacts during poor air quality days;
- the experience in NSW in trialing tunnel pollution controls shows no demonstrable improvement in the PM levels in the relevant local area to justify the use of pollution control equipment;
- local air monitoring around other tunnels in Victoria and Australia without PM controls have not measured discernible elevated PM levels, indicating the design and operation of these tunnels can adequately manage the PM emissions from the ventilation stacks; and,
- there are energy and greenhouse implications of operating pollution control equipment over the life of the tunnel with no demonstrable benefit in the reduction of PM levels.

Conclusions

The likely benefits in air quality in the subject area that may occur from installing pollution control equipment (filtration), compared to having no filtration, is not considered to be commensurate with the economic cost of the additional infrastructure. (An assessment of likely costs associated with filters used in Sydney's M5 filtration trial is discussed further at section 5).

It is noted in IAC's consideration of the matter, as stated in the 23 October 2017 Committee Report, that determining weight was given to the relevance to cl6(b) of SEPP(AQM), where it states:

"drive continuous improvement in air quality and achieve the cleanest air possible having regard to the social and economic development of Victoria",

IAC recommended that to meet this aim, any improvement, however marginal, should be obtained by the Project, emphasizing the aim of *driving continuous improvement in air quality and achieve the cleanest air possible.* Albeit, compliance with cl6(b) of SEPP(AQM) is not considered to solely occur within a continuous improvement vacuum, but must be considered in context with the broader social-economic outcomes of the proposal, the environmental benefits, environmental risk and the ongoing orderly development of Victoria.

In this regard, additionally taking into consideration cl7(1)(c) of SEPP(AQM), where it states that, measures adopted should be *cost effective and in proportion to the significance of the environmental problems being addressed*. It is considered in this context, the installation of pollution control equipment for the reasons outlined above, is not a measure that could be considered to be in proportion with the significance of the environmental problem.

In this case, subject to conditions of approval, the proposal without the initial installation of pollution control equipment within the ventilation system is considered to be meritorious. Notwithstanding, as a precautionary measure, the application is approved with a condition imposing the requirement for the final design of the system to show the conceptual provision for future pollution control equipment, should the need arise. Recommended EPA conditions of approval include:

- *a detailed design of the tunnel ventilation system showing conceptual provision for future pollution control equipment;*

- *a monitoring program for in-tunnel air quality and ventilation stack emissions; and,*
- *a monitoring program for ambient air quality, including periods before and after the commencement of tunnel operation using the existing five monitoring sites relied upon within the application inclusive of the specification and location of instruments.*

It is noted that the EPRs additionally include the requirement for the implementation of a roadside air quality mitigation strategy to be implemented at locations that may exhibit deteriorating air quality as a result of the Project.

Legislative compliance is discussed in more detail below in Section 5 of this report.

3. Monitoring and mitigation strategies through the EPR

The EPA supports the inclusion of monitoring and mitigation strategies through the EPRs.

Additionally, the EPA recommended the following works approval conditions, relevant to monitoring and mitigation measures:

"At least 18 months before the commencement of any commissioning, you must provide to EPA a plan that includes:

a) a monitoring program for in-tunnel air quality and ventilation stack emissions;

b) a monitoring program for ambient air quality, including periods before and after the commencement of tunnel operation using the existing five monitoring sites relied upon within the application inclusive of the specification and location of instruments;

c) a monitoring program for noise impacts, including periods before and after the commencement of tunnel operation; and,

d) provision for daily reporting of ambient air quality monitoring program results, on a publicly available website related to the project, or through EPA Victoria's Air Watch website (these details can be included in the monitoring plan required above at b)). The reporting shall be undertaken for at least five years post commissioning of the project, or such lessor period, as agreed with the EPA."

4. The State ensures it continues to maintain best practice in terms of air quality standards

This recommendation is noted.

The EPA confirms that considering best practice, particularly in relation to air quality implications during the assessment of a development is a practice and legislative requirement of the EPA.

Table 2 below details the total of IAC findings and an EPA response where relevant to the WAA, inclusive of air, noise, health and GHG emissions.

Table 2. IAC Findings and EPA responses relevant to the WAA.

IAC Findings	EPA Response
Background data: *Based on the evidence the use of the Footscray data as background is accepted by the IAC.*	Noted
Emission Factors: *The Emission factors used in the Air Quality Impact Assessment are appropriate for the task.*	Noted

Non-Exhaust emissions: • *Additional modelling should be undertaken on roads where a significant increase in traffic is predicted using combined exhaust and non-exhaust emissions; and,* • *The results of such modelling should be used to help inform near road or other mitigation measures.*	This matter is discussed above at point 1 – IAC recommendations. This matter is outside the scope of the WAA. It is noted that the Minister supports this recommendation as detailed in the approved EPR's.
Specific area considerations (Millers Road and Brooklyn Residential Community): *Air quality mitigation should be provided on roads likely to experience a significant increase in traffic i.e. Millers Road, Geelong Road and Williamstown Road.*	This matter is discussed above at points 1 and 2 – IAC recommendations. This matter is outside of the scope of the WAA.
Specific area considerations (Millers Road and Brooklyn Residential Community: *A 'smoky vehicle' enforcement program would assist in mitigating air quality impacts.*	The Minster for Planning has noted that a 'smoky vehicle' enforcement program is desirable and recommends this finding to the project Minister for consideration of how the project might most appropriately integrate with a whole of government approach to the issue. Noting that the responsibility for compliance and enforcement rests with EPA and VicRoads.
Specific areas consideration (Emma McLean Kindergarten): *The air quality impacts on the Emma McLean Kindergarten can be managed to an acceptable level.*	Noted.
Tunnel Air Quality *The in-tunnel air quality is capable of being managed to an acceptable level through design, the EPR and the provisions of the EPA Licence.*	Noted
Tunnel Air Quality • *While tunnel ventilation emissions are relatively insignificant in relation to background air quality in the area, the installation of pollution control equipment in the tunnel ventilation system is one feasible specific, practical measure that can be taken to modify the Project;* • *This approach is justified given the poor air quality in the Project area.*	This matter is discussed above at point 2 – IAC recommendations. Installation of pollution control equipment is not recommended by the EPA or the Minister for Planning.

Mitigation and Monitoring: *Based on the evidence, at the Project level there is unlikely to be a significant overall deterioration in air quality when assessed against current standards.*	Noted
Mitigation and Monitoring: *Some roadside locations are predicted to have improved air quality due to the relocation of some heavy vehicle traffic to other locations.*	Noted
Mitigation and Monitoring: *Where air quality is predicated to deteriorate due to the Project including Millers Road and Geelong Road and parts of the West Gate Freeway, further detailed investigations and location specific mitigation strategies should be developed to ensure air quality.*	This matter is discussed above at point 1 – IAC recommendations. This matter is outside of the scope of the WAA.
Mitigation and Monitoring: *The timeframe for monitoring should be five years, with permanent monitoring stations established at areas where modelling and monitoring suggests exceedances are likely.*	Noted. The EPR's contain conditions relating to this requirement.
Construction Air Quality: *Subject to the application of the EPR in Appendix F, the IAC is satisfied that construction air quality impacts can be adequately managed through the development and application of the CEMP.*	Noted
Air Quality Standards: • *It is not the role of the Project or indeed the IAC, to set new air quality standards against which the Project should be assessed;* • *The standards chosen are appropriate for the task of Project assessment of environmental effects; and,* • *Given the state of science in relation to fine and ultrafine particulates, it would be appropriate for the State, through the EPA, to continue to monitor emerging medical research and modify the air quality standards as necessary to maintain a best practice approach.*	Noted
Air quality impacts on the Veloway: • *It is unclear whether the Veloway design will result in particular air quality impacts on cyclists, as opposed to general impacts of on-road or roadside cycling; and,*	This issue was raised with the Conclave of experts. Further modelling was undertaken to asses these impacts. The modelling demonstrated that in comparing elevated receptors and GLG, such as cyclists

• *The IAC considers it would be prudent, if practicable to assess the air quality likely in the Veloway and modify the design to improve ventilation if necessary.*	using the elevated veloway, these receptors are unlikely to experience any greater impacts than the predicated GLC.
Vehicle Emission Standards: *Improved vehicle emissions standards over time are highly desirable but are not part of this project.*	Noted.
Greenhouse Gas Emissions: *The Project has addressed GHG emissions from the construction and operation of the Project to an acceptable level subject to the application of EPR's GGP1 and GGP2.*	Noted.
Noise: *During the detail design phase of the Project, capacity should be provided to enable the future provision of noise protection measures at the source, where the alignment is adjacent to existing or proposed urban renewal area.*	Noted. The WA is approved with a condition requiring the final detailed design of the ventilation system to ensure that the predicated acoustic impacts are met. Additionally, the EPR's contain conditions regarding the design of the ventilation structures with regard to noise design and management.
Health: • *The Health Impact Assessment undertaken for the Project is reasonable and provides an acceptable base from which to consider the health effects of the Project.* • *Subject to mitigation measures and EPR put forward in the EES and additional mitigation (particularly for air quality and noise) recommended by the IAC, the IAC considers that the health effects of the Project can be managed to an acceptable level.*	Noted. The IAC recommendations have been adopted by the applicant and where relevant have informed the WA conditions of approval and or the EPR's, except where it relates to the installation of filtration within the ventilation system. The EPA's assessment of this matter is discussed above at point 2 – IAC recommendations. Installation of pollution control equipment is not recommended by the EPA or the Minister for Planning.
Health: • *The health experts generally agree the health impacts of ultrafine particles are concerning and there is no safe exposure limit.* • *In the absence of a properly regulated standard the IAC is not in a position to recommend that the Project specifically*	Noted.

monitor or attempt to mitigate such ultrafine particles.	

3.3 PUBLIC SUBMISSIONS

A total of 504 submissions were received during the exhibition of the EES and WAA.

Of the 504 submissions received, 97 relate to the proposed WAA, which equates to 19.25% of all submissions received.

The issues raised that relate to the WAA are shown below in table 3.

Table 3: Issues raised related to the works approval application.

Issues related to works approval	**Percentage of submission related to works approval (total 97 submissions received)**
Air Quality – vent stack emissions	95.88%
Air Quality – in-tunnel	9.25%
Air Quality – near road exhaust emissions - operation	2.08%
Noise – ventilation stacks	2.08%
GHG – ventilation stacks	2.08%

Note: the breakdown of the submissions by type from the relevant submissions does not total 100%, this is due to multiple issues raised within a single submission.

An assessment of the WAA submissions reveals that the main concern of submitters is the likely impact of air quality emissions resulting from the operation of the proposed ventilation fans. To a significant lesser degree in-tunnel air quality was a concern, with near road exhaust, noise and GHG issues being less of a concern.

The issues raised have been taken into consideration during assessment of the EES and the WAA. These issues were additionally addressed by IAC.

Additionally, an assessment of the likely impacts of the development is discussed below in Section 5.

It is considered that notwithstanding the submissions received, the proposal is considered to comply with the relevant legislation, polices and guidelines.

3.4 PROBITY ASSESSMENT

EPA engaged a probity advisor to help manage probity and conflict given the EPA's multiple roles in the project.

An action coming from the probity framework was EPA to engage third party reviewers to review EPA's assessment of air quality, noise and GHG. This was done because the EPA has a small pool of experts and no opportunities to firewall experts involved in reviewing the EES draft impact assessment reports and assessment of the WAA.

To demonstrate that EPA's review and position on the impact assessments (for WAA and EES) were consistent, defensible and remained impartial throughout EPA's involvement, third party consultants were engaged after a panel selection process to provide a review of the EES and WAA air quality, noise and GHG impact assessments, and EPA's assessment of those topics. Three separate reports were delivered to EPA, one for each environmental segment considered.

The findings of the third parties were useful to draw out some matters which were not picked-up by EPA's internal experts and also verified consistency between assessment. The peer review outcomes were taken into consideration.

The independent probity reviewer concluded that EPA's role in the Project is consistent with applicable policies and the Probity Principles as outlined in the State's primary probity guidance (VGPB Guide to Probity).

3 REFERRAL AGENCY COMMENTS

Prior to the IAC hearing, statutory referrals were sent by the EPA on 31 May 2017 to the Department of Health and Human Services DHHS, Maribyrnong City Council and Hobsons Bay City Council.

Replies were received outlining the scope of each referral agency pending their respective IAC submissions.

The referral submissions received during the exhibition period are summarised below.

4.1 DEPARTMENT OF HEALTH AND HUMAN SERVICES

DHHS does not object to the Project on the grounds that public health is likely to be endangered.

DHHS recommended that the EPA be satisfied that the tunnel ventilation system is designed, constructed and operated according to the objectives and principles of the Act, the relevant SEPP's and environmental guidelines.

Response

Subject to works approval conditions, the EPA is satisfied that the Project shall comply with the relevant legislation, polices and guidelines.

Table 4 below summarises the DHHS assessment and an EPA response where relevant to the WAA.

Table 4 – DHHS assessment with EPA responses.

DHHS assessment	EPA Response
Noise: ○ The design of the tunnel ventilation system will achieve compliance with the noise SEPP N-1. ○ The modelling undertaken suggests that all sensitive receptors are predicted to be below the night and day time noise limits. In addition, ongoing noise monitoring from tunnel ventilation systems will be required by the EPA once the tunnels are operational to verify compliance with SEPP N-1.	Noted. A condition of approval is proposed requiring the final detailed design of the ventilation system with regard to the proposed acoustic design of the proposal and the ability to comply with the predicted impacts.
Air Quality (tunnel ventilation system and residual risk from fine particles): Overall the potential air impacts on health from emissions associated with the operation of the tunnels component were assessed as being below health-based guidelines and the risk to human health is also considered to be low.	Noted.

Detailed design specification: The detailed design specification for the ventilation structures are currently unavailable, however EPA confirms that detailed design information must be supplied to the Authority's satisfaction prior to commencement of works permitted by the Works Approval	Noted. Conditions apply on the WA.
Monitoring Air Quality: The Department recommends that EPA consider reserving the right to review and amend the air monitoring program beyond five years if deemed necessary to continue monitoring for environmental or public health impacts.	Noted. The WA conditions and EPR's require both in-tunnel air quality ventilation stack emission and ambient air quality monitoring. The monitoring program plans are to be made in consultation with the EPA and resolved prior to commencement of any commissioning.
Modelling scenarios and assumptions: The Department recommends that EPA be satisfied that in-tunnel emissions and emissions from the ventilation structures are protective of human health in the event of a worst-case congested saturation, such as the modelled scenario C.	Noted. The proposal was assessed taking into consideration worst-case congested saturation assumed under Scenario C.
Modelling scenarios and assumptions: The tunnel air flow and ventilation extraction requirements should also accommodate issues including, but not limited to, power outage resulting in failure of the ventilation extraction system or emergencies such as an in-tunnel accident or fire.	Noted. Modelling and assumptions considered this Scenario. A similar, assessment was undertaken in the testing of the CityLink and EastLink tunnel proposals.

4.2 MARIBYRNONG CITY COUNCIL

Council's submissions regarding the proposal and the WAA will be lodged as part of its submission to the EES.

Council requested that the EPA ensure that data collected from air quality monitoring stations deployed in the City be taken into consideration.

The Council is concerned that meteorological data relied upon from an existing station in Footscray may not accurately reflect the conditions where air quality monitoring stations have been deployed.

Response

The background data relied upon for modelling the likely air quality impacts of the development has been taken into consideration during assessment of the application.

The EPA is satisfied that the Footscray background air quality and meteorological data relied upon is acceptable.

IAC found that the reliance upon data from Footscray was also considered to be acceptable.

4.3 HOBSONS BAY CITY COUNCIL

The Council advised that a submission would be made to the EES.

The Council recommended that pollution control equipment is considered to be best practice emission control as required under SEPP(AQM). However, should pollution control equipment not be required by the EPA, the Council recommended that provision be made to allow retrofitting of the ventilation system with pollution control equipment at a later date. Additionally, the Council stated that the design and operation of the development should take into consideration the likely development of a medium to high-density residential precinct to be developed on land south of the proposed ventilation structure.

Response

The likely impacts on air quality resulting from the ventilation structures was taken into consideration during assessment of the application and was a key focus of the IAC hearing.

The EPA in this case recommends that the Project is unlikely to have an adverse impact on the receptors in proximity to the southern portal.

As discussed elsewhere in this report, the EPA does not recommend the initial installation of pollution control equipment within the ventilation structure, however does recommend the provision for retro-fitting at a later date should the need arise.

Additional modelling was undertaken to consider the likely impacts of the development on elevated receptors. In this case, it was found that elevated receptors, such as those found in high-density residential precincts, are unlikely to be adversely affected and will experience similar impacts to GLC.

