WGT Project Air Quality Assessment Review

Expert Witness Statement

Maribyrnong City Council

August 2017

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WGT Project
Air Quality Assessment Review

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Maribyrnong City Council

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PLANNING PANELS STATEMENT

Dr. Iain Cowan of Environmental Resources Management Australia Pty Ltd (ERM) was instructed by Maddocks, acting on behalf of Maribyrnong City Council (Council), to prepare and present expert witness testimony to the Planning Panels Victoria (PPV) in relation to impact to ambient air quality impacts from the proposed Westgate Tunnels development.

This statement is focussed on impacts from traffic emissions during operation of the project, as it is considered that any generation of dust during construction can be adequately managed through monitoring and mitigation. The assessment of ambient air quality impact is based on atmospheric dispersion modelling to assess the air quality impact to the surrounding land use as a result of the development.

1.1 NAME AND ADDRESS

Dr. Iain Cowan
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1.2 QUALIFICATIONS, EXPERIENCE AND AREAS OF EXPERTISE

Details of my qualifications, experience and areas of expertise are detailed in my curriculum vitae which may be found in Annex A.

1.3 EXPERTISE IN PREPARING THIS REPORT

I have undertaken numerous studies over fifteen years in the field of atmospheric dispersion modelling. This includes my doctorate which focussed on impacts to ambient air quality from traffic emissions and projects in relation to emissions from traffic.

1.4 RELATIONSHIP BETWEEN THE EXPERT WITNESS AND THE PARTY FOR WHO THE REPORT IS PREPARED

I am employed by Environmental Resources Management Australia Pty Ltd (ERM), who has a commercial relationship for the provision of this expert witness statement with Maribyrnong City Council. This statement has been prepared independently of Maribyrnong City Council, and forms my opinion of the potential for impact related to ambient air quality surrounding the roads associated with the Westgate Tunnel Project.
1.5 INSTRUCTIONS THAT DEFINE THE REPORT

Copies of instructions received to prepare this report are included in Annex B.

1.6 FACTS, MATTERS AND ALL ASSUMPTIONS ON WHICH THE REPORT PROCEEDS

The assessment relies on the following information:

- Environmental Effects Statement Map book – Section A Project Boundary;
- Environmental Effects Statement Map book – Section E Typical Cross Sections; and

1.7 REFERENCED DOCUMENTS

A list of documents referenced in this expert witness report may be found in Section 6 of this statement.

1.8 IDENTITY AND QUALIFICATIONS OF THE PERSON WHO CARRIED OUT ANY TESTS OR EXPERIMENTS UPON WHICH THE EXPERT RELIED IN MAKING THE REPORT

No tests or experiments were undertaken in the preparation of this report. Emission estimation and atmospheric dispersion modelling were completed by Dr. Iain Cowan along with support from air quality specialists at ERM. The methodologies used in this assessment are provided in this report and have been checked by the author for accuracy.

1.9 STATEMENT

A review of the air quality assessment contained in Technical Report G – Air Quality Impact Assessment Report, determined the following potential areas of contention:

- Within Technical Report G, emission estimation for the main products of combustion (carbon monoxide, nitrogen dioxide, PM$_{10}$ and PM$_{2.5}$) used the PIARC emission factors, whilst emission estimation for the air toxics used COPERT Australia. This is a potential issue as:
  - Emission factors contained in PIARC are based on a survey of Australian PIARC members about typical emission rates, whilst COPERT Australia is based on the typical Australian fleet;
  - Comparison of PIARC emissions to COPERT Australia for the same traffic data indicates that PIARC under-estimates primary nitrogen...
di dioxide and carbon monoxide, but that particulate matter emission factors are similar.

- Modelling for the open road network used AusRoads, which is a Victorian EPA formulation of the CALINE model series. CALINE has been shown by the USEPA to under-estimate predicted concentrations based on tracer experiments of sulphur hexafluoride and USEPA has recommended the use of AERMOD as a replacement for the modelling of roads using the LINE source algorithm.

- An accurate cumulative assessment has not been completed within the EES as the assessment used AERMOD for the tunnel ventilation system and AusRoads for the open road network using different years for the assessment of each. Only where overlap of modelled years for the separate assessments occurred was a cumulative evaluation completed. This is not in accordance with the requirements of EPA Publication 1551.

- The modelling only considers primary nitrogen dioxide by considering 15% of emitted oxides of nitrogen as nitrogen dioxide. Once emitted to the atmosphere, the remaining 85% of emitted nitric oxide is available for oxidation to nitrogen dioxide. The potential for oxidation has not been considered in the assessment.

- The number of roads considered in the assessment is not sufficient by international standards for road assessments. International standards suggest that roads to be incorporated in an air quality assessment is needed where there is a change of:
  - 1,000 vehicles flow on average per day;
  - 200 HCV flow on average per day;
  - Daily average speed of 10 kph or more; and/or
  - Peak speed of 20 kph or more.

- The assessment used meteorological data 2009 to 2013 to model the emissions from the tunnel, whilst the years 2011 to 2016 were used for modelling the open road sections (whilst only reporting results for 2012).