4 ENVIRONMENTAL SEGMENT COMPLIANCE ASSESSMENT

5.1 REGULATORY COMPLIANCE ASSESSMENT

Environment Protection Act 1970 (the Act)

The application has been considered with regard to the Act.

The Project is considered to comply with the Act.

An assessment against the relevant sections of the Act that apply to the WAA is detailed below:

- Section 1A – Purpose of the Act

Pursuant to s1A(2) and (3), the Project has been considered with regard to the *principles of environment protection* prescribed under the Act and detailed at s1C to 1L.

In summary, the Project is considered to meet the following relevant decision making Principles:

- the integration of economic, social and environmental considerations in decision making processes with the need to improve community well-being and benefit future generations;
- measures adopted should be cost-effective and in proportion to the significance of the environmental problems being addressed;
- the conservation of biological diversity and ecological integrity;
- the costs of containment, abatement or avoidance of pollution and waste borne by the generator;
- the pursuance of environmental goals in a cost-effective way commensurate with the scale of the environmental problem;
- shared responsibility and stewardship of the protection of the environment;
- integrated environmental management;
- enforcement of environmental requirements; and,
- accountability.

An intent of the Project is to improve the level of services and infrastructure available to the community, through the construction of additional road infrastructure.

It is envisaged that the Project will improve not only traffic conditions within Melbourne but equally the liveability of areas of the City, particularly in some locations through the removal of heavy vehicles from inner-west suburban areas with the potential to introduce long-term amenity improvements.

Subject to the supporting information, conditions of approval and EPR's it is considered that the proposal to install ventilation systems for dispersal of air collected within the tunnels supporting the Project can be undertaken without adversely affecting any segment of the environment and beneficial uses.

- Section 19A – Scheduled Premises

The proposal to install ventilation structures within the proposed road tunnels is defined as a *scheduled premises* at clause L03 (road tunnel ventilation systems) of Schedule 1 of the Regulations.

Since lodgement of the application the Regulations were amended on the 25 June 2017, this amendment does not affect the statutory pathway of the WAA.

A WA under the Act is required to support the construction of the proposed *L03 (road tunnel ventilation systems),* being a work as prescribed at s19A(2) where a chimney is to be constructed through which a waste shall be discharged to the atmosphere.

- Section 19B – Works Approval

The EPA is satisfied that the WAA has been made in accordance with the Act.

A copy of the WAA was referred and placed on public exhibition as required under the Act.

The submissions received during the referral and public exhibition period are discussed at sections 3 and 4 of this report.

- Section 19B5(c)

The WAA may not be determined until such time that the proposed PSA is gazetted.

- Section 20AA – Joint Advertisement

The WAA was advertised as a joint advertisement with the EES (inclusive of the proposed PSA) in accordance with this section of the Act.

A conference as defined under s20B was dispensed with. Rather than a s20B conference, an Inquiry authorised pursuant to section 9(1) of the EE Act and an Advisory Committee under section 151 of the *Planning and Environment Act 1987,* was convened to consider the likely environmental effects of the Project.

The outcomes of the Inquiry, relevant to the WAA are discussed at section 3 of this report.

- Section 40 – Discharges

The EPA is satisfied that the discharges to the atmosphere resulting from the operation of the ventilation system supporting the road tunnels, complies with the relevant SEPP's and polices.

- Section 46 – Emission of Noise

The EPA is satisfied that the emissions of noise resulting from the operation of the ventilation system supporting the road tunnels, complies with the relevant SEPP's and polices.

Climate Change Act 2017 (CC Act 2017)

Since lodgement of the WAA, the *Climate Change Act 2010* has been repealed and replaced with *Climate Change Act 2017* (CC Act 2017).

The CC Act 2017 came into effect on the 1 November 2017.

The Act does not contain any savings provisions relating to applications submitted but not determined prior to commencement of the CC Act 2017. In this regard, the application has been considered with regard to Part 3 of the CC Act 2017, where it prescribes the matters for consideration by decisions makers.

- Section 5 – Application to Crown

The CC Act applies to the Crown.

- Section 17 – Decision makers must have regard to climate change

This section applies to decisions made pursuant to the issue or refusal of a WA under s19B of the Act.

Pursuant to s17(2), the decision maker must have regard to the following heads of consideration:

(a) the potential impacts of climate change relevant to the decision or action; and,

(b) the potential contribution to the State's greenhouse gas emissions of the decision or action; and,

(c) any guidelines issued by the Minister under s18.

Pursuant to s(17)(3), in considering the potential impacts of climate change relevant to the decision or action, as prescribed at 17(2)(a), the relevant matters to consider, include:

- *the potential biophysical impacts;*
- *potential long and short term economic, environmental, health and other social considerations;*
- *potential beneficial and detrimental impacts;*
- *potential direct and indirect impacts; and,*
- *potential cumulative impacts.*

These matters have been taken into consideration during assessment of the application.

The application is supported by a GHG Assessment.

The assessment estimates the whole-of-project impacts, including the construction and operational phases. This report has been used to support both the EES and WAA.

The report has relied upon the classification used in the *National Greenhouse Reporting Act 2007* (NGER) (scope 1 – direct emissions, scope 2 – indirect emissions from purchased energy and scope - other indirect emissions) and the *International Standard for Risk Management* (AS/NZS ISO 31000:2009).

GHG emission impacts are likely from electricity used to operate and undertake maintenance on the ventilation system and fuel used during maintenance.

The operational electrical systems are estimated to represent 9% of the Project's annual total operational GHG emissions.

The electrical and fuel consumption GHG emissions during the operational phase is estimated to be 18.9 kilo-tonnes CO_2-e/pa of which the majority (89%) relate to electricity consumption associated with the operation of the tunnel pumps, lighting and ventilation. This is 0.02% of Victoria's total GHG emissions in 2014 and 0.10% of Victoria's road transportation emissions in 2014. This represents a low risk to the environment.

Notwithstanding, the small contribution to both the State and the Project's GHG emissions, the ventilation system has additionally been designed with the following GHG reduction measures:

- variable speed drives for main ventilation fan control, tailoring ventilation levels to traffic flows;

- use of low static pressure fans; and,
- the use of light emitting diodes (LED) where required.

These measures are considered to represent best practice.

Additionally, it is noted that relevant EPR's include:

- GGP1 – Greenhouse gas emissions

"Integrate sustainable design practices into the design process to minimise, to the extent practicable, greenhouse gas emissions arising from construction, operations and maintenance of the West Gate Tunnel Project. Include mandatory actions under the Protocol for Environmental Management (Greenhouse Gas Emissions and Energy Efficiency in Industry) for selection of best practice energy usage for the Tunnel ventilation and lighting systems";

- GGP2 – Emission reduction

"In detailed design, consider the selection of materials and monitor energy and carbon during construction, to target reductions for GHG emission impacts of materials and energy consumption in accordance with Mat-1 (Level 2) and ENE-1 (Level 2) credits of the Infrastructure sustainability rating tool (v1.2). Investigate opportunities to use green power sourced from renewable energy and bio-diesel where practicable.

Target Ene-1 (Level 2.7) credits of the Infrastructure Sustainability (IS) rating tool (v1.2), above the minimum Project requirement of Level 2."

IAC found that the project addressed GHG emissions from the construction and operation of the Project to an acceptable level. Further, IAC considered the approach and in-principle adopted in the EES (in relation to GHG) to be reasonable and the overall effect of the GHG emissions to be acceptable, when compared to the no-project scenario. It should be noted that this assessment was predicated on the whole-of-project impacts, whereas the contribution of the ventilation fans is a minor component of the Project.

Additionally, the WA is conditioned with the requirement for the provision of following reports, plans and specifications, prior to the commencement of construction:

"the tunnel ventilation and lighting systems, showing compliance with best practice requirements of the Protocol for Environmental Management Greenhouse Gas Emissions and Energy Efficiency in Industry",

In this regard, taking into consideration:

- the small amount of GHG emissions likely from the operation of the proposal compared to both the whole-of-project and the States emissions,
- the ventilation system also does not account for the total budget of the operational electrical and fuel consumption estimation,
- the proposal is considered to adopt best practice measures under the Protocol for Environmental Management Greenhouse Gas Emissions and Energy Efficiency in Industry;
- IAC found that the Project has adequately dealt with GHG and the overall effect of GHG to be acceptable when compared to the no-project scenario; and,
- EPR's and WA conditions are imposed to ensure GHG emissions shall be effectively managed;

the potential for GHG emissions to adversely affect the biophysical, built, or social environments or the health of the State, and or introduce adverse potential cumulative impacts resulting from the

construction of the ventilation system, is considered to be low. The proposal is unlikely to introduce adverse long-term impacts and is considered to be consistent with the CC Act 2017.

EPA Guideline Protocol for Environmental Management (Greenhouse Gas Emissions and Energy Efficiency in Industry) (PEM)

The proposal was also considered with regard to the PEM.

The Project is considered to comply with the PEM, proposing best practice measures to mitigate GHG emission where possible.

The EPA's assessment of GHG was additionally subject to an independent peer review.

The review made the following observations:

- *the WAA assessed the GHG and energy use associated with the Project as required by the PEM;*
- *demonstration of how the Project will achieve best practice in terms of energy efficiency of the ventilation is unclear;*
- *the mandate of the Project to achieve 'excellent' as built and 'design' ratings under the IS rating scheme will result in energy savings in both the construction and operation phases of the Project, based on the Ene-1 criteria;*
- *it is recommended that the alignment of the Project with National, State and local polices targeting GHG emissions be explored and addressed.*

EPA has considered the peer review conclusions during the assessment of the WAA.

In this circumstance, it is recommended that the information supporting the application is acceptable in context with the recommended conditions of approval and the Projects EPR's. In this regard, it is considered that additional information is not required to support the application.

Environment Protection (Scheduled Premises) Regulations 2017 (the Regulations)

The proposal to install ventilation structures with the proposed road tunnels is defined as a *scheduled premises* at clause L03 (road tunnel ventilation systems) of Schedule 1 of the Regulations.

State Environment Protection Policy (Ambient Air Quality) (SEPP (AAQ))

The proposal is considered to comply with the desired environmental outcomes and goals of the Policy to ensure that beneficial uses are protected throughout the State.

A Human Health Impact Assessment (HHIA) was undertaken. The assessment concludes that with regard to the WAA, the operation of the tunnel and associated air quality is not considered likely to cumulatively adversely impact on quality, health and amenity of sensitive receptors in proximity to the project area.

The HHIA was considered by the DHHS.

DHHS does not object to the proposed works on the grounds that public health is likely to be endangered.

The impacts of the Project with regard to air quality is discussed further in Sections SEPPAQM, 3 and 5.2 of this report.

State Environment Protection Policy (Air Quality Management) (SEPP(AQM))

The WAA has been considered with regard to the Policy.

The WAA is supported by an Air Quality Impact Assessment (AQIA). An assessment of the AQIA is discussed below in Section 5.2 of this report.

The proposal is considered to comply with the relevant clauses of the Policy, as detailed below.

- Clause 6 – Policy aims

The aims of the Policy are to:

(a) ensure that the environmental quality objectives of the SEPP(AAQ) are met;

The proposal is considered to comply with the environment quality objectives of the SEPP(AAQ).

(b) drive continuous improvement in air quality and achieve the cleanest air possible having regard to the social and economic development of Victoria;

This matter has been dealt with in Section 3 of this report.

The proposal to install ventilation infrastructure within the road tunnels is considered to meet this aim where new infrastructure shall be provided to support the ongoing socio-economic development of Victoria, whilst ensuring that the amenity, beneficial uses, health and the air quality of sensitive receptors in proximity to the project area, is not adversely affected.

(c) support Victorian and national measures to address the enhanced greenhouse effect and depletion of the ozone layer.

The likely implications of GHG emissions resulting from the installation, operation and maintenance of the ventilation system has been taken into consideration.

The likely emissions resulting from electricity and fuel consumption with regard to the fans is not considered to be of scale (in context with the overall project emissions and State emissions) to introduce adverse or long-term impacts to the State's contribution to GHG emissions.

- Clause 7 – Policy Principles

The proposal is considered to comply with the policy principles detailed under cl7.

These principles have been additionally considered under the Act and in Section 3 above. In particular, the proposal to install the ventilation system is considered to ensure that the on-going socio-economic development of the State can continue through the delivery of new improved infrastructure and services to support the community, whilst ensuring that the amenity and air quality of sensitive receptors in proximity to the project is not adversely affected.

- Clause 8 – Policy intent

The WAA was supported by an AQIA that assesses the likely air impacts of the development.

The modelling demonstrates that air emissions likely from the proposed ventilation stacks is unlikely to adversely affect beneficial uses of the environment in proximity to the project area.

The proposed ventilation stacks meet the criteria for all air pollutants under the Policy, except for PM_{10} emissions, where the prevailing hourly PM_{10} background levels (the design criterion) are exceeded by the predicted cumulative PM_{10} levels. That is the emissions plus background will exceed the design criteria at times when the background is elevated, such as bushfire events.

However, in this case, the exceedance is not considered to conflict with the intent of the Policy, for the following reasons:

- the contribution for the proposed tunnel emissions is small. Ventilation stack emissions during projected 2022 and 2031 traffic volumes of operation were predicted to contribute up

to 7% of the design criterion, when the cumulative PM_{10} levels exceeded the design criterion. The predicted tunnel emissions will rarely contribute to hourly events exceeding the hourly design criteria;

- SEPP(AQM) specified for cases where design criteria are not met, a health risk assessment may be undertaken to demonstrate that there will be no adverse impact from the proposal. A human health risk assessment was prepared for this project. The human health risk evaluated the changes in air quality from the whole project and concluded these changes would not result in measurable adverse changes to the health of the community;
- the PM_{10} 24-hour average stack ventilation emissions were estimated to contribute less than 0.2% of the SEPP(AAM) 24-hour average air quality guideline; and,
- previous local ambient air monitoring undertaken after construction and during the early years of operation of the CityLink and EastLink tunnels did not measure significant changes in the local air quality, indicating the impacts from those tunnel ventilation systems were not significant, as discussed in Section 2.6 of this report.

This matter is also further discussed above in Section 3 of this report.

In this regard, additional pollution control equipment is considered unwarranted.

It is noted that this clause of the Policy states that:

"motor vehicle emissions will be managed through the adoption of national emission control and fuel quality requirements, improving the in-service performance of motor vehicles, managing the overall level of motor vehicle use, facilitating the introduction of low-emission technologies and fuels, and encouraging less-polluting means of transport needs".

It is considered that this requirement is beyond the scope of the current WAA which seeks approval only for the ventilation system to be constructed within the tunnels.

- Clause 9 – Beneficial uses

The proposal is not considered to adversely affect any beneficial uses of the State of Victoria.

- Clause 10 - Air quality indicators

This clause classifies air contaminants as Class 1, 2, or 3 air quality indicators according to their potential to adversely affect the beneficial uses of the air environment.

The Policy, does not contain specific criteria for the assessment of impacts from transport corridors. However, Schedule A of the Policy lists Class 1, 2, and 3 air quality indicators and their design criteria *'to be used in the assessment of the design of new or expanded sources of emissions'.* These criteria are applicable to the modelling assessment of emissions from the proposed ventilation structures.

Further, Schedule C of the Policy, describes the requirements for conducting air dispersion modelling assessments for new or modified sources of emissions to air in Victoria.

Table 5 below shows the relevant design criteria under the Policy.

Table 5. SEPP(AQM) design criteria (Source: Applicant).

Pollutant	Criterion $(mg/m^3)^2$	Averaging period
PM_{10}	0.08	1 hour
$PM_{2.5}$	0.05	1 hour
NO_2	0.19	1 hour
CO	29	1 hour
Benzene	0.053	3 minute
Toluene	0.65 (odour)	3 minute
Ethylbenzene	14.5	3 minute
Xylene isomers	0.35 (odour)	3 minute
Formaldehyde	0.04	3 minute
1,3 Butadiene	0.073	3 minute
PAHs [as B(a)P toxic equivalents]	0.00073	3 minute

Notes:
1 Design criteria are to be used in assessing the design of new or expanded sources of emissions such as industrial premises.
2 99.9^{th} percentile as determined by modelling in accordance with Schedule C of SEPP(AQM).

The application has demonstrated general compliance with the relevant design criteria (table 5), however as discussed elsewhere in this report, one criterion is exceeded, being PM_{10} cumulative levels, where the year 2022 modelling scenarios during the worst-case year out of five years, estimate six hours out of 8760 hours where the ventilation stack emissions contributed to the design criteria being exceeded. This represents an exceedance of 0.06% over the year.