To determine whether these contentions represent a material impact to ambient air quality, the following tasks were completed:

- Emission estimation for oxides of nitrogen, carbon monoxide, particulate matter and benzo-a-pyrene using COPERT Australia to produce a diurnally varying emission estimation file for all road links considered in Technical Report G of the EES;

- Generation of a recent meteorological dataset (2012 to 2016 inclusive) using AERMET version 16216r (the meteorological pre-processor for the
AERMOD dispersion model) based on meteorological data from the EPA monitor at Footscray and the Bureau of Meteorology observation station at Laverton in accordance with EPA Publication 1550 (Environment Protection Authority Victoria, 2013);

- Cumulative atmospheric dispersion modelling using AERMOD version 16216r for the stacks and road sources, including:

  - Incorporation of hourly background data from the EPA Footscray monitor for nitrogen dioxide, carbon monoxide, ozone and PM$_{10}$;
  
  - Incorporation of the 70th percentile of the 24 hour average background data from the EPA Footscray monitor for PM$_{2.5}$ as required by the SEPP(AQM) when there is not a full set of data for a species. The values reported by EPA were a 24 hour average presented every 3 days rather than hourly average for each hour as required by AERMOD; and
  
  - Use of the ozone limiting method within AERMOD to convert emitted nitric oxide to nitrogen dioxide, with a limit on conversion placed due to the available oxidant in the atmosphere.

The results of the assessment indicate that:

- There is no predicted exceedance of the assessment criterion for carbon monoxide, PM$_{2.5}$ or polycyclic aromatic hydrocarbons (PAH) expressed as benzo-a-pyrene (BaP) at any of the assessed sensitive receptors.

- Exceedance of the NO$_2$ criteria is predicted at sensitive receptors in close proximity to the Westgate Freeway and along Williamstown Road to the junction with Francis Street. It is considered that:

  - The sensitive receptors at which exceedance of the assessment criterion occurs are located along heavily trafficked existing roads. It is considered likely by the author of this statement that exceedance of the assessment criterion would occur at these locations in any case without the proposed development.

- Exceedance of the PM$_{10}$ criteria is predicted by the model due to elevated background concentration above the criteria in 2014. Further examination of the model results indicates an additional day of exceedance at some modelled sensitive receptors and two additional days of exceedance at one sensitive receptor in for the modelled year of 2012. These additional exceedances were not noted in other years, and were due to maximum background concentrations in 2012 being close to, but not exceeding the assessment criteria.

Overall, it is therefore considered that whilst exceedances of the NO$_2$ assessment criteria are predicted, these exceedances would likely occur in any case without the project. The predictions also indicate additional days of exceedance for PM$_{10}$ at a number of receptors, but only for years where the
background PM$_{10}$ concentration is elevated but remains below the assessment criterion. In other years when the background concentration is sufficiently low, additional exceedances of the PM10 assessment criterion would not be expected.

1.10 Declaration

I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance, which I regard as relevant, have to my knowledge been withheld from the Panel.

\[\text{Signature}\]
INTRODUCTION

Dr. Iain Cowan of Environmental Resources Management Australia Pty Ltd has been instructed by Maddocks Lawyers Pty Ltd on behalf of Maribyrnong City Council (Council) to consider the potential impacts from the proposed Westgate Tunnels project (the ‘Project’) on sensitive receptors and recreation areas within the Council’s administrative area.

To consider these instructions, the following approach has been adopted:


- Emission estimation using COPERT Australia for all road sources;

- Atmospheric dispersion modelling using the AERMOD dispersion model for both roads and tunnels for the year 2012 to 2016 inclusive to indicate the cumulative impact at sensitive receptors within Council’s administrative area.

The review of Technical Report G was completed by Dr. Iain Cowan. Emission estimation and atmospheric dispersion modelling was completed by ERM’s air quality team. All inputs to emission estimation and dispersion modelling were checked by Dr. Iain Cowan for accuracy before being used in the assessment.
The Assessment has undertaken the dispersion model in three parts considering:

- Emissions from the tunnel ventilation system;
- Emissions from the open road network; and
- Cumulative assessment at specific sensitive receptors.

There are three potential areas of under-estimation within the Assessment, which are further documented in this statement:

- The emission estimation of particulate matter (PM$_{10}$ and PM$_{2.5}$), carbon monoxide (CO) and NO$_2$ is reliant on emission factors published by PIARC whilst emissions of air toxics are based on emission factors calculated through COPERT Australia:
  - It is unclear how COPERT Australia emission factors for PM$_{2.5}$, PM$_{10}$, CO and NO$_2$ compare to those from PIARC; and
  - Both COPERT Australia and PIARC emission factors are based on laboratory tests which in recent times have been shown to under-estimate real-world driving emissions especially for diesel vehicles;

- The modelling of the road network uses AusRoads which is based on the CALINE suite of models. The CALINE suite of models is being phased out by the USEPA in preference to AERMOD as the CALINE suite of models has been shown to under-predict ambient concentrations from road networks; and

- The modelling from both the road and the tunnel has considered the primary emission of NO$_2$ only. No consideration has been given to the emission of NO which will oxidise to NO$_2$ as a result of atmospheric chemistry.