Additionally, during the year 2031 modelling scenario, nine hours shall exceed the hourly criterion, where the ventilation stack emissions contribute to the design criteria being exceeded, representing an exceedance of 0.1%.

The highest hourly contribution to the cumulative level from the ventilation emissions, contributing to the exceedance was 5.6 µg/m³ of the 80 µg/m³ criteria, equating to an exceedance of 7% for both 2022 and 2031.

When comparing the estimated GLC PM_{10} 24 hour concentrations against the ambient PM_{10} 24 hour air quality standard, the modelling estimate of the contribution of the ventilation systems over the 24 hour period is very small.

The 24 hour PM_{10} ventilation emission contribution was estimated to be 0.034 µg/m³ of the maximum cumulative level of 61 µg/m³ for 2021 (58 µg/m³ was the background, exceeding the 50 µg/m³ air quality standard). Based on these figures the background likely exceeded the air quality standard due to other sources, such as bushfires.

The modelling predications indicate the ventilation emissions are very low and would unlikely be discernible from the background levels. This is consistent with local air monitoring around other tunnels in Victoria and interstate.

Where design criteria may not be met, the authority at cl16(5) may use the findings of a risk assessment in making statutory decisions to determine whether a generator of emissions complies with the Policy.

In this case, a HHIA was undertaken. This assessment concluded that the changes to the air quality due to the project would not result in any measurable adverse changes to the health of the community.

Overall, the modelling estimates that ventilation emissions are very low and the air quality risks related to these emissions are not significant.

- Clause 11 – Ambient Air Quality Objectives

These are discussed above under SEPP(AAQ).

- Clause 16 – Risk assessment

The HHIA dated 8 May 2017 supporting the EES has been taken into consideration.

The report was considered by the DHHS.

The report concluded that the cumulative impacts associated with emission to air of VOCs, PAHs, carbon monoxide, nitrogen dioxide and particulates are not considered to be of a concern in relation to the health of the community.

The HHIA notes that the Project is likely to redistribute traffic and vehicle emissions on key surface roads within the community where there is the potential for some health benefits resulting from a reduction from exposure to vehicle emissions in some locations.

- Clause 18 – General Requirements and cl19 – Management of new sources of emissions

The implications of best practice with regard to managing tunnel emissions has been considered.

Best practice for air quality management of emissions from the tunnel ventilation system principally relates to whether or not air pollution control technology should be installed.

It has been argued elsewhere in this report that the installation of pollution control technology in this case is not considered to be warranted to mitigate emissions to air from the proposed ventilation stacks.

Air pollution control equipment has been installed in road tunnels in Norway, Japan, Austria, Italy Spain and Sydney (New South Wales (NSW)). The NSW example, is Sydney's M5 East Motorway tunnel trial.

The main types of control equipment utilised to remove pollutants from a road tunnel air to improve visibility and to ambient air quality, include:

  - electrostatic precipitators (ESP) that remove particles; or,
  - absorption and adsorption technologies that remove nitric oxide and nitrogen dioxide (DeNO$_x$),

There are approximately 60 ESPs in operation worldwide, three quarters of which are located in Japan and eight in Norway. The treatment of nitrogen oxides is much less common, with control technology installed in only five tunnels worldwide. Limited information is available on the efficacy of pollution control equipment in road tunnel applications. Albeit, the available evidence suggests that their efficiency is less than expected when applied to the removal of low concentrations of pollutants present in road tunnels.

The most comprehensive study to date on the effectiveness of air pollution control equipment installed in tunnel ventilation structures was conducted for the M5 East tunnel in Sydney.

In 2011, CSIRO was commissioned by the then NSW RTA to evaluate the removal efficiencies of ESP and DeNOx systems. The findings of the study concluded that the removal efficiencies of $PM_{2.5}$, PM_{10} and NO_2, were 69, 70 and 55 percent respectively.

A further study of the operation performance of the air pollution control system in February 2012, *"M5 East Tunnel Filtration Trial Evaluation Program – Review of Operational Performance" (*AMOG, revision 1 dated 22 February 2012) concluded that the use of ESP and DeNOx systems captured much lower than the target efficiency levels, particularly with regard to PM levels, to justify the use of the controls.

Within the trial, the capital costs of installing filtration (ESP) was $60 million with running costs estimated at $835,000 per annum.

The trail also produced cost estimates per tonne of pollutant removed, with and without capital costs (AMOG 2012).

The cost to remove PM_{10} was calculated at:

- $17 million per tonne (including operating costs and capital costs amortised over 20 years); and,
- $3.8 million per tonne for operating costs only.

The cost of NO_2 removal was calculated at:

- $4 million per tonne (including operating costs and capital costs amortised over 20 years), and,
- $874,000 per tonne for operating costs only.

By comparison, the estimated cost estimates for alternative particle removing methods such as using filters fitted to vehicle exhausts, ranged from $150,000 to $300,000 per tonne. Indicating the cost of air pollution control technology such as ESP and DeNOx systems to be very high. In 2012, the then New South Wales Department of Climate Change and Water commissioned an analysis of a range of pollutant abatement initiatives. The study identified 12 particulate reduction initiatives including measures such as truck and bus diesel retrofitting, emissions standards for wood heaters, and introduction of euro 5/6 emission standards for new passenger vehicles. The reduction measures analysis per tonne of PM_{10} equated from $1000 to $274,00 per tonne.

In conclusion, the trial found that:

- the cost of pollutant removed was high when compared with techniques to reduce emissions at the source, such as new vehicle emissions standards and retrofitting particle traps to older trucks; and,
- it is not possible to cost effectively remove pollutants with the system as installed or to modify that system to make it cost effective.

In this regard, based on the trial outcomes and observations, the operation of the air filtration plant was ceased pending further investigations, noting that extensive knowledge had been obtained from the trial that may enable the development of cost effective systems to reduce pollutants in tunnels at a later date.

Similarly, in context with the subject proposal, it is considered that the installation of pollution control equipment at this time is not feasible as a best practice measure.

It is noted, that this conclusion was also reached in the assessment of the EastLink and CityLink tunnel projects.

To date, no permanent air pollution control equipment has been installed in Australian road tunnels to control vehicle emissions to air. Notwithstanding, in the subject application the provision for retrofitting air control pollution equipment in the ventilation structures is conditional, should cost effective methods in the future become feasible.

- Clause 20 – Management of class 3 indicators

Class 3 indicators such as benzene, 1,3 butadiene and PAH's form components of the emissions.

It is considered that the most effective way to remove these indicators is at the source through improvements in fuel quality and motor vehicle technology. For instance, improved emission quality associated with the introduction of higher fuel quality requirements and Euro vehicle emission standards is considered to represent maximum extent achievable for Class 3 indicators.

- Clauses 21 – Monitoring of Emissions, 24 – Monitoring of Air Quality, 27 – Local air quality management and 28 – modelling of emissions

The application proposes monitoring to be undertaken. Details of monitoring is further discussed below in Section 5.2.9. and is subject to conditions of approval and the EPR's.

The application is considered to be satisfactory in this regard.

- Clause 30 – Air quality management in air quality control regions

The EPA is satisfied (subject to the proposed conditions of approval and the EPR's) that the proposal does not conflict with this clause and effective measures are in place to reduce the impacts on air quality, including the requirement for a roadside air quality monitoring program for $PM_{2.5}$ and a roadside air quality mitigation strategy (EPR's).

- Clause 33 – Management of greenhouse gases

The application has been considered with regard to the PEM *Greenhouse Gas Emissions and Energy Efficiency in Industry*, Publication No.824.

The tunnel ventilation system is likely to use greater than 100 tonnes of energy related CO_2 - equivalent emissions per annum and therefore best practice measure are required.

A discussion of best practice measures is detailed above in the CC Act 2017 Section of this report.

The proposal adopts best practice measures.

State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) N-1

An assessment of the likely acoustic impacts of the construction and operation of the tunnel ventilation system has been undertaken with regard to the Policy.

The Project is considered to comply with the Policy.

The relevant clauses of the Policy that apply include:

- Clause 6 – Policy goal

The Project is considered to comply with the goals of the Policy to protect people from commercial, industrial or trade noise that may affect the beneficial uses made of noise sensitive areas while recognising the reality of the existing land use structure in the Metropolitan Region.

The Project does not exceed the design noise criteria for the locality. The predicted noise levels are modelled to be lower than background levels during the day, evening and night periods.

- Clause 10 – Environmental Quality Indicators

The NIA has determined the effective noise level in accordance with Schedule A of the Policy.

- Clause 11 – Environmental Quality Objectives

The NIA has calculated the appropriate zoning noise limits in accordance with Schedule B of the Policy.

Noise from the tunnel ventilation system will meet the effective noise levels determined under this clause.

- Clause 13 – Effective Noise Levels

The EPA is satisfied that the effective noise levels predicted for the Project shall not exceed the noise limits prescribed in the Policy.

- Clause 16 - Noise Limits

Under the Policy, where new commercial, industrial or trade development is planned, the premises shall be designed so that noise emissions do not exceed the noise limits.

The EPA is satisfied that subject to the following measures, the Project will ensure that noise limits are not exceeded:

  - fans are to be fitted with technology to reduce noise such as variable speed drives;
  - be designed for a low static pressure; and,
  - the fans shall be fitted with silencers and dampers.

- Clause 17 – Compliance with Requirements of the Policy

The EPA is satisfied that subject to conditions of approval, the Project shall comply with the requirements of the Policy.

In particular, the WA has been conditioned to ensure that:

> *"a detailed design of the tunnel ventilation system shall be required to be submitted to the EPA, showing measures to be taken to ensure compliance with the State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1."*

- Clause 19 – Equipment Installation

Under the Policy, where new equipment is to be installed, the quietest equipment available should be used where a significant reduction in noise (in noise sensitive areas) is required to undertaken.

The EPA is satisfied that the best practice measures have been adopted, including the use of variable speed drives.

The application is supported by a Noise Impact Assessment (NIA). The NIA is discussed in more detail below in Section 5.2 of this report.

EPA Publication 1254 Noise Control Guidelines

The Publication makes recommendations for best practice measures during construction. In particular, the guideline specifies hours of construction for day-time, evening and night-time works. During the night-time period, works during the night-time period should be inaudible to habitable rooms. At this stage, the construction phasing of the installation of ventilation system is unknown. However, given the nature of the proposed development, there is the likelihood that these works could be undertaken during the night-time period.

A comprehensive Construction Environment Management Plan (CEMP) shall be completed prior to commencement of works, detailing compliance with the relevant statutory requirements.

The EES contains comprehensive CEMP noise management EPR's, inclusive of a community engagement program. Additionally, the WA shall include a condition that ensures a copy of the CEMP detailing the proposed noise, management procedures and practices to be undertaken during construction is provided to the EPA prior to works commencing.

It is considered that subject to the EPR's and WA conditions, there is scope to ensure that measures can be implemented to ensure that unavoidable construction noise impacts can be mitigated to ensure the amenity of sensitive receptors is not adversely affected during construction of the ventilation system.

5.2 KEY ISSUES

Noise Impact Assessment

The application is supported by a NIA undertaken by AECOM report number 1521107 -223-R-Rev0 dated 9 May 2017. An assessment of the report is detailed below.

5.2.1 Emission sources and types

Emission sources and types were adequately identified.

There are two major noise sources associated with the operation of the ventilation system, being the exhaust fans and jet fans at the tunnel portals.

Traffic noise associated with the proposed tunnel and connector roads is not considered in this assessment.

Some construction noise may be present during installation of the ventilation system (the fans).

5.2.2 Site specific factors

Site specific factors were adequately identified.

The project area is within a highly-urbanised region of Melbourne.

The existing acoustic environment at the southern portal is strongly influenced by road traffic noise from the West Gate Freeway and connector roads.

The existing acoustic environment at the northern portal is influenced by road traffic noise from Footscray Road, Hyde and Whitehall Streets.

Other major noise sources in proximity to the two portals include:

- a significant proportion of heavy commercial vehicles;
- manufacturing industries;
- railway operations; and,
- the Newport Power Station.

5.2.3 Appropriate modelling

Generally, the modelling was considered to be appropriate.

The impact assessment methodology included:

- establishing existing conditions within the Project boundary area. This involved a review and analysis of existing reports and monitoring of data from the public records; and,

- assuming sound power levels emitted from the tunnel ventilation system, jet fans, with computer modelling to predict the resultant noise impact.

SEPP N-1 sets noise limits based on the land use around the receiver to protect the environment from sleep disturbance and domestic uses to protect habitable rooms from noise disturbance. Habitable rooms are defined as sensitive receivers.

The noise limit (design criteria) is based on a calculation on the zoning level under the Policy, which takes into account land uses in the surrounding area and background noise levels.

The CadnaA environmental noise predication model (version 4.6) was used to calculate noise levels received at residential properties neighbouring the proposed ventilation structures. This software is an internationally recognised state-of-the-art predictive tool that uses algorithms for the calculation of noise attenuation through the built and natural environment using ISO standard method 9613. The model is conservative, in that it assumes favourable noise propagation in the direction of the receiver always (the receiver is always downwind). It does not adjust for meteorological effects that may affect noise propagation.

The ventilation structures for each portal are represented in the model as two point sources at each location at heights of 44 and 46 m above natural ground level (NGL).

The sound power level at the tip of each operating source has been based on a design criterion of 100 dB(A), regardless of the fan speed and chimney direction. The sound power level of the jet fan located at the entrance of the tunnel portals was assumed to be 101 dB(A) at the tunnel entrance and 103 dB(A) at the tunnel exit.

The project noise contribution at the selected receptors with regard to the background noise levels was predicted to be:

- four dB(A) below the evening and night period at two metres above NGL;
- seven dB(A) below the day period at two metres above NGL;
- two dB(A) below the evening and night period at four metres above NGL; and,
- five dB(A) below the day period at four metres above NGL.

The modelling shows that at the expected noise levels prescribed under the N-1 Policy requirements shall be met at the identified sensitive locations, subject to verification of the design of proposal prior to construction of the works.

5.2.4 Demonstration that the proposed expansion meets Best Practice requirements

Best practice requirements were adequately addressed.

SEPP N-1 does not specifically refer to best practice measures for industry. Notwithstanding, cl19 of the Policy prescribes that,

"*where equipment is to be replaced or new equipment is installed, the quietest equipment available should be used where a significant reduction in noise in noise sensitive areas can be expected to occur".* This clause is considered to represent best practice.

In this regard, the fans are to be fitted with variable speed drives (VSD) as a best practice measure.

VSD's reduce the speed of the fan to match the exhaust needs during low traffic volumes. Reducing the speed of the fan reduces the noise. This is the primary method for minimising the proposed noise source as required at cl19 of SEPP N-1.

At this time, the detailed design of the ventilation equipment is not finalised, however with the adoption of VSD, plus design for a low static pressure and use of silencers, as proposed, the proposal is considered unlikely to adversely affect the amenity of the locality.

5.2.5 Sampling and monitoring requirements

The proposed sampling and monitoring requirements are considered to be acceptable.

Prior to commencement of construction, the WA has been conditioned to ensure that:

- a detailed design of the tunnel ventilation system shall be required to be submitted to the EPA, showing measures to be taken to ensure compliance with the State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1;
- a monitoring program for noise impacts, including periods before and after the commencement of tunnel operation; and,
- a copy of the CEMP detailing the proposed noise, management procedures and practices to be undertaken during construction.

Additionally, it is noted that the project specific EPR's supporting the EES include noise management and monitoring measures to ensure compliance during construction and operation of the Project.

5.2.6 Peer Review

The EPA commissioned an independent peer review of EPA's assessment of the NIA.

The findings of the review relevant to the installation of the ventilation system is detailed below:

"Overall, the assessment methodology in this Report is consistent with the current approaches and methodologies that are used by noise and vibration professionals.

The relevant EPA Policy No.N-1 document is referred to.

Detailed jet ventilation design details are not provided, thus not allowing a comprehensive review of the predicated noise emission levels in the adjacent residential community.

Based on the material provided, the conclusion is that compliance with EPA Policy No. N-1 might occur. The complete design should be provided to allow a proper assessment, particularly given that uncertainty in the predicted noise level has not been addressed. Mitigation measures should be incorporated in the detailed design as the retrofit of most measures post opening would be very expensive to install".

In this case, the EPA is satisfied, subject to the proposed conditions and EPR's, that the proposed ventilation system is unlikely to introduce adverse noise to sensitive receptors in proximity to the proposal.

It is noted that the NIA was additionally considered by the Conclave of experts and the IAC.

5.2.7 Health Impacts

The EPA has assessed the likely public health impacts associated with noise.

The tunnel ventilation system is designed to achieve compliance with SEPP N-1, where the potential noise sources primarily relate to noise form the ventilation structure exhaust fans and jet fans located near the tunnel portals.

The EPA does not object to the proposed works on health grounds.

In conclusion, the Project is considered to:

- comply with the requirements of SEPP N-1;
- adopt best practice measures; and,
- is unlikely to adversely affect the amenity of sensitive receptors in proximity to the proposed ventilation system and the beneficial uses of the environmental segments.

Air Impact Assessment

An assessment of the AQIA by AECOM report No.1521107-223-R-Rev0 dated 9 May 2017, is detailed below:

5.2.8 Emission sources and types

Emission sources and types were adequately identified.

Emission sources contributing to the local air shed include:

- traffic using the road network, including a significant proportion of heavy commercial vehicles;
- manufacturing, industry, waste and recycling land uses;
- railway operations; and,
- power generation.

Potential air quality impacts associated with the operation of the Project primarily relate to:

- exhaust emissions from vehicles and surface roads; and,
- vehicle exhaust emissions discharged from the road tunnel ventilation system.

5.2.9 Site specific factors

Site specific factors were adequately identified.

The Project is located in a highly-urbanised part of Melbourne.

Existing air quality in the vicinity of the Project is typical for the urban context.

Local meteorology (wind speed, direction and temperature) is described using monitoring data for the period 1 January 2005 to 31 December 2015, collected at the Footscray ambient air quality monitoring station (AAQMS), which is considered to be the nearest to the project area.

Given the proximity of the Footscray AAQMS to the project area and the relatively flat surrounding topography, metrological conditions along the proposed alignment are expected to be similar to those recorded at Footscray.

Existing air quality for the project area is described using publicly available ambient air quality monitoring data collected by the EPA at the following locations:

- Footscray for the period 2005 to 2015;
- Alphington for the period 2005 to 2015;
- Francis Street, Yarraville for the period June 2012 to August 2013;
- Brooklyn for periods March to November 2004 and 2009 to 2015; and
- monitoring conducted by the EPA for air toxics at various locations across the Melbourne metropolitan area from 2003 top 2012.

SEPP (AQM) does not contain specific criteria for the assessment of impacts from transport corridors, however, Schedule A of SEPP (AQM) lists Class 1, 2, and 3 air quality indicators and their design criteria. These criteria were used in the assessment of the Project.

The Project area is situated in the suburbs of Yarraville, Footscray, Seddon, Spotswood, South Kingsville, Altona North, Brooklyn, Laverton North, Kensington, North Melbourne, West Melbourne, Docklands and the western end of Melbourne's central city.

Sensitive receptors within the project area, include, but are not limited to schools, kindergartens and childcare centres, community centres, hospitals and recreational areas.

The main industrial and non-industrial air emission sources contributing to the local air shed affect sensitive receptors include:

- traffic using the road network, including a significant proportion of heavy commercial vehicles, using the West Gate Freeway ;
- manufacturing, industry, and waste and recycling land uses;
- domestic fuel burning (gas, liquid and solid);
- residential activities;
- maritime, commercial and recreational shipping/boating;
- chemical storage and ship to shore transfer;
- railway operations; and,
- power generation.

These sources give rise to emissions of key pollutants relevant to the project include particulate matter fractions.

There are locations within the vicinity of the project area where air quality is elevated due to the influence of local sources such as vehicles and industrial emissions. This issue is discussed in more detail above in Section 3 of this report.

5.2.10 Demonstration that the proposed expansion meets Best Practice requirements

Best practice requirements were adequately addressed.

SEPP(AQM) sets out best practice requirements for air quality emissions.

The proposed design and implementation of the tunnel ventilation system is considered to meet best practice criteria, as discussed above in Section 5.

The air pollution dispersion modelling undertaken for the AQIA meets the SEPP(AQM) requirements.

Air dispersion modelling was conducted using the Victorian regulatory model, AERMOD, in accordance with the requirements of Schedule C of SEPP(AQM) to predict ground level (GLC) concentrations resulting from emissions to air from the proposed ventilation structures.

GLC of the following pollutants were predicated:

- particulate matter with equivalent aerodynamic diameters less than 10 microns and 2.5 microns ($PM_{2.5}$ and PM_{10});
- nitrogen dioxide (NO_2);
- carbon monoxide (CO);
- benzene; toluene; ethylbenzene; xylene isomers (BTEX); 1,3 butadiene; formaldehyde; and,
- polycyclic aromatic hydrocarbons (PAHs).

The modelling undertaken is discussed in more detail below in Section 5.2.12.

5.2.11 Sampling and monitoring requirements

The proposed sampling and monitoring requirements are considered to be acceptable.

The tunnel ventilation system is designed to achieve zero portal emissions and remove air from the tunnels to meet air quality requirements for carbon monoxide to achieve:

- a longitudinal air velocity not exceeding 10 m/s;
- maximum peak value of 150ppm;
- 15 min average of 50ppm; and.
- 2 hour average of 25ppm;

The in-tunnel air quality standard for NO_2 of 0.5 ppm as a rolling 15-minute average; and,

- apply best practice Australian management techniques to minimise impact on health from in-tunnel exposure to $PM_{2.5}$ and PM_{10}.

Monitoring equipment will be installed at specific locations within each tunnel to monitor air, velocity, visibility, CO and NO_2. In particular, CO data shall be used to control the VSD fan operation.

In-tunnel air quality and ventilation stack emission monitoring is proposed.

The proposed monitoring program includes:

- continuous emission monitoring system (CEMS) undertaken using standard methods by NATA accredited operators (similar to the monitoring currently undertaken in the CityLink and East Link tunnel ventilation stacks;
- ventilation stack testing will provide independent verification of the CEMS.

The CEMS will be installed on each ventilation structure to monitor the emission of the following pollutants, together with exhaust gas velocity, temperature and relative humidity:

- $PM_{2.5}$ and PM_{10};
- NO_x; and,
- CO.

Installed equipment will include pumps, sample line, gas conditioning equipment and automatic calibration systems.

Air toxics emission monitoring will be conducted on each ventilation structure to determine the concentrations and mass rates of emission for the following pollutants:

- benzene, toluene, xylene isomers and 1,3-butadiene;
- polycyclic aromatic hydrocarbons (PAHs); and,
- formaldehyde.

Low concentrations of air toxics are anticipated in the ventilation structures. A number of emission testing methods include: SUMMA passivated canister sampling and GC analysis; multicomponent sampling train; and adsorbent cartridge and HPLC analysis.

EPR and WA conditions are imposed with regard to the requirement for a monitoring program to be in place prior to commissioning.

Ambient air quality monitoring is also proposed, including:

- five air monitoring sites measuring particulates; and,
- pre-development monitoring of particulates, NO_2, benzene, toluene, ethybenzene, and xylem;

EPR and WA conditions are imposed with regard to the requirement for a monitoring program to be in place prior to commissioning.

It is noted that the supporting EPR does not specify in-tunnel air standards for $PM_{2.5}$ or PM_{10}, as there are no international in-tunnel air quality standards. Notwithstanding, the requirement for the installation of pollution equipment is not considered to be necessary. This issue is discussed in more detail in Sections 3 'IAC report' and 5.1 Regulatory compliance.

The proposal subject to the following WA conditions of approval is considered to be acceptable:

- a monitoring program for in-tunnel air quality stack emissions; and,
- a monitoring program for ambient air quality, including periods before and commencement of tunnel operation, using the existing five monitoring sites relied upon with the application, inclusive of the specification and location of instruments.

5.2.12 Appropriate modelling

Generally, the modelling was considered to be appropriate.

A number of conservative assumptions have been made in conducting the ventilation structure air quality impact assessment.

These include:

- background pollutant concentrations for 2022 (anticipated year of project opening) and 2013 were assumed to remain at levels recorded during the period 2009 to 2013; and,
- vehicle emissions factors for 2011 and 2031 were assumed to remain at levels predicated for 2020.

The AERMOD model inputs were considered to be appropriate, inclusive of:

- model domain of an outer grid covering 100 km^2 with an inner grid of 10.6 km with a 25 m resolution centred on the length of the project;

- use of a combination of Geoscience Australia Digital Elevation Model and Victoria Department of Land, Water and Planning, Metro Contour 1-5 metre-Vicmap elevation data;
- meteorological input data from EPA's Footscray, Laverton and Melbourne Airport monitoring stations, representative of local meteorology and surface characteristics;
- five years of meteorology (2009-2013) was used in compliance with EPA publication No.1550;
- design ventilation stack structures with anticipated hourly operating ventilation emissions rates used and building down wash; and,
- sensitive receptors inclusive of 69 sites covering schools, aged and childcare facilities, community centres and local reserves.

The traffic emission estimations and in-tunnel concentrations used for the stack emissions rates were also considered to be suitable, as detailed below:

- motor vehicle estimations are based on project traffic modelling;
- traffic emission inputs (CO, NO_2 to NOx ratio, $PM_{2.5}$ and PM_{10}) based on the World Road Association, Permanent International Association of Road Congress (PIARC) emission factors with the methodologies used to account for the local conditions such as vehicle fleet, speeds, road gradient etc. being suitable and generally consistent approaches used for other recent road tunnel assessments in Australia;
- air toxics traffic emission inputs estimated using the COPERT Australia motor vehicle road emission model with assumptions and methodologies accounting for local conditions and where there was absence of adequate data/detail is appropriate;
- diurnal emission rate patterns and distribution of emission estimates are consistent with the anticipated emissions from road traffic profiles;
- road gradient is factored in the vehicle emission estimations; and,
- EPA comparison of PIARC and Victorian tunnel monitoring data indicated the differences between PIARC and monitoring data were $PM_{2.5}$ (1-11%), NO_x 11% and CO 38% (EES Tabled Document 70 Conclave Report – Air Quality Report).

Worst case emission estimations and elevated emission scenarios were generally applied, including:

- projected traffic volume scenarios during tunnel operation in 2022 and 2031 are based on 2009 meteorology, which was assigned the year that predicated highest GLC occurred (worst case);
- worst case scenarios of operating maximum traffic volume capacity (three lanes) at all hours over a whole year;
- increased diesel emissions. Doubled the proportion of diesel emission cars from 15 to 30% in proportion to non-diesel cars;
- traffic volume scenarios with higher proportions of heavy commercial vehicles (5-10%); and,
- in-tunnel CO and NO_2 concentration at in-tunnel air quality limits.

The Representative background data used was also considered to be suitable, inclusive of:

- EPA air monitoring data (CO, NO_2, PM_{10} and $PM_{2.5}$) from the Footscray monitoring site located 2.5 km away is generally representative of the air quality in the local study area;
- available EPA air toxics air monitoring data from across Melbourne;
- continuous time varying hourly data (CO, NO_2, PM_{10} and $PM_{2.5}$) was used where available; and,
- time averaged constant background ($PM_{2.5}$ and air toxics) based on available data.

Based on the modelling, the air quality impact of the emissions from the proposed ventilation stacks is considered to meet the requirements of SEPP (AQM) for all pollutants except for PM_{10}.

The design criterion for PM_{10}, was not met, mainly due to the existing background levels.

Support for the proposal is discussed in greater detail above in Sections 3 and 5.

5.2.13 Peer Review

The EPA commissioned an independent peer review of EPA's assessment of the AQIA and evaluation of the proposed EPR's.

The findings of the review relevant to the installation of the ventilation system is detailed below:

- *anomalies identified with regard to predicated concentrations of PM10, PM2.5 and NO_2. Whilst it is likely that these anomalies would not change the assessment outcome, they should be investigated and resolved;*

This issue was noted. It is considered in this case, that further assessment would unlikely have a material effect on the outcome of the modelling. This outcome was additionally supported by the majority of the Conclave of experts.

- *the AQIA has not assessed potential impacts of the ventilation structures at elevated receptors (e.g. multi-story buildings with boundaries). Further information should be provided that identified receptors that are above ground-level including both existing or possible future multi-story developments. Potential impacts of the project should be quantified at these above-ground receptors;*

This issue was raised with the Conclave of experts. Further modelling was undertaken to assess air quality impacts on planned multi-storey buildings. The modelling demonstrated that in comparing elevated receptors and GLG, elevated receptors are unlikely to experience any greater impacts than the predicated GLC.

- *the findings of the AQIA would be improved if the number of additional exceedances due to the Project were quantified. For the cumulative assessment, whilst the AQIA did determine the number of additional exceedances, this was for a small subset of receptors only. This analysis should be extended to all receptors; and,*

The conventional cumulative impact assessment of additional exceedances was undertaken for the local area including the receptors was undertaken using representative background.

A complementary cumulative impact assessment was undertaken specially for worst case impacts alongside major roads using road modelled emissions plus representative background. A number of specific receptors were selected to generally represent the impacts on the road. This complementary modelling is not conventionally undertaken for air quality impact assessments in Victoria.

- *in-tunnel concentrations of CO, NO_2 and visibility should be based on in-tunnel standards specified in PIARC as a minimum.*

This matter has been resolved with inclusion in the supporting EPR's for these standards.

It is noted that the AQIA was additionally considered by a Conclave of experts and the IAC.

5.2.14 Health Impacts

The EPA assessed the proposed development, with regard to the likely air quality impacts and health impacts.

The EPA does not object to the proposed development with regard to air impacts on public health grounds.

The supporting HHIA details that air impacts from the Project are not expected to cause acute or chronic health risk issues in the local community.

In conclusion, it is considered the Project:

- complies with requirements of SEPP (AQM) and (AMM)
- adopt best practice measures; and,
- is unlikely to adversely affect the amenity or health of sensitive receptors in proximity to the proposed ventilation system, and any beneficial uses of the environment segments.

5 RECOMMENDATION

It is recommended that the WAA be approved subject to conditions.

6.1 WORKS APPROVAL CONDITIONS

SITE SPECIFIC WORKS APPROVAL CONDITIONS

WA_G1 Subject to the following conditions, this approval allows the construction of the following works and associated equipment - Tunnel ventilation systems associated with the construction and operation of twin tunnels supporting the West Gate Tunnel.

WA_G2 the works must be constructed in accordance with the application accepted on 5 June 2017 as ("the application") except that, in the event of any inconsistency arising between the application and the conditions of this approval, the conditions of this approval shall apply.

WA_G4 This approval expires:

(a) on the issue or amendment of a licence relating to all works covered by this approval

(b) when EPA advises in writing that all works covered by this approval have been satisfactorily completed and no licence is required, or

(c) five years from the date of issue of this approval unless the works have been commenced by this date to the satisfaction of EPA.

Works Conditions

WA_W1 Before commencing construction of the following components of the works, you must provide to EPA a report or reports with the plans and specifications of those components, including details of:

(a) the tunnel ventilation system and exhaust stacks showing measures to be taken to ensure compliance with State Environment Protection Policy (Air Quality Management), ensure impacts are equivalent to or less than the design assessed for this Works Approval;

(b) the tunnel ventilation system, showing conceptual provision for future pollution control equipment;

(c) final design measures to be installed to ensure that the tunnel can achieve zero portal emissions during operation;

(d) the tunnel ventilation system, showing compliance with best practice requirements of the Protocol for Environmental Management "Greenhouse Gas Emissions and Energy Efficiency in Industry";

(e) the tunnel ventilation system, showing measures to be taken to ensure compliance with the State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1; and,

(f) prior to commencing construction of the tunnel ventilation system, a copy of the Construction Environmental Management Plan detailing the proposed noise, dust and waste management procedures and practices to be undertaken during construction of the tunnel ventilation system.

WA_W2 You must not commence construction of those parts of the works for which reports are required by condition WA_W1(a) until written EPA approval of those reports has been received.

WA_W3 Where any reports specified in condition WA_W1(a) and approved by EPA differ from the application, the works must be constructed in accordance with those approved reports.

WA_W4 You must notify EPA when the construction of the works covered by this approval has been commenced.

WA_W5 You must notify EPA when the construction of the works covered by this approval has been completed.

WA_W7 You must not commission or operate the works without the written approval of EPA.

WA_W12.1 You must install all exhaust stacks so that provisions for sampling are included in accordance with EPA Publication 440.1 "A guide to the Sampling and Analysis of Air Emissions and Air Quality", or as approved by EPA.