### 3.1 MAIN CONTENTIONS

#### 3.1.1 Emission Estimation

Emission estimation within the Assessment has been undertaken using the PIARC emission factors for PM$_{2.5}$, PM$_{10}$, CO and NO$_2$ and COPERT Australia for air toxics. There is no discussion within the Assessment as to why the different emission estimation techniques have been used other than that PIARC does not include emission factors for air toxics.

The PIARC emission factors were derived by the PIARC working group during the 2008 to 2011 working cycle through the provision of questionnaires concerning fleet distribution data and emission standards (implementation...
years). Based on this information emission factors were derived for a 2010 base year with deviations from that year calculated using appropriate factors for future emissions (PIARC, 2012). It is unclear from the document how the emission factors were derived and whether deterioration of engines has been considered from the emission standards introduction and fleet distribution. Consequently, there is uncertainty as to the validity of this data as an emission estimation source.

COPERT is a software tool used world-wide to calculate air pollutant and greenhouse gas emissions from road transport. COPERT development is coordinated by the European Environment Agency in the framework of the activities of the European Topic Centre for Air Pollution and Climate Change Mitigation. The European Commission's Joint Research Centre manages the scientific development of the model. COPERT has been developed for official road transport emission inventory preparation in EEA member countries (EMISIA, 2014). COPERT Australia is an extension of COPERT, and is the result of a joint effort between EMISIA and the Queensland Department of Information Technology, Innovation and the Arts (EMISIA, 2014). COPERT Australia includes algorithms that are developed from data collected in Australian test programs designed to reflect the Australian fleet and activity data (EMISIA, 2014).

Given that the COPERT method is well documented and used throughout the European Union, it is considered that the COPERT approach would provide more representative emission factors for the Assessment than PIARC. It is unclear why COPERT was not used for all assessed emission species.

It should be noted, however, that both PIARC and COPERT are based on Australian test programs, which are standardised driving cycles in a laboratory setting. In recent years, it has come to be more widely known that the test driving cycles do not reflect real world emissions especially for diesel vehicles. A recent study in Australia found that:

- Real-world fuel consumption of vehicles was on average 25% higher than Australian driving cycle laboratory tests;
- When compared to Federal emission limits set via the laboratory tests:
  - CO was exceeded by 20% of petrol vehicles tested (two out of ten vehicles). These vehicles emitted more than three times the laboratory limit for CO.
  - NOx was exceeded by 83% of diesel vehicles tested (five out of six vehicles). The highest of these emitted almost nine times the laboratory limit for NOx.
  - PM was exceeded by 17% of diesel vehicles tested (one out of six vehicles). This vehicle emitted 40% more CO than the laboratory limit (ABMARC, 2017).

It must therefore be considered that emission estimates based on laboratory tests under-estimate the likely impact during use. This is especially true for...
diesel vehicles and oxides of nitrogen (NOₓ), which for this project is of specific concern given that:

- the Assessment considers that there is a trend toward more diesel cars in Australia; and
- the intent of the project to connect the Westgate Freeway with the Port of Melbourne, indicating a high proportion of diesel LCV and HCV.

Unfortunately, this limitation applies to all road evaluations worldwide, until such time as emission estimates based on real-world driving are available. At this time all that can be done is to consider the results of the model and acknowledge this limitation and the potential for deviation in reality compared to the predicted results.

It is considered prudent that an evaluation of the difference of COPERT and PIARC emission factors are undertaken to understand whether this is a significant difference in anticipated emissions. Such an evaluation is completed in Section 4.1.1.

### 3.1.2 Dispersion Model Selection

In Victoria, atmospheric dispersion modelling for regulatory purposes must be undertaken in accordance with the requirements of the State Environment Protection Policy for Air Quality Management (SEPP(AQM)). The SEPP(AQM) requires that:

- For stationary sources – “Proponents must use the currently approved version of the regulatory model Ausplume to predict the impact of a new or modified source of emissions except where the proponent can demonstrate to the satisfaction of the Authority that an alternative model is appropriate” (EPA Victoria, 2001).

- For mobile sources – “Proposed transport corridors such as roads must be assessed using one of the regulatory models for near-road modelling”. Where a regulatory model is defined as “a model that has been approved by the Authority for use in the assessment of emissions to air” (EPA Victoria, 2001).

### 3.1.3 Tunnel Ventilation

For the tunnel ventilation system, Technical Report G of the EES has used the AERMOD dispersion model. Whilst the SEPP(AQM) specified Ausplume as the regulatory model, this was replaced by AERMOD by EPA as of 1 January 2014 (EPA Victoria, 2013). AERMOD is considered by the Author, Victorian EPA and the United States EPA to be a suitable model for the consideration of emissions from stack systems, where the terrain is non-complex as is the case for the project area.