Reporting Conditions

WA_R1.1.1 At least 18 months before the commencement of any commissioning, you must provide to EPA a plan that includes:

a) a monitoring program for in-tunnel air quality and ventilation stack emissions;

b) a monitoring program for ambient air quality, including periods before and after the commencement of tunnel operation using the existing five monitoring sites relied upon within the application inclusive of the specification and location of instruments;

c) a monitoring program for noise including periods before and after the commencement of tunnel operation; and,

d) provision for daily reporting of ambient air quality monitoring program results, on a publicly available website related to the project, or through EPA Victoria's Air Watch website (these details can be included in the monitoring plan required above at b)). The reporting shall be undertaken for at least five years post commissioning of the project, or such lessor period, as agreed with the EPA.

COMMISSIONING APPROVAL REQUIREMENTS

Under the Act, a 30A commissioning approval shall be required prior to commissioning of the ventilation system. Standard conditions shall apply.

LICENCE ISSUE

Under the Act, a licence will be required to be issued prior to the operation of the proposed development.

The following draft licence conditions are recommended, noting that the licence conditions shall be subject to review prior to issue.

The applicant proposed licence limits reflecting the peak rate of use of the project, being maximum lane capacity on three lanes, 24 hours per day, 365 days a year in the year 2031. This modelled

scenario represents the worst-case scenario. As discussed elsewhere in the report, this scenario complies with SEPP(AQM) design criteria.

The proposed discharge levels shown below at table 1 -discharge level, includes the worst-case scenario and an additional safety factor, where the modelled emission rate (worst case scenario) has been multiplied by a factor of 1.48.

The multiplication factor is intended to provide a safety measure to account for potential measurement uncertainties and the like. This degree of safety is considered to be quite conservative, however has previously been accepted by the EPA in assessment of the East West Link road project.

Whilst this safety factor is conservative, the inclusion of this addition to the peak estimation rates does not affect the ability of the draft discharge licence limits to comply with the design criteria for SEPP(AQM).

DRAFT LICENCE CONDITIONS

LI_G1 You must ensure that waste is not discharged, emitted or deposited beyond the boundaries of the premises except in accordance with this licence.

LI_G2 You must immediately notify EPA of non-compliance with any condition of this licence.

LI_G3 By 30 September each year you must submit an annual performance statement to EPA for the previous financial year in accordance with the Annual Performance Statement Guidelines (EPA Publication 1320).

LI_G4 Documents and monitoring records used for preparation of the annual performance statement must be retained at the premises for seven years from the date of each statement.

LI_G5 You must implement a monitoring program that enables you and EPA to determine compliance with this licence.

LI_A4 Nuisance airborne particles must not be discharged beyond the boundaries of the premises.

LI_DA1 Discharge of waste to air must be in accordance with the 'Discharge to Air' Table.

Table 1-Air Discharge Table

Discharge Point	Stack height (metres)	Emission Indicator	Proposed Licence Limit (g/m)
DP01 – northern stack	46	PM_{10}	49.8
		$PM_{2.5}$	34.8
		CO	426
		NO_2	90
		Benzene	7.2
DP02 – southern stack	46	PM_{10}	72
		$PM_{2.5}$	51.6

		CO	600
		NO_2	96
		Benzene	11.4

LI_DA1.6 The concentration of carbon monoxide in the tunnel must not exceed (a) a maximum of 150 ppm, (b) a 15 minute average of 50 ppm, and (c) a two hour average of 25 ppm.

The concentration of nitrogen dioxide in the tunnel must not exceed 0.5ppm as a rolling 15 minute average.

LI_DA1.9 Discharge of waste to air may exceed the limits referred to in conditions LI_DA1 and LI_DA1.6 during an emergency to prevent danger to life or limb in the tunnel.

LI_DA2.4 Visible emissions to air other than steam must not be discharged from the premises except in accordance with conditions LI_DA1 and LI_DA1.9.

6 PEER REVIEW

Development Assessment Unit (Approval)

Applied Science Directorate (Air)

Applied Science Directorate (Noise)

Major Projects and Planning (Project Management)

Environmental Public Health Unit

Development Assessment Unit (Licencing)

Legal Services Unit

REPORT DATE

Date: 4 December 2017

LIST OF APPLICATION DOCUMENTS AND INFORMATION

The WA application and associated information was delivered as a comprehensive suite of documents associated with the EES application documentation:

1. Summary Report
2. Volume 1 – West Gate Tunnel Project
3. Volume 2 – West Gate Freeway
4. Volume 3 – Tunnels
5. Volume 4 – Port, CityLink and city connections
6. Attachments I to V
7. Technical reports A to Q
8. Map book
9. Development and Urban Design Plans

The Works Approval application was Attachment V.

APPENDIX A DHHS REFERRAL LETTER

Department of Health & Human Services

50 Lonsdale Street
Melbourne Victoria 3000
Telephone: 1300 650 172
GPO Box 4057
Melbourne Victoria 3001
www.dhhs.vic.gov.au

Our Ref: WA1002695
Your Ref: 524428

Quentin Cooke
Team Leader
Development Assessments
Environment Protection Authority (EPA) Victoria
GPO Box 4395
MELBOURNE VIC 3001

Dear Mr Cooke

Works Approval Application WA1002695 Westgate Tunnel Ventilation Systems Department of Economic Development, Jobs, Transport and Resources, YARRAVILLE VIC 3013

Thank you for referring this Works Approval Application to the Department of Health and Human Services (the Department) on the 1 June 2017 for consideration. This response reflects an extension of time granted by EPA Victoria to 3 July 2017.

Under *Section 19B* of the *Environment Protection Act 1970*, the Department is a statutory referral agency for EPA Works Approvals. The Department may provide comments, recommendations or an objection if the proposed works are likely to endanger public health.

In December 2016, in response to the Independent Inquiry into the EPA, some environmental health functions associated with the assessment of public health risks for pollution and waste were transferred from the Department to the EPA. In line with this change, EPA provided the Department with the EPA Environmental Public Health Risk Assessment of 27 June 2017 also for consideration.

In summary, the West Gate Tunnel Project (WGTP) consists of :

- An Environmental Effects Statement currently on public exhibition for the WGTP.
- This Works Approval application is for the construction and installation of tunnel ventilation systems for two proposed tunnels going in opposite directions – each three traffic lanes wide.
- The inbound tunnel is likely to be 2.8 km long and has the northern ventilation structure, 60 metres east of Whitehall Street, 250 metres north of Somerville Road, Footscray.
- The outbound tunnel is likely to be 4 km long and has the southern ventilation structure, 150 metres west of the Newport freight railway line.
- Both ventilation structures will be located close to the tunnel exit portals for each tunnel.

In consideration of the Works Approval application, including the EPA Environmental Public Health Risk Assessment, the Department provides the following comments and recommendations:

State Government Victoria

Noise:

- The design of the tunnel ventilation system will achieve compliance with the noise State Environment Protection Policy (SEPP) N-1.
- The modelling undertaken suggests that all sensitive receptors are predicted to be below the night and day time noise limits. In addition, ongoing noise monitoring from tunnel ventilation systems will be required by the EPA once the tunnels are operational to verify compliance with the noise SEPP N-1.

Water:

- A sewer realignment will occur on the east side of the West Gate tunnel and tunnel spoil generated will be removed to a temporary handling facility before being transported for disposal. The EPA must be satisfied that these works will be undertaken in accordance with the relevant SEPP's and guidelines.

Air Quality (tunnel ventilation system):

- The Tunnel Ventilation System Air Quality Impact Assessment Report (Golder Associates – May 2017) includes predicted pollutant concentrations from tunnel ventilation structures.
- Air modelling demonstrated that air emissions from the tunnel ventilation structures (ie NO_2, CO, VOCs and PAHs) complied with all applicable design criteria in the SEPP (Air Quality Management or AQM), except for PM_{10} as a 1 hour average.
- For PM_{10} (1 hour average design criteria of 80 $\mu g/m^3$) and, in some instances $PM_{2.5}$ (1 hour average design criteria of 50 $\mu g/m^3$) there were exceedances. These exceedances have been associated with local sources such as vehicles (roadside) and industrial emissions contributing to relatively high background levels.
- Section 16, SEPP(AQM) refers to risk assessment as a method of gaining better understanding of the impacts of emissions from an activity on beneficial uses of the air environment, including public health. EnRisks consultancy undertook the health risk assessment for the WGTP.

Air Quality (assessment of residual risk from fine particles):

- To allow for appropriate consideration of exceedances of fine particles and the assessment of potential impact on community health, EnRisks prepared the WGTP: Technical Report J Human Health Impact Assessment (May 2017).
- Overall, EnRisks concluded that the human health impact from nitrogen dioxide, carbon monoxide, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) from tunnel ventilation outlets were acceptable and with the implementation of Environmental Performance Requirements the residual risk to be low. For VOCs and PAHs there would be no acute or chronic health risk issues in the local community from the operation of the tunnel ventilation structures.
- The EnRisks assessment of potential residual risk of the combined impacts from tunnel ventilation outlets plus the proposed changes to surface road-related emissions for $PM_{2.5}$ concluded that the risk of all-cause mortality; cardiovascular hospitalisations in older adults; and respiratory hospitalisations in older adults for Years 2022 (normal operations) and 2031 (normal operations) to be at an acceptable (i.e. tolerable) level of risk.
- Overall the potential air impacts on health from emissions associated within the operation of the tunnels component were assessed as being below health-based guidelines and the residual risk to human health is also considered to be low.

Detailed design specification:

- The detailed design specifications for the ventilation structures are currently unavailable, however EPA confirms that detailed design information must be supplied to the Authority's satisfaction prior to commencement of works permitted by the Works Approval.

- As per the *Environment Protection (Scheduled Premises) Regulations 2007*, an EPA licence is required prior to the commencement of operation of the tunnel ventilation system.

Monitoring air quality:

- To effectively validate the air modelling undertaken as part of the Works Approval application, it is noted that a minimum of one year of air quality monitoring will occur to the satisfaction of the EPA before operation of the tunnel, and for five years monitoring during operation of the tunnel.
- The Department recommends that EPA considers reserving the right to review and amend the air monitoring program beyond five years if deemed necessary to continue monitoring for environmental or public health impacts. Air monitoring includes in-tunnel monitoring; in stack or in ventilation structure monitoring as well as ambient air quality monitoring.
- In-tunnel air quality and ventilation structure emissions will be monitored during operations to demonstrate compliance with licence conditions and relevant SEPP's and guidelines.
- Results will be made publicly available for ambient air quality monitoring program, including in-tunnel air quality results (published quarterly).
- Post-project completion, ambient air quality monitoring systems will be located adjacent to each ventilation structure to assess potential impacts of emissions on nearby sensitive receptors.

Modelling Scenarios and assumptions:

- The worst-case (congested) scenario, Scenario C is for maximum traffic capacity and conservatively assumes that all three lanes are operating at full capacity (i.e. 24 hours a day, seven days a week). This Scenario is not considered in much detail in the Tunnel Ventilation System Air Quality Impact Assessment Report (Golder Associates – May 2017).
- The Department recommends that EPA be satisfied that in tunnel emissions and emissions from the ventilation structures are protective of human health in the event of a worst-case congested situation such as Scenario C.
- In addition, the tunnel air flow and ventilation extraction requirements should also accommodate issues including (but not limited to) power outage resulting in failure of the ventilation extraction system or emergencies such as an in tunnel accident or fire.

Based on the information provided by EPA, the Department does not object to the proposed works approval on the grounds that public health is likely to be endangered. The Department however recommends that EPA is assured that the tunnel ventilation system is designed, constructed and operated according to the objectives and principles of the EP Act and relevant SEPPs and environmental guidelines.

If there are any queries regarding this matter, please contact Sandra Falconer, Manager Environmental Health Policy & Risk Management Program on 9096 5105.

Yours sincerely

Dr Mihaela Ivan
Acting Deputy Chief Health Officer (Environment)
Health Protection Branch

3/7/2017

APPENDIX B MARIBYRNONG CITY COUNCIL REFERRAL LETTER

Maribyrnong CITY COUNCIL

30 June 2017

Marcel van der Schoot
Assessing Officer
Development Assessments
Environment Protection Authority

Dear Mr van der Shoot

Re: Application for Works Approval 1002695 (West Gate Tunnel)

I refer to your recent letter advising receipt of the works approval application described above (WAA).

The WAA has been jointly exhibited with an Environment Effects Statement (EES) for the West Gate Tunnel (the Project).

The EES includes a draft planning scheme amendment which proposes to authorise the project in accordance with the terms of an Incorporated Document, to be given effect through clause 52.03 of the Maribyrnong Planning Scheme. If approved, the Project would be exempt from the requirements of any other provision in the Scheme that otherwise require a planning permit. The Minister for Planning is to be the responsible authority for the purposes of administering the Incorporated Document under the terms of the proposed planning scheme amendment.

If a permit application were lodged with Council under the Maribyrnong Planning Scheme in its current terms the project works would require a planning permit to be granted under *the Planning and Environment Act 1987*. I advise that:

- no planning permit has been issued at this time for the works forming part of the project;
- no application for a planning permit has been lodged with Council;
- the proposed works are not prohibited by the Maribyrnong Planning Scheme.

Council's submissions regarding the proposal and the WAA will be lodged as part of its submission to the EES.

I note that several air quality monitoring stations have been deployed over the past 12 months in Yarraville Gardens and at other locations. It is understood that these stations were deployed to provide baseline data for the assessment of the air quality impacts of the project. Council would ask the Authority to ensure that this data informs its assessment of the baseline condition of the environment. Its understanding of the EES is that it has relied on meteorological data from an existing station in Footscray which may not accurately reflect the conditions where the air quality monitoring stations have been deployed.

Please contact Virginia Howe Coordinator Strategic Planning should you have any specific queries regarding this matter.

Yours sincerely

Adrian Havryluk
Manager City Strategy

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APPENDIX C HOBSONS BAY CITY COUNCIL REFERRAL LETTER

HOBSONS BAY CITY COUNCIL

23 June 2017

Marcel van der Schoot
EPA Victoria
GPO Box 4395
MELBOURNE VIC 3001

Ask for: Rachael Hayes
Phone: 9932 1000
Email: rhayes@hobsonsbay.vic.gov.au
Our Ref: GE1737252

Dear Sir/ Madam

Application GE1737252 - Westgate Tunnel, Yarraville VIC 3000
Re: APPLICATION FOR WORKS APPROVAL 1002695

It is understood that there is to be a ventilation structure constructed close to the exit of that southern portal on the Hobsons Bay Council side of the West Gate Tunnel Project (150.0 metres to the west of the Newport Freight Railway Line). The ventilation structure is to sit over the tunnel and is to have a height of 45.0 metres. The ventilation structure will be designed as part of a complete combined portal supporting the canopy over exiting traffic.

Based on the information sourced from the West Gate Tunnel Project website it would appear that the ventilation structure is to be constructed entirely within the Road Zone pursuant to the Hobsons Bay Planning Scheme. If this is the case a planning permit is not required for use, being a road. Nor is a planning permit required for the buildings and works. Should any of the works fall outside of the Road Zone and instead on land zoned Industrial 1 a planning permit would be required for any buildings and works.

At this time it is advised that Hobsons Bay City Council will be lodging a submission to the West Gate Tunnel Project Environmental Effects Statement in line Council's adopted position. To assist in the preparation of the submission an air quality consultant has been engaged.

Council's Senior Technical Advisor (Strategic Infrastructure) has advised given the proposed location of the ventilation stack, and the condition of the existing air environment, Hobsons Bay Council believes that pollution control equipment is considered best practice emission control as required under the SEPP (AQM).

Should pollution control equipment not be required by EPA Victoria upon the West Gate Tunnel Project opening, council's officers suggest that provision should be made that it be able to be retrofitted for a time when needed. The design and operation of the ventilation shaft should take into consideration that the land immediately to the south of the ventilation structure is strategically geared to be developed into a medium

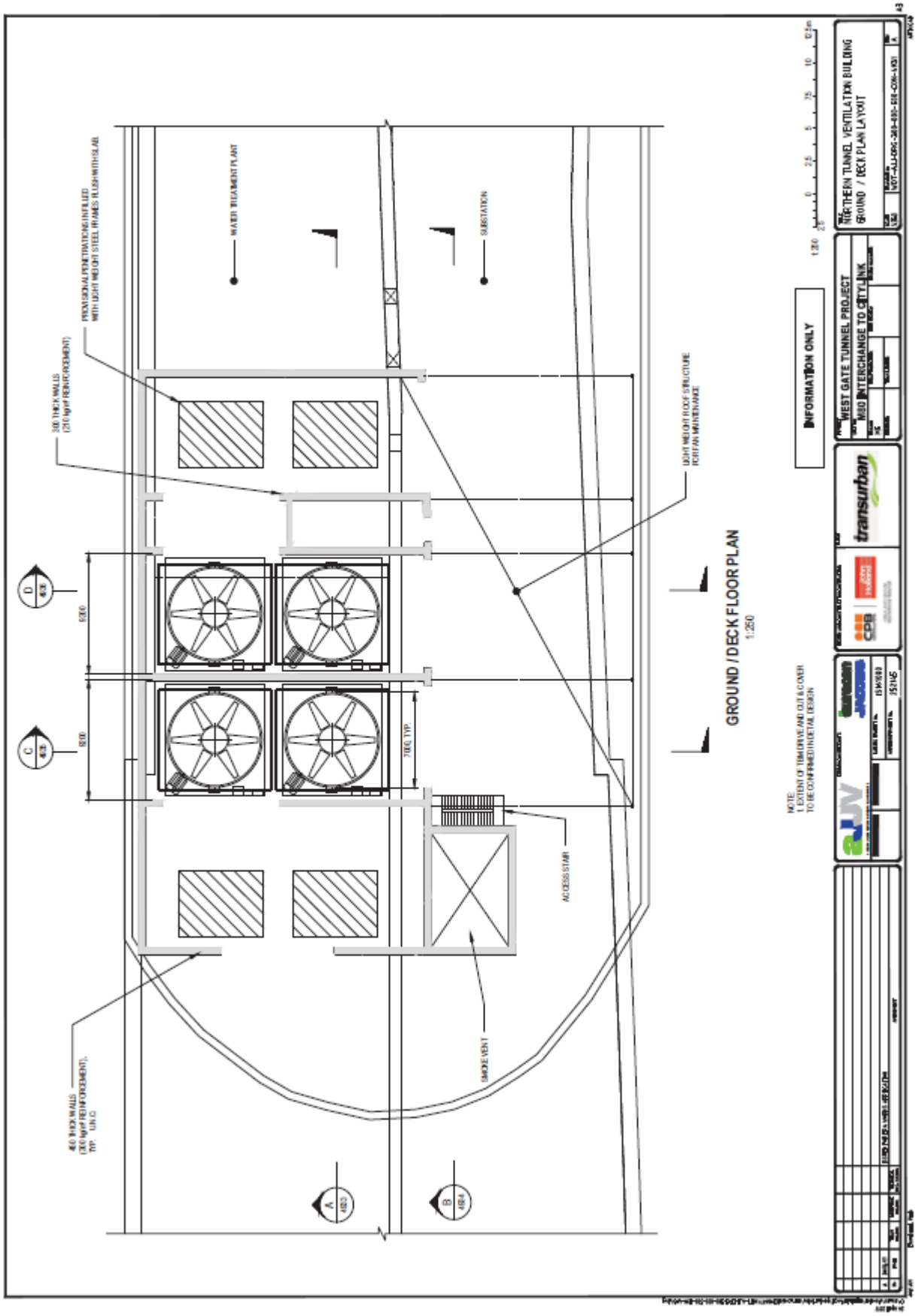
to high density residential area. In this light council's officers are mindful that future residents be protected from harmful air emissions from the West Gate Tunnel Project.

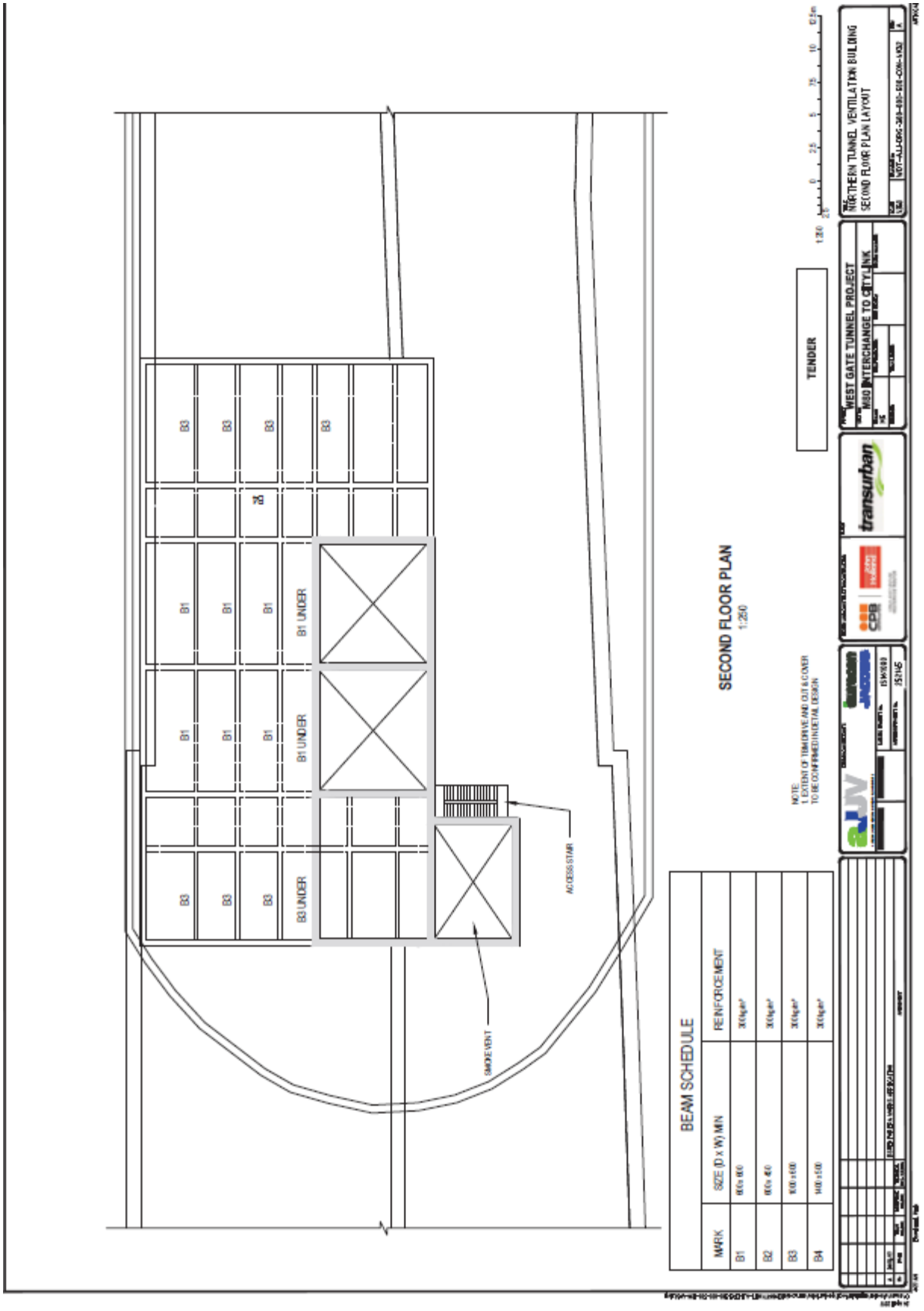
Should you have any further queries please contact me on 9932 1000