### 3.1.4 Open Road Network

For the open road network, the Assessment used the AusRoads dispersion model. AusRoads was created by EPA as an Australian variation to the
CALINE series of models. CALINE 3 is currently a preferred / recommended dispersion model by the United States Environment Protection Agency (USEPA), however it was originally developed in 1979 and as of 17 January 2017 a revision to the modelling guideline in the United States stated in relation to replacing CALINE 3 with AERMOD that:

“The studies based on tracer releases rather than modelled [sic] emissions are limited to the CALTRANS99 and the 2008 Idaho Falls field studies examined in HEESt (2013), and its robust model performance evaluations of these two studies. Thus, HEESt (2013) was the primary literature the EPA considered in making a determination regarding AERMOD replacing CALINE3, rather than the small number of other recent model evaluations available in the peer reviewed literature. Since the CALTRANS99 field campaign evaluated by HEESt (2013) included an emission measurement system attached to vehicles driving on an operational highway, the results are fully representative of operational highways. The HEESt (2013) study compared a developmental line-source model, RLINE, to AERMOD with volume and line sources as well as CALINE3 and CALINE4. RLINE showed nearly equivalent performance to the area and volume formulations from AERMOD. CALINE3 was clearly the worst performing model from the six model formulations evaluated. While CALINE4 had better performance than CALINE3, CALINE4 was still the second-worst performing model. It should also be noted that most recent literature only evaluates the CALINE4 model rather than the CALINE3 model, which further highlights that the CALINE3 model is outdated in its science, even within its own class of models” (United States EPA, 2017).

Figure 3-1 shows a comparison of modelled versus measured concentrations from a study at two locations in the United States based on tracer emissions from a line source. It can be seen from Figure 3-1 that the CALINE group of models tends to under predict concentrations compared to AERMOD or ADMS.

**Figure 3-1** Model inter-comparison tracer study (United States EPA, 2015)

The USEPA has implemented a 3-year transition from CALINE to AERMOD as it is considered that many of the States in the US do not yet have the experience in using AERMOD for road networks, and time is needed for the transition (United States EPA, 2017). This does not detract from the fact that the CALINE series of models is now considered outdated and does not contain the latest understanding of the science or the fact that in all cases the
CALINE suite of models under estimates ground level concentrations compared to AERMOD or ADMS. As AusRoads is based on the CALINE suite of models, it may be expected that performance of the AusRoads model is similar and there is a likely under-estimation of impacts from the road sources.

Use of ADMS for the assessment would require written approval from EPA as an alternative model; whilst use of AERMOD would have been accepted as it is the regulatory dispersion model and has been shown by the USEPA to be an acceptable model for road sources.

This assessment has used the AERMOD dispersion model to evaluate impacts from road sources (Section 4.2)

### 3.1.5 Cumulative Assessment

The cumulative assessment in Technical Report G of the EES could not be undertaken over a modelled grid to produce contour plots as the AusRoads model has a limited number of sensitive receptors. The cumulative assessment was therefore undertaken at selected sensitive receptors. This results in the potential of not selecting a location where cumulative impacts are worse than presented.

As discussed in Section 3.2.2, the study for the emissions from the ventilation stack used meteorological data for 2009 to 2013, whilst the road study considered meteorology for 2011 to 2015 but only presented data for 2012 as it showed the worst case impacts at the 99.9th percentile.

It is considered that the two studies should have been undertaken using the same meteorological years to provide consistency and the ability to combine the results at all road sensitive receptors on an hour by hour basis to find the highest cumulative concentration over a five year period.

Were AERMOD used for both the stack and the road and adaptive gridding used for the road network a cumulative impact assessment could have been more effectively implemented and may have indicated different results from those presented. This would have included contouring to provide an indication of ambient concentrations as a result of the project.

### 3.1.6 Primary and Secondary Nitrogen Dioxide

The Assessment has estimated that the percentage of NO₂ within the tunnel is 15%. This assumption is considered in the Assessment to be conservative as it is considered that in Australian road tunnels the NO₂ to NOₓ ratio has typically been assumed to be 10% based on published data by PIARC. The Assessment also provides data that other in-tunnel ratios of NO₂ to NOₓ have been estimated as high as 20 to 30 percent depending on the location in the tunnel, the type of ventilation system or the fleet characteristics, but for the length of tunnels in Australia that are longitudinally ventilated a ratio of 7% to
8% is more likely. Further evidence is provided in the Assessment that NO₂ to NOₓ ratios in the CLEM7 tunnel in Brisbane range from 10% to 15% during periods with significant traffic volumes and around 25% when traffic volumes are low.

A study by the University of Leeds on the remote sensing of vehicle emissions in Aberdeen reports details of results by Carslaw et al., 2014 that considers the primary NO₂ fractions in exhaust from different vehicle types (Tate, 2016). The University of Leeds study reports that Carslaw et al., 2014 determined that primary NO₂ from vehicles ranges from:

- 2% to 12% in Euro 1 to Euro 6 petrol cars;
- 8% to 34% in Euro 1 to Euro 6 diesel cars;
- 13.1% to 27.3% in Euro 1 to Euro 5 LCV; and
- 18.5% to 9.4% in Euro 1 to Euro 5 HCV.

As time progresses and the vehicle fleet is replaced more vehicles will be of later Euro class. To provide a rough estimate of likely primary NO₂, the latest Euro Class primary NO₂ was used with the data provided for inbound traffic in Scenario A of Table 36 in the Assessment. This indicated that the primary NO₂ concentration from the vehicle mix was likely to be 15%.

Emissions from vehicles consist of both nitric oxide (NO) and nitrogen dioxide (NO₂). NO is rapidly oxidised to nitrogen dioxide on exposure to oxidants within the atmosphere and NO₂ can be disassociated on reaction with sunlight to form NO and an oxygen radical that can then be oxidised to NO₂ again. As a result of this circular reaction the two are often summed and termed oxides of nitrogen (NOₓ). Photo-disassociation does not occur at night, which is why NO₂ concentrations tend to be higher at night than during the day. Photo-disassociation will also not occur within tunnels due to the lack of sunlight.

The Assessment has assumed both within the tunnel exhaust stream and from the roads an emission of NO₂ at 15% of NOₓ. Using this assumption, there is 85% of NO which is also released. The 85% of NO is available for oxidation either within the tunnel or once released to atmosphere from the stack or on the open sections of the road. Oxidation of the NO will occur and will be limited only by the amount of oxidant available.

The assumption within the Assessment that percentage of NO₂ will be limited to 15% of NOₓ is flawed and the Assessment needs to consider the oxidation

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1 Euro class is the European emissions specification, which is also accepted in Australia.
of NO to NO₂. Thus it is considered that the concentration of NO₂ in the assessment is likely under predicted.

3.2 MINOR CONTENTIONS

This section considers minor contentions of the Assessment, which are not likely to change the outcome of the Assessment, but are worth consideration.

3.2.1 Modelled Roads

Roads were selected for inclusion in the Assessment modelling where the:

- Total flow in 2031 is expected to be greater than 30,000 vehicles per day with a change to the total vehicle number of ±25%; or
- HCV volume in 2031 is expected to be greater than 1,000 vehicles per day with a change to the HCV volume of ±25%.

No justification is given for selection of these criteria for inclusion of roads.

The United Kingdom undertakes a high degree of air quality modelling for road networks as the ambient air quality is significantly impacted by this source due to density of population. The Institute of Air Quality Management suggests that where air quality is below acceptable standards, an air quality assessment is required for a change of 500 vehicles or 100 HCV (IAQM, 2017). Meanwhile the main guide for the design and construction of major roads in the United Kingdom (the design manual for roads and bridges (DMRB)) suggests that an air quality assessment is needed where there is a change of :

- 1,000 vehicles flow on average per day;
- 200 HCV flow on average per day;
- Daily average speed of 10 kph or more; and/or
- Peak speed of 20 kph or more.

Use of the IAQM criteria for local roads, and DMRB criteria for highways would have included many more roads within the assessment. This is important as the location of the baseline measurement used in the assessment is situated away from the road network, it is therefore important that all significant roads are included in order that their cumulative contribution to ambient air quality is taken into account.

Despite this however, the roads that have been considered appear to be the main arterial routes within the area of interest and whilst inclusion of additional roads would make the assessment more accurate, it is not considered that it would result in substantial changes to ambient air quality.
3.2.2 Modelled Meteorological Years

The Assessment used meteorological 2009 to 2013 to model the emissions from the tunnel, whilst the years 2011 to 2016 for the open road sections (whilst only reporting results for 2012). It is unclear why the Assessment used different years for the tunnel emissions compared to the open road sections. Consistency of assessment would dictate that the same years are used for both parts of the assessment. Whilst different years will give slightly different results year on year, especially at the 99.9th percentile, the differential is not likely to result in a significant change in the results.

3.2.3 Incorporation of Baseline

Background data in relation to PM$_{10}$, PM$_{2.5}$, NO$_2$ and CO for the assessment was taken from the EPA Footscray monitor. The EPA monitor has been placed to provide data for reporting against the National Environmental Protection Measure for Ambient Air Quality (Ambient Air NEPM) as required under the State Environment Protection Policy for Ambient Air Quality (SEPP(AAQ)). Consequently, the monitor is purposely positioned in a background location away from major roads and industry in a location representative of exposure of 50,000 people. Monitoring at this location therefore reflects true background.

Use of this station for background air quality data within the assessment is considered acceptable as long as major roads are incorporated to the model, especially where there is potential that roads in close proximity to one another are considered in the dispersion modelling.

Air toxics background concentrations were provided by EPA, it is considered that these were likely to have been based on monitoring campaigns historically undertaken by EPA.

It is understood, that as part of the overall assessment, ambient air quality data has been collected for a period of over a year. It is unclear why this data has not been included in the assessment, or what this data indicates about ambient air quality within the project area.

The baseline data collected at Footscray has shown that, generally speaking, the area has relatively good air quality away from major roads, with NO$_2$, CO and air toxics below acceptable standards. PM$_{10}$ concentrations show exceedances of the acceptable standards on multiple days per year, however these are very often associated with bush fire, back burning and / or regional dust events.

The World Health Organisation has stated that there is no safe level of PM$_{10}$, with all concentrations having a health impact to a greater or less extent (WHO, 2000). The acceptable standard in Victoria for PM$_{10}$ is therefore a concentration which is deemed an acceptable risk for the population in terms of additional hospital admissions. Importance must, therefore, be given to
periods of additional exceedance of the standard, where exceedance did not previously occur but as a result of the project are likely. The available baseline and modelling indicate that there will be six additional exceedances of the standard per year as a result of the project. Given the under-estimations discussed above, there is potential that the number of exceedances may be higher than presented. Whether the actual number of additional exceedances is an acceptable risk should be the subject of a human health risk assessment, which would need to be re-evaluated should remodelling indicate a higher level of exceedance.