Yours sincerely

Rachael Hayes
Major Projects and Policy Planner

APPENDIX D PROPOSED PLANS

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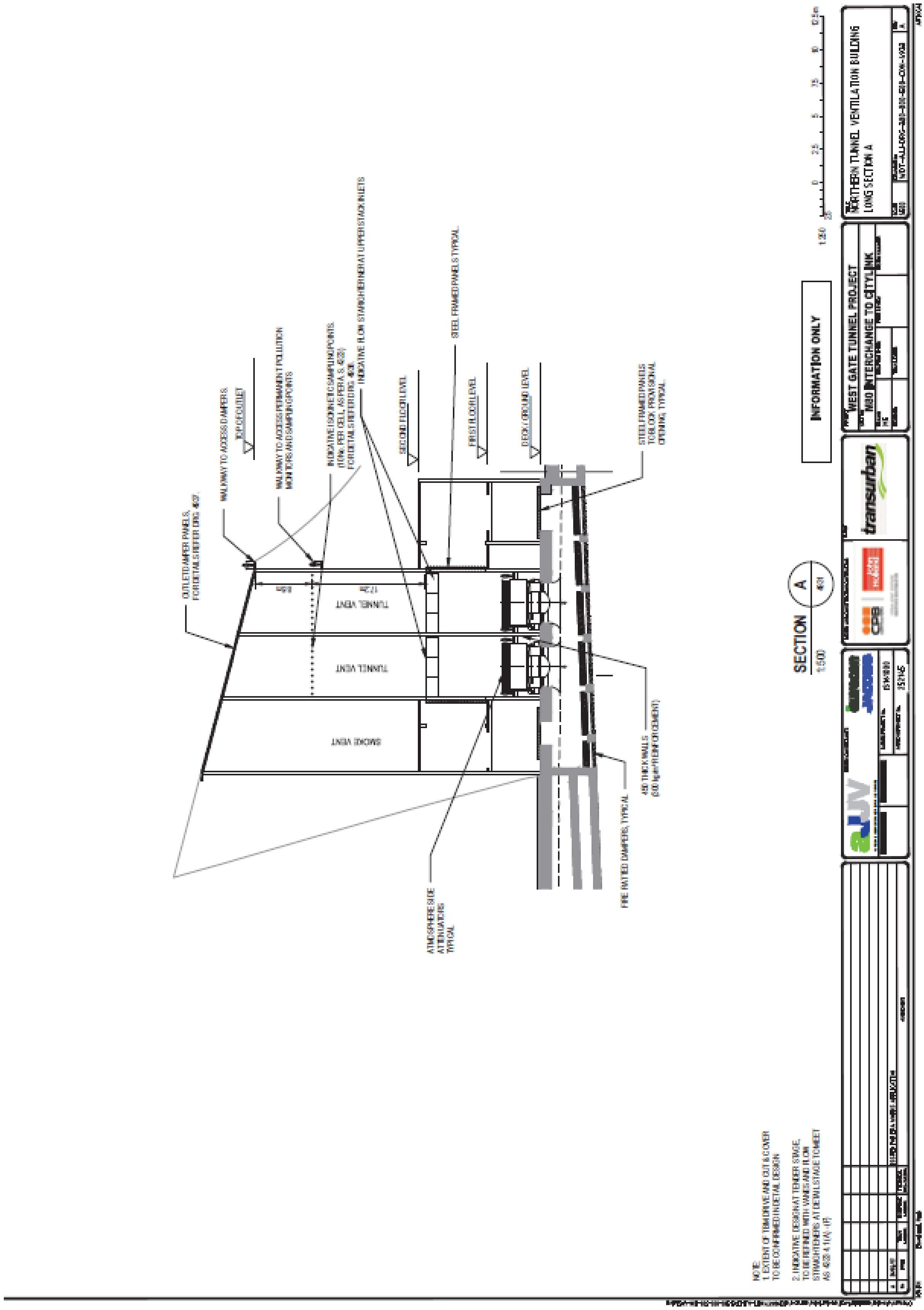
B3
B1
B1 UNDER
B2
B2 UNDER
ACCESS STAIR
SMOKE VENT
BEAM SCHEDULE
MARK
SIZE (D x W) MIN
REINFORCEMENT
B1
B2
B3
B4
NOTE:
1. EXTENT OF TUNNEL VENTILATION BUILDING TO BE CONFIRMED IN DETAIL DESIGN
TENDER
WEST GATE TUNNEL PROJECT
M80 INTERCHANGE TO GTT LINK
NORTHERN TUNNEL VENTILATION BUILDING
SECOND FLOOR PLAN LAYOUT
transurban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WALKWAY TO ACCESS DAMPERS.
TOP OF OUTLET
WALKWAY TO ACCESS PERMANENT POLLUTION MONITORS AND SAMPLING POINTS
INDICATIVE ISOKINETIC SAMPLING POINTS. (10No. PER CELL, AS PER A.S. 4323) FOR DETAILS REFER DRG. 4030.
INDICATIVE FLOW STRAIGHTENER AT UPPER STACK INLETS
SECOND FLOOR LEVEL
STEEL FRAMED PANELS TYPICAL.
FIRST FLOOR LEVEL
DECK / GROUND LEVEL
SMOKE VENT
TUNNEL VENT
TUNNEL VENT
ATMOSPHERE SIDE ATTENUATORS TYPICAL
FIRE RATED DAMPERS, TYPICAL
450 THICK WALLS
STEEL FRAMED PANELS TO BLOCK PROVISIONAL OPENING, TYPICAL.
NOTE:
1. EXTENT OF TBM DRIVE AND CUT & COVER TO BE CONFIRMED IN DETAIL DESIGN
2. INDICATIVE DESIGN AT TENDER STAGE, TO BE REFINED WITH VANES AND FLOW STRAIGHTENERS AT DETAIL STAGE TO MEET AS 4323.1(A) - (F)
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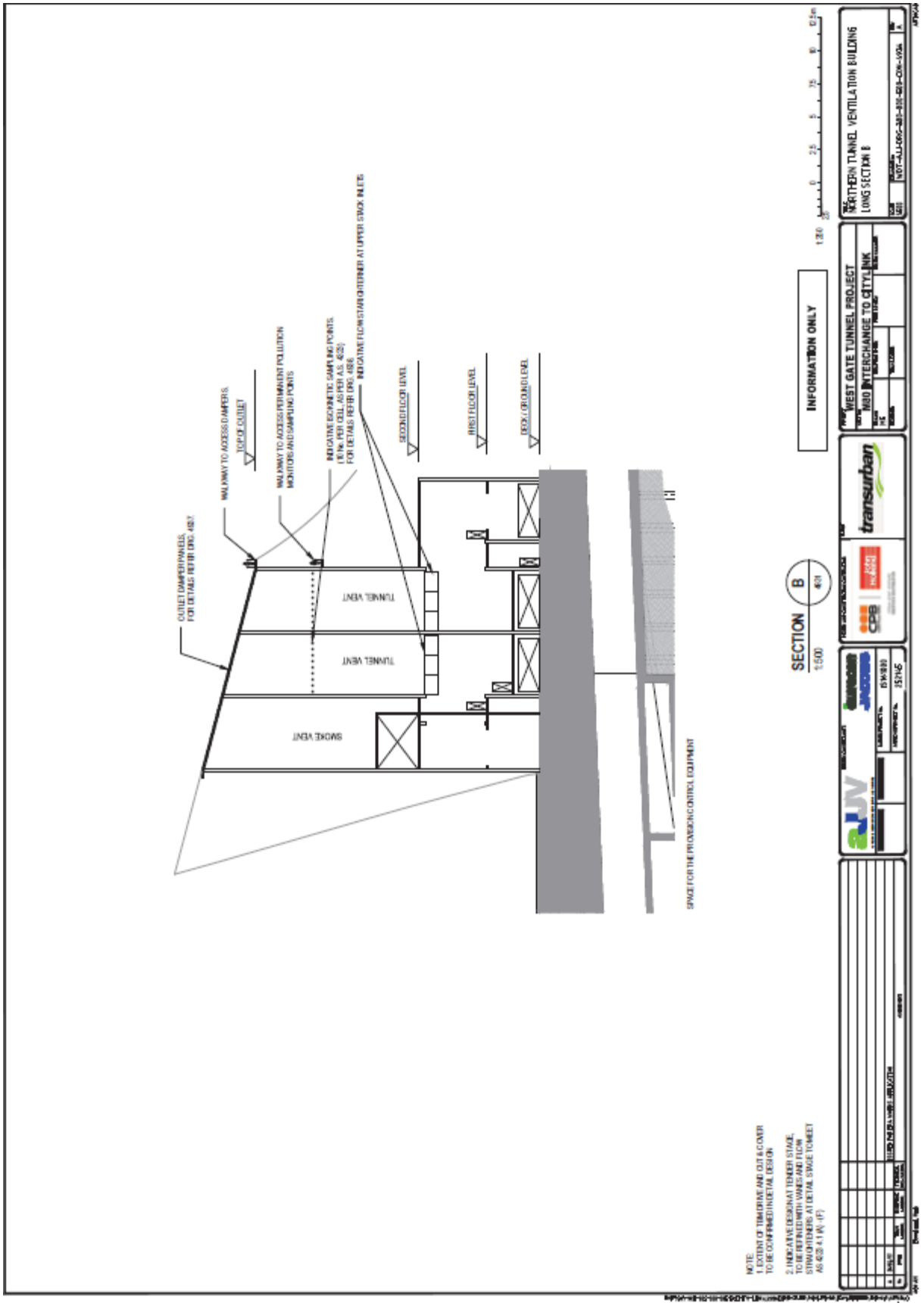
CPB
John Holland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ROOF / GROUND LEVEL
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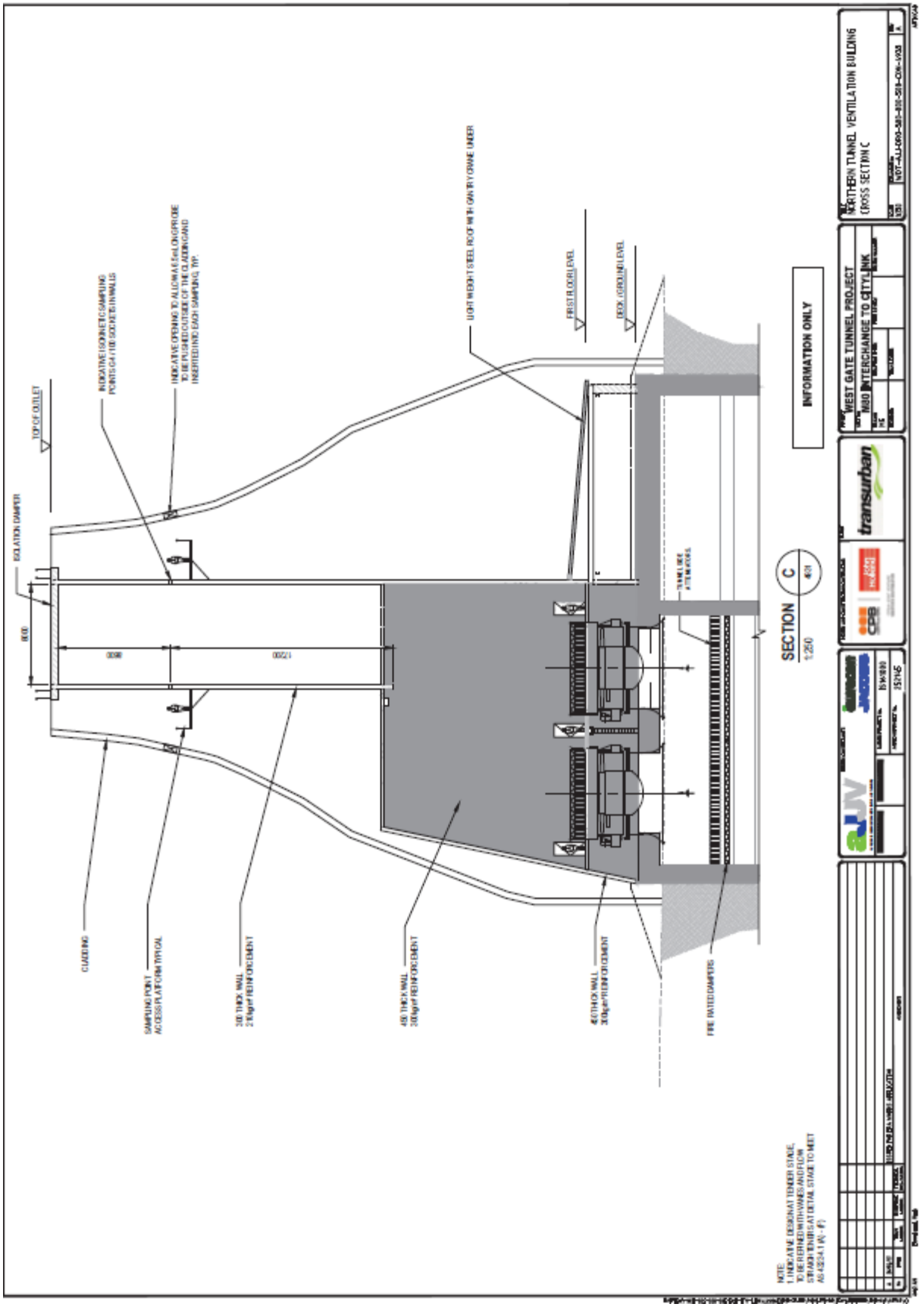
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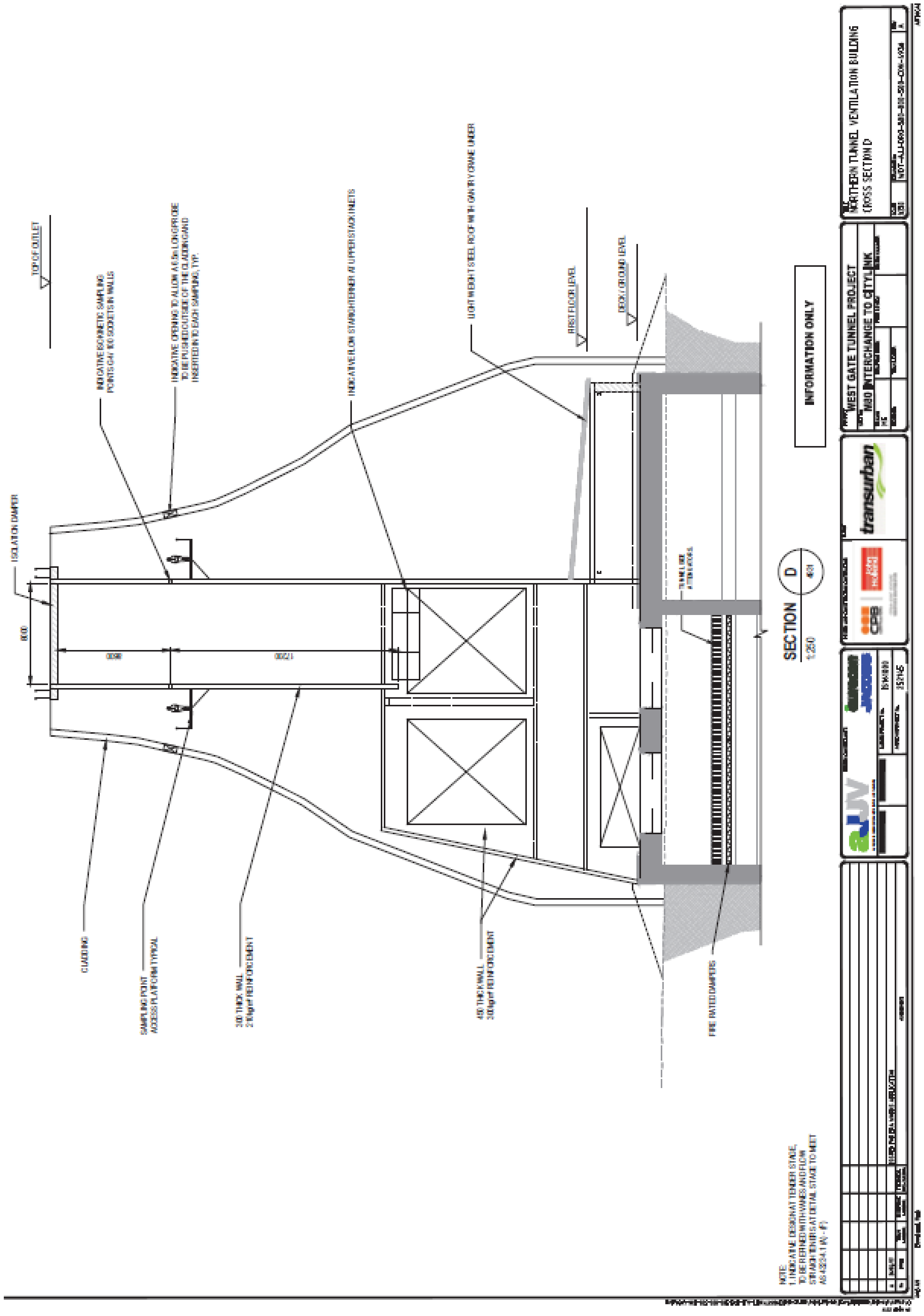
GROUND LEVEL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LIGHT WEIGHT STEEL ROOF WITH GANTRY CRANE UNDER
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DECK / GROUND LEVEL
CLADDING
SAMPLING POINT ACCESS PLATFORM TYPICAL
FIRE RATED DAMPERS
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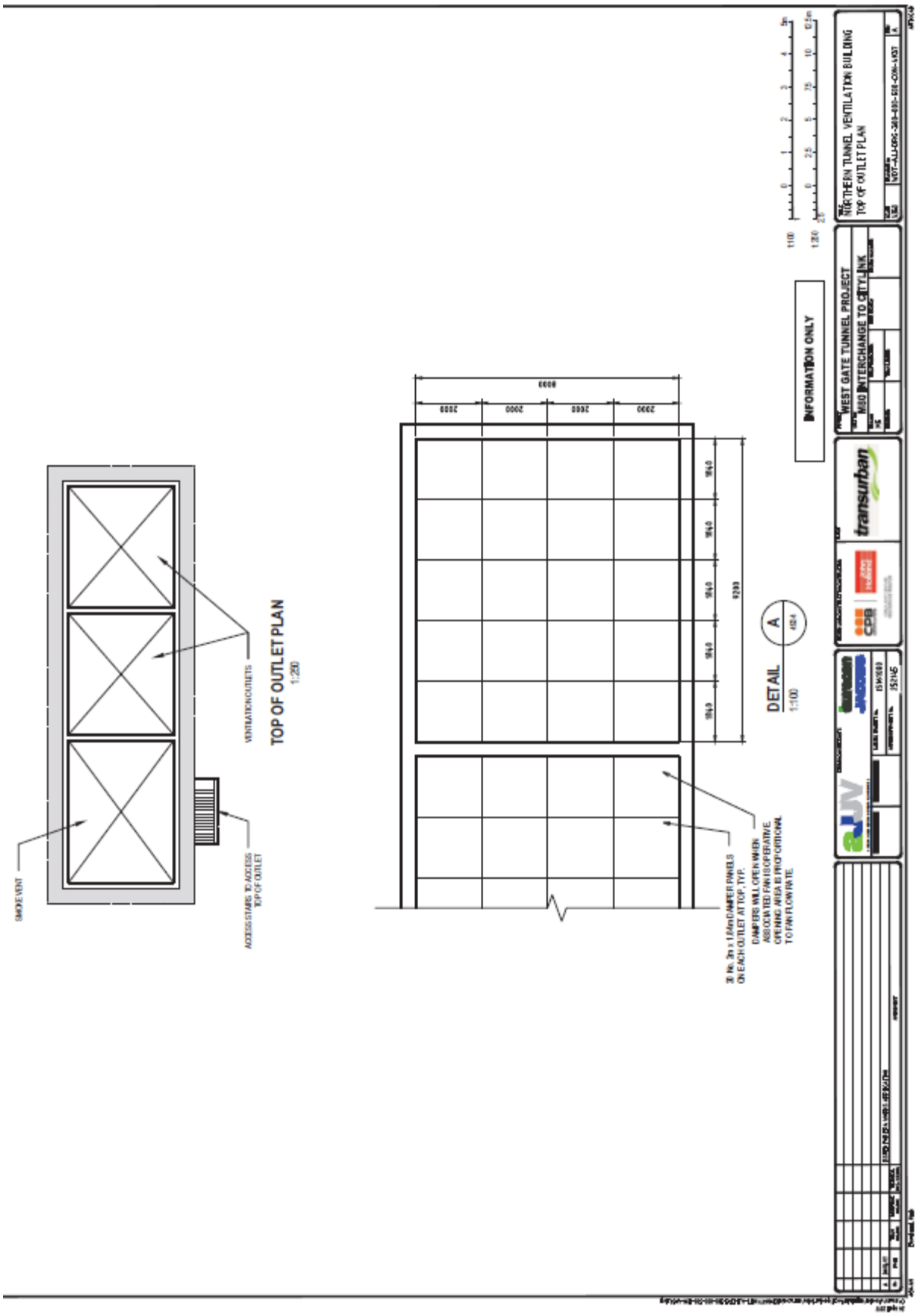
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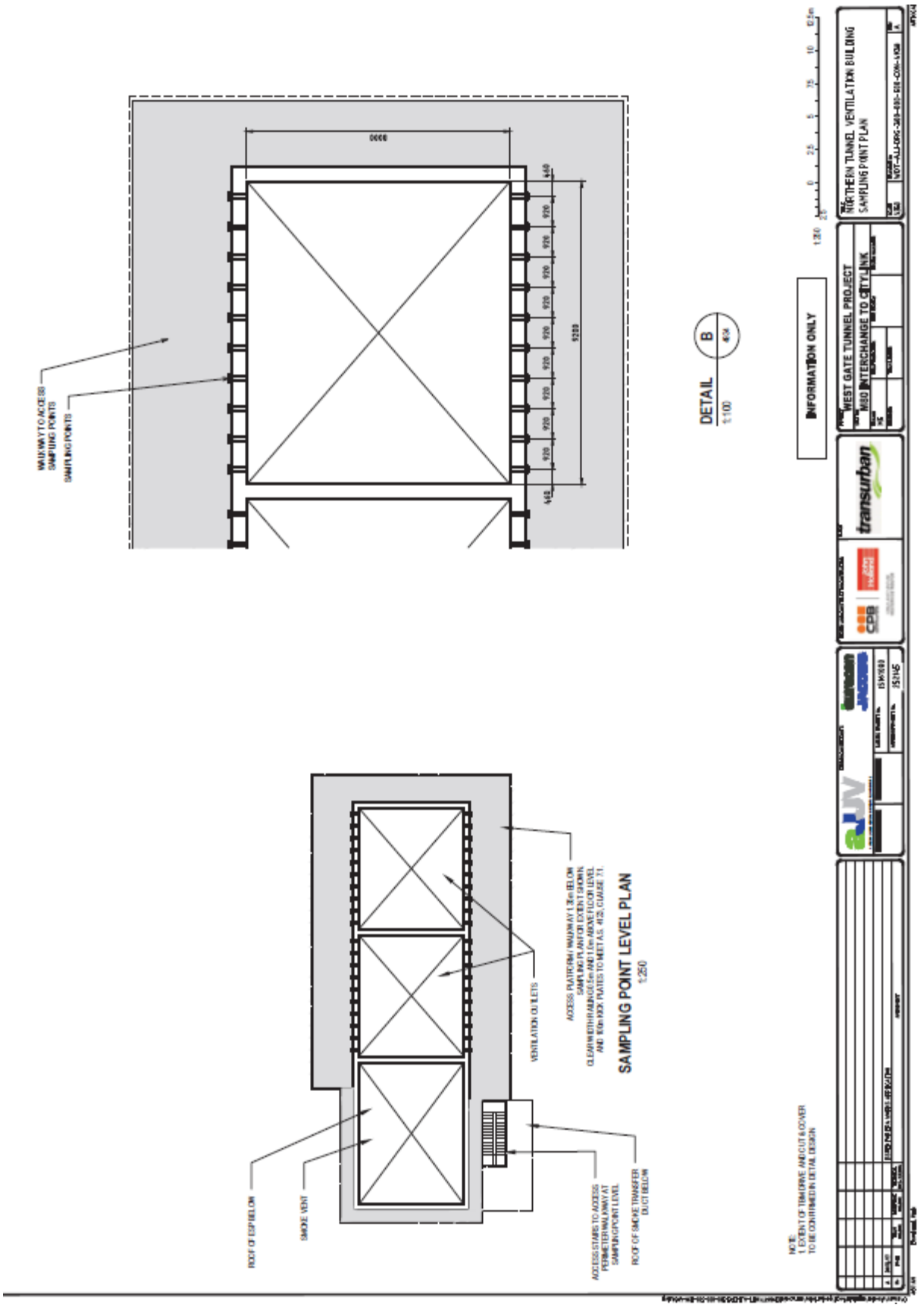
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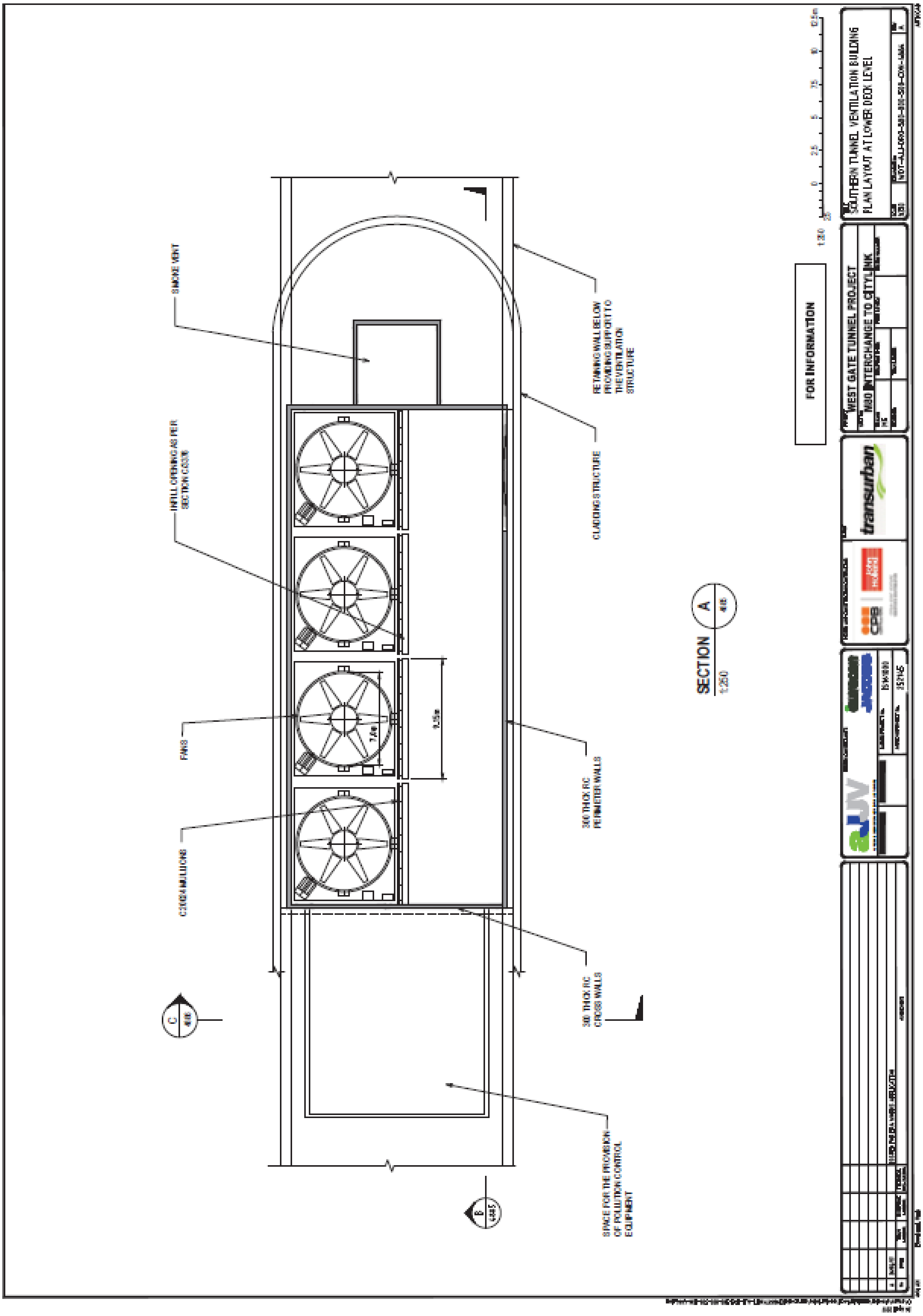
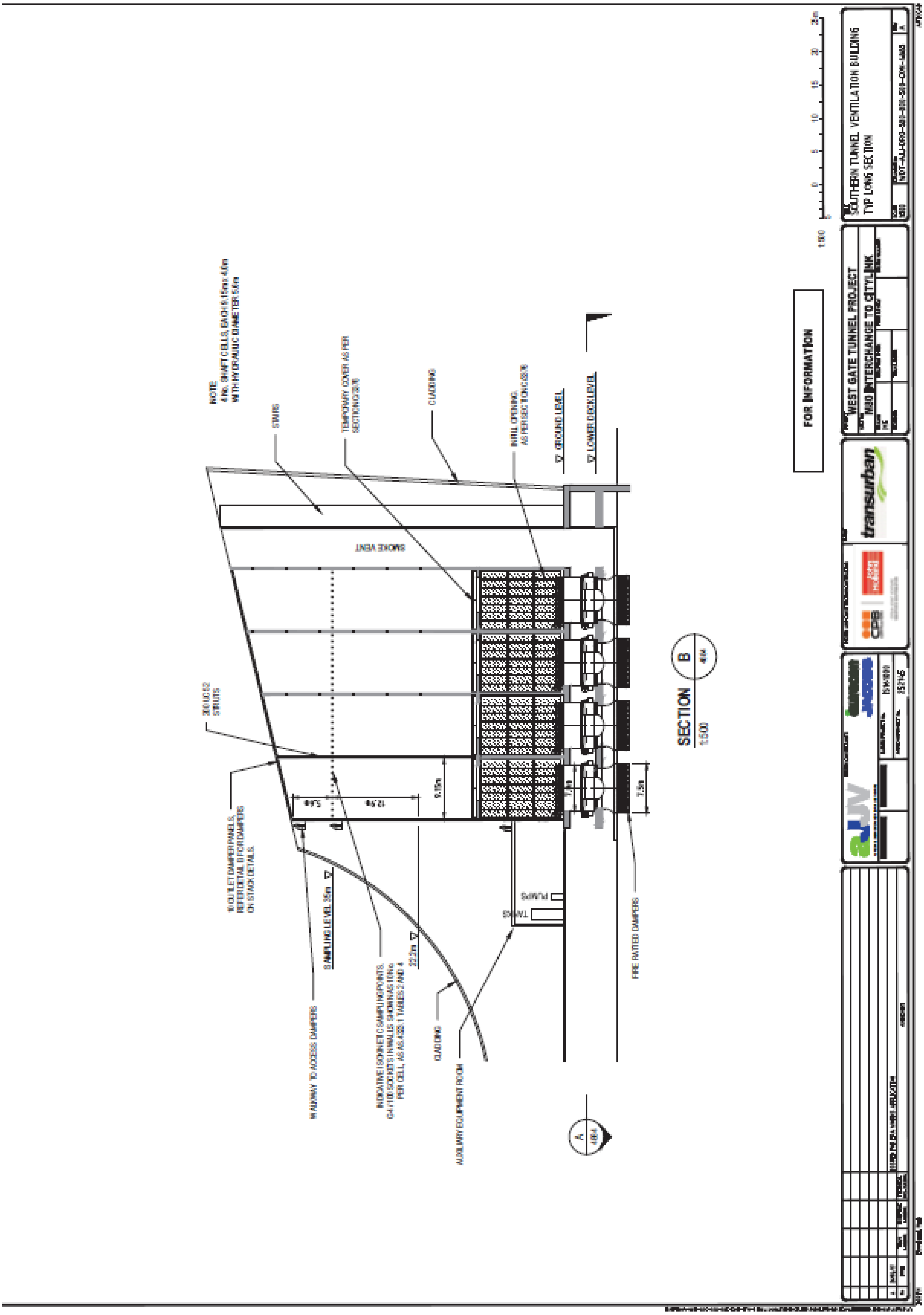
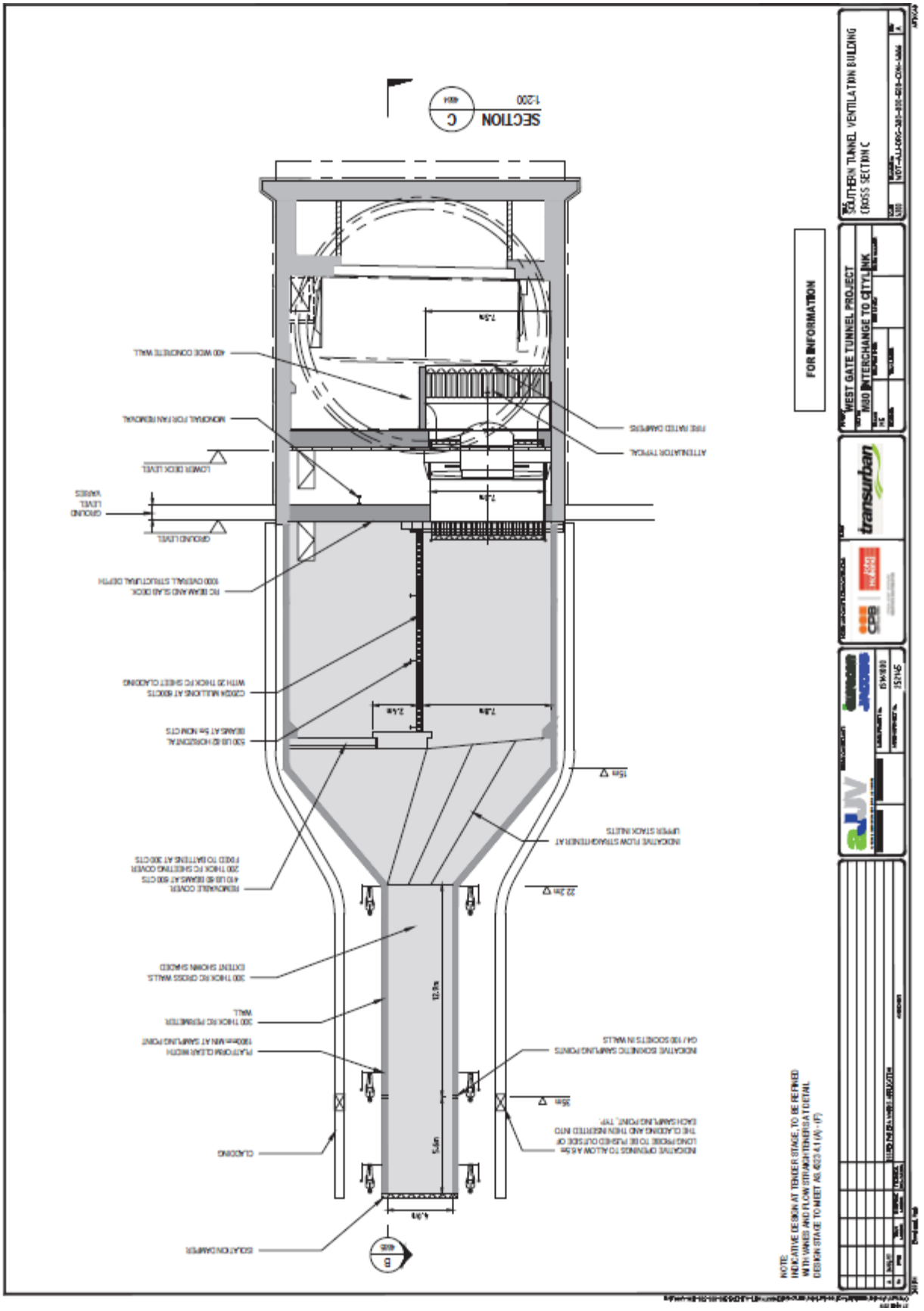
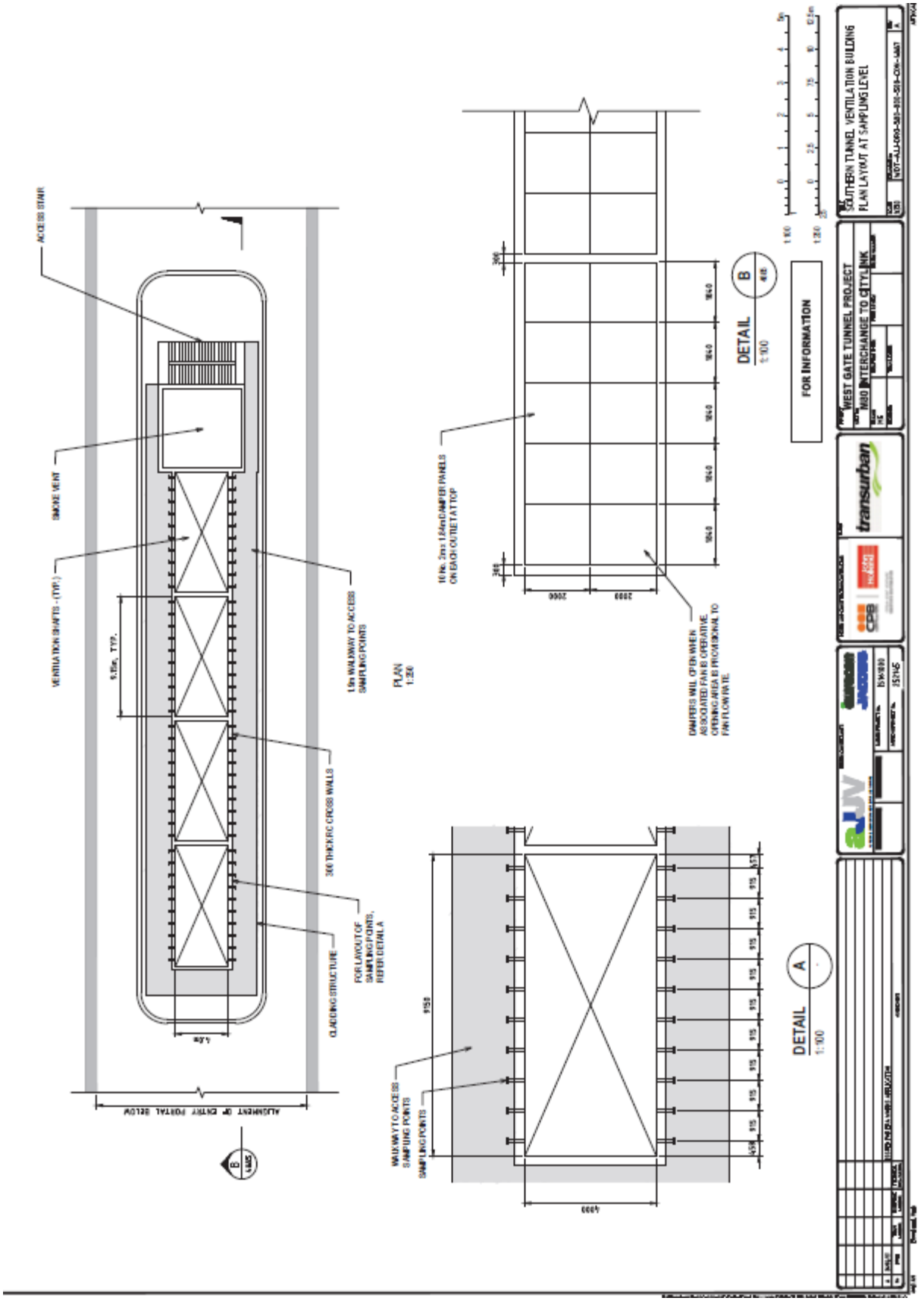
1:100
SAMPLING POINT LEVEL PLAN
1:250
ROOF OF EXHAUST
SMOKE VENT
VENTILATION OUTLETS
ACCESS STAIRS TO ACCESS PERIMETER WALKWAY AT SAMPLING POINT LEVEL
ROOF OF SMOKE TRANSFER DUCT BELOW
INFORMATION ONLY
WEST GATE TUNNEL PROJECT
NORTHERN TUNNEL VENTILATION BUILDING
SAMPLING POINT PLAN
transurban