### 3.2.4 Apparent Discontinuity of Results

There appears to be a discontinuity of results within the tables. For example Table 83 indicates that maximum 1 hour average NO2 concentration at a receptor without background will be 19 µg/m3 in 2022 and 20 µg/m3 in 2031. As this data is without background, this has been interpreted as the concentration as a result of impact from the road network. In contrast, Table 84 and Table 85 in the Assessment indicate that the contribution from the project to 1 hour NO2 will be 2 µg/m3 in 2022 and 2.1 µg/m3 in 2031. This apparent discontinuity is repeated for other species.

This apparent discontinuity is considered to be a result of the evaluation of the 99.9th percentile without the background data indicating the highest likely contribution over all hours from the road network. When the background is added to each hour, and the 99.9th percentile concentration determined, this occurs at a time when the background is elevated, but the road contribution lower (likely to occur at night). The consideration of over five years of data (with only the worst year reported for the roads), is likely to have considered all circumstances when elevated background and road emissions have been considered, and thus the apparent discontinuity should not be considered significant.

### 3.2.5 Tunnel Emissions

As vehicles enter a Tunnel, the air in-front is pushed forward creating a 'piston effect'. This means that the emissions generated in the tunnel are pushed from the entrance to the exit of the tunnel. Where insufficient extraction occurs, emissions can occur at the tunnel portal. As the tunnel portals are often depressed compared to the surrounding land, this can lead to very high concentrations around the tunnel portal which spill onto the surrounding land.

The tunnel emissions have only been considered from the tunnel stack and no consideration of tunnel portal emissions has been included in the Assessment. Volume 3 of the overall EES indicates that the system will be required to achieve zero portal emissions during operation. Given this requirement, the omission of tunnel portal emissions in the modelling is considered acceptable.
Tunnel portal emissions can be significant, and as they have not been considered in the dispersion modelling it is important that conditions are put in place that ensure that no tunnel portal emissions occur in operation. These conditions could, for example, provide for a requirement for monitoring at the location of the portal exit at nearby sensitive receptors prior to and within operation of the tunnel and linking roads. Substantial increase in measured ambient concentrations at the tunnel portal in operation would be indicative of the ventilation system not sufficiently extracting tunnel emissions to the full extent.

3.2.6 Noise Barriers

There is some evidence in the literature that noise barriers generally result in a decrease in pollutant concentrations behind the barrier when the wind were directionally from the road, but that under certain wind conditions (when the wind direction is in parallel with the road) can result in a slight increase in ambient air concentrations on the receptor side of the noise barrier compared to the situation with no noise barrier (Baldaulf, et al., 2008). Overall it is considered that the omission of consideration of the noise barriers in the modelling is acceptable.

3.2.7 Values in Tables

There are some tables throughout the report where the numbers do not add up. Table 36, for example gives the traffic modelling throughput for the inter-peak period as 8,000 cars, 600 LCV, 2,300 HCV and all vehicles as 1,100. Clearly the number of vehicles in the different categories do not add up to 1,100. The values provided in Appendix G, however, do appear to be accurately represented and it is considered that as these are the values used in the assessment that the error in Table 36 is likely to be typographical.

Results in the Assessment have often been rounded to two significant figures. This provides the impression of the values not adding up, however it is a level of reporting inaccuracy rather than an error. It would have been better had the results been presented to indicate that they added up rather than a degree of inaccuracy in the reporting method, however this is not considered significant to the overall results.
ASSESSMENT OF CONTENTIONS

To determine whether the contentions raised represent a material change to the predicted concentrations, emission estimation has been completed using COPERT Australia and dispersion modelling undertaken using AERMOD for the stacks and open roads using a cumulative assessment approach.

4.1 EMISSION ESTIMATION

As discussed in Section 3.1.1 emission estimation within Technical Report G of the EES has use the PIARC emission factors both within the tunnel and on the open road network for common combustion species including:

- Nitrogen dioxide (NO₂);
- Particulate matter of less than 10 µm in aerodynamic diameter (PM₁₀);
- Particulate matter of less than 2.5 µm in aerodynamic diameter (PM₂.₅); and
- Carbon monoxide (CO).

For air toxics Technical Report G of the EES has used emission factors derived using the COPERT Australia emission factors. Given that the PIARC emission factors are generic and based on a survey, whilst COPERT Australia is based on Australian fleet data, there is therefore a question as to whether the use of the PIARC emission factors has resulted in a potential under-estimation of emissions from the modelled roads.

To determine whether PIARC emission factors result in lower emission estimates, this review has compiled, emission estimates using the COPERT Australia emissions model for roads within the Council’s administrative area with traffic movement data for 2022 as contained in Technical Report G of the EES.

COPERT Australia is a national motor vehicle emissions model, designed to estimate emissions for 226 different vehicle classes and for 116 air pollutants. The COPERT Australia Model also accounts for various types of emissions from vehicles including hot running, cold-start, evaporative and non-exhaust emissions.

Emissions were estimated based on vehicle data for each road section with the traffic make up for the state of Victoria. No changes were assumed for updates in technology for the vehicle fleet that is expected to be introduced by 2022.