SMOKE VENT
FANS
CLADDING STRUCTURE
RETAINING WALL BELOW PROVIDING SUPPORT TO THE VENTILATION STRUCTURE
300 THICK RC PERIMETER WALLS
300 THICK RC CROSS WALLS
SPACE FOR THE PROVISION OF POLLUTION CONTROL EQUIPMENT
SECTION A
1:250
FOR INFORMATION
WEST GATE TUNNEL PROJECT
M80 INTERCHANGE TO CITYLINK
SOUTHERN TUNNEL VENTILATION BUILDING
PLAN LAYOUT AT LOWER DECK LEVEL
transurban



SECTION B
FOR INFORMATION
SMOKE VENT
transurban
WEST GATE TUNNEL PROJECT
M80 INTERCHANGE TO CITYLINK
SOUTHERN TUNNEL VENTILATION BUILDING
TYP LONG SECTION


SECTION C
1:200
FOR INFORMATION
SOUTHERN TUNNEL VENTILATION BUILDING
CROSS SECTION C
WEST GATE TUNNEL PROJECT
M80 INTERCHANGE TO CITYLINK
transurban
NOTE:
INDICATIVE DESIGN AT TENDER STAGE, TO BE REFINED
WITH VANES AND FLOW STRAIGHTENERS AT DETAIL
DESIGN STAGE TO MEET AS 4233.4.1 (A)-(F)


SOUTHERN TUNNEL VENTILATION BUILDING
PLAN LAYOUT AT SAMPLING LEVEL
WEST GATE TUNNEL PROJECT
M80 INTERCHANGE TO CITYLINK
FOR INFORMATION
DETAIL A
1:100
DETAIL B
1:100
PLAN
1:250
ACCESS STAIR
SMOKE VENT
VENTILATION SHAFTS - (TYP.)
6.65m TYP.
1.0m WALKWAY TO ACCESS SAMPLING POINTS
300 THICK RC CROSS WALLS
FOR LAYOUT OF SAMPLING POINTS, REFER DETAIL A
CLADDING STRUCTURE
ALIGNMENT OF PORTAL BELOW
WALKWAY TO ACCESS SAMPLING POINTS
SAMPLING POINTS
DAMPERS WILL OPEN WHEN ASSOCIATED FAN IS OPERATIVE. OPENING AREA IS PROPORTIONAL TO FAN FLOW RATE.