The length of each road section was taken from Google street imagery from the middle of each intersection. Emissions were estimated based on the speed limits for the road sections investigated as presented in Table 58 in Technical Report G of the EES. For sections without specified speed limit it was assumed that the speed limit was 60 km/h expect for the West Gate Tunnel for which
80 km/h was assumed. There were no variations in speed with hour of the day or any changes in emissions due to the gradient of the road assumed.

The diurnal profile for each road section was taken from the bar charts presented in Section 6.2.2.7.1 for the West Gate Tunnel and for all other road sections in Appendix G of the Technical Report G of the EES. As the traffic make up for the state of Victoria was assumed petrol fuelled passenger cars (PCP) and diesel fuelled passenger cars (PCD) were included together for the diurnal profiles. The 24 hour vehicle numbers for Cars, LCV and HCV were taken from the tables presented in Section 6.2.2.7.1 of Technical Report G of the EES for the West Gate Tunnel (Scenario A) and for all other road sections in Appendix G of the Technical Report G of the EES.

For COPERT Australia, it was assumed that car numbers presented in the report included passenger vehicles and SUVs. Heavy commercial vehicles included heavy duty trucks and buses. Fuel data for 2009 was assumed in COPERT for the emission estimation.

4.1.1 Comparison of COPERT Emission Estimates to EES

The emissions for the West Gate Tunnel from the previous assessment were compared with emissions estimated using COPERT, as presented in Figure 4.1. To compare against the previously modelled NO2 emissions a ratio of 15% was applied to the predicted COPERT NOx emissions, as per the ratio applied in the previous modelling. The estimated PM10 and PM2.5 emissions are similar for both emission estimation methods, however higher emission rates were estimated using COPERT for NO2 and CO.
Figure 4.1 Emissions comparison of the West Gate Tunnel from the EES (left) and using COPERT for emission estimation (right) (Note the different scale for the outbound traffic emission rates).
4.2 **DISPERSION MODELLING**

As discussed in Section 3.1.2, there are potential areas of concern regarding the dispersion modelling as described in Technical Report G of the EES, these include:

- Dispersion model selection and ability to undertake a cumulative assessment; and
- Consideration of primary and secondary nitrogen dioxide.

To address these matters, dispersion modelling was undertaken using the latest version of AERMOD (version 16216r) using the setup described in the following sections.

4.2.1 **Meteorological Modelling**

In dispersion modelling, meteorology drives dispersion and dilution of emissions and therefore determines the predicted concentrations at ground level. It is important that meteorology used in the dispersion modelling provides a reasonable representation of the Site’s meteorology.

Meteorological modelling was undertaken in accordance with EPA Publication 1550 – ‘Construction of input meteorological data files for EPA Victoria’s regulatory air pollution model (AERMOD)’ (Environment Protection Authority Victoria, 2013).

Meteorological modelling was completed for a five year period (2012 to 2016 inclusive) in accordance with EPA Publication 1551 (Environment Protection Authority Victoria, 2013). This was undertaken to provide sufficient data to the dispersion modelling to understand the inter-annual variation in predicted impacts as a result of inter-annual meteorology.

Meteorological modelling was undertaken using AERMET 16216r, the meteorological pre-processor for AERMOD. The surface data file in AERMET was constructed using the observed data from the nearest EPA monitoring station Footscray (37.8048°S, 144.8727°E), located within 5 kilometres of the Project. The hourly averaged parameters included:

- Scalar wind speed;
- Vector wind direction;
- Screen level temperature; and
- Sigma-theta.
The missing records from the Footscray stations observations were spliced with the observations recorded at the EPA monitoring station Brooklyn (37.822°S, 144.8471°E), also located within 5 kilometres of the Project.

The additional parameters, not recorded at the nearest EPA monitoring stations were obtained from the Bureau of Meteorology station Laverton RAAF (37.8565°S, 144.7566°E), located approximately 10 kilometres west-south-west of the Project. Laverton RAAF meteorological station is also located along the bay (approximately 5.5 kilometres of the coast) and therefore it is considered that the observations at the station are representative of the Project meteorology. The following parameters were included in the surface data file:

- Surface pressure;
- Relative humidity;
- Cloud cover; and
- Rainfall.

AERMET was set up using values to describe the surrounding surface roughness, Bowen ratio and Albedo as shown in Table 4.1. The values in Table 4.1 were estimated in accordance with the approach and values contained in EPA Publication 1550.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Season</th>
<th>Sector (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Roughness</td>
<td>All</td>
<td>0.67 0.85 1 0.85 0.71</td>
</tr>
<tr>
<td>Albedo</td>
<td>All</td>
<td>0.167</td>
</tr>
<tr>
<td>Bowen Ratio</td>
<td>Winter</td>
<td>1.475</td>
</tr>
<tr>
<td></td>
<td>Autumn</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>1.425</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td></td>
</tr>
</tbody>
</table>

Historically, AERMOD has under-estimated ambient concentrations in light winds. This was because the equation to estimate a parameter known as $U^*$ was incorrect at wind speeds below 1 m/sec during night hours. The parameter $U^*$ is used to calculate the mixing height which is the amount of atmosphere in which mixing occurs. Consequently if the mixing height is estimated as being too low then the model over-estimates concentrations. Victoria EPA has recommended the use of an adjustment to $U^*$ in low wind speed conditions. This adjustment was used in this modelling.
Upper air data for the AERMOD meteorological profile file was extracted from TAPM. TAPM was run adopting the setup prescribed by Environment Protection Authority of Victoria (EPA) (EPA Publication 1550) in generating AERMOD compatible meteorological files (Environment Protection Authority Victoria, 2013) and used the following parameters:

- Five nests of 30 km, 10 km, 3 km, 1 km and 0.3 km;
- Grid centre of 37°49’ S, 144°53’ E (MGA Zone 55 314347m E, 5812800m S);
- Grid of 41 X 41 cells; and
- 25 vertical levels (10 m, 25 m, 50 m, 100 m, 150 m, 200 m, 250 m, 300 m, 400 m, 500 m, 600 m, 750 m, 1000 m, 1250 m, 1500 m, 1750 m, 2000 m, 2500 m, 3000 m, 3500 m, 4000 m, 5000 m, 6000 m, 7000 m and 8000 m).

Typical wind conditions

Figure 4-2 provides wind roses showing the frequency of strength and direction of winds for the past five years (2012 to 2016 inclusive) as predicted for Site (see Section 4.2.1). The data has been divided to show annual trends.

The wind roses indicate that typically winds at the subject Site are:

- most frequently from the northern and southern directions;
- occur moderately from the western direction;
- rarely from the east; and
- less than 1% of calm conditions (less than 0.5 m/sec).
Figure 4-2  Site-specific annual wind roses (2012-2016)
4.2.2 Dispersion Model Setup

Atmospheric dispersion modelling was completed in AERMOD (v16216r) for both the open road network and the tunnel vents. No tunnel portal emissions were included in the assessment as there is a commitment by the project that the ventilation system will prevent tunnel portal emissions. It is important that this commitment is realised as tunnel portal emissions can result in significant impact to land use in the immediate vicinity of the tunnel portal.

Modelled Species

Technical Report G of the EES considered standard products of combustion (NO₂, CO, PM₁₀, PM₂.₅) and air toxics (polycyclic aromatic hydrocarbons (PAH) expressed as Benzo-a-pyrene). To provide a comparison with the results of Technical Report G of the EES, this assessment has considered only the products of combustion and PAH expressed as benzo-a-pyrene. Differences in predicted concentrations of BAP are indicative of likely differences in other air toxics.

Tunnel Vents

Emissions

Emissions were derived from the COPERT Australia output with the assumption that all emissions generated are extracted through the ventilation system and emitted to atmosphere. The emissions per hour are shown in Figure 4-3.
Figure 4-3  
*Figure 4-3 Tunnel emissions g/sec per hour of the day for eastern stacks (top) and western stacks (bottom)*

Source Configuration

The tunnel vents are comprised of five stacks close to each tunnel portal at the western and eastern end of the proposed tunnel. The five stacks are proposed to be located linearly adjacent to one another within an enclosed structure. *Table 4.2* shows the height and diameter of each stack as included in this dispersion modelling as obtained from the EES.

**Table 4.2  Stack heights and diameters included in the dispersion modelling**

<table>
<thead>
<tr>
<th>Stack</th>
<th>Western Portal</th>
<th>Eastern Portal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stack Diameter (m)</td>
<td>Stack Height (m)</td>
</tr>
<tr>
<td>1</td>
<td>8.8</td>
<td>51</td>
</tr>
<tr>
<td>2</td>
<td>10.2</td>
<td>52</td>
</tr>
<tr>
<td>3</td>
<td>11.4</td>
<td>53</td>
</tr>
<tr>
<td>4</td>
<td>12.4</td>
<td>54</td>
</tr>
<tr>
<td>5</td>
<td>13.4</td>
<td>55</td>
</tr>
</tbody>
</table>

The amount of air that will need to be extracted from the tunnel will be dependent on the amount of traffic and air quality within the tunnel, which will vary throughout the day. As traffic volumes increase and/or air quality within the tunnel deteriorates, greater volumes of air will pass through the ventilation system and to the stack system. The different diameter stacks will therefore be used at different points in the day dependant on the volume of air that is required to be evacuated from the tunnel system.

The stacks have been sized such that from the minimum to the maximum air flow, the exit velocity of the various stacks remains at 7.5 m/sec.
Building downwash

The proposed structures around the stacks have been designed to reduce the visibility of the stacks from the surrounding land use. This means that the structure is equal to the heights of the stacks.

Building downwash occurs when there are buildings in close proximity to stack sources. The buildings cause air flow around the stacks to become more turbulent resulting in a rapid mixing of emissions with surrounding air and grounding of the emitted plume.

To consider this impact, the BPIP-Prime downwash algorithm has been incorporated to the dispersion modelling for the tunnel stacks with the ventilation structure considered as a building with 5 tiers. Each tier enclosed the stack and was equal to the height of the stack. This creates a stepped building within BPIP, which is similar to the proposed slopped design.

Open Road Network

The open road network was modelled as line sources in accordance with guidance contained in the AERMOD user guide and Appendix W (United States EPA, 2016) and (United States EPA, 2017). The roads incorporated to the dispersion modelling were the same as those considered in Technical Report G of the EES within the boundary of the Council’s administrative area (Figure 4-4).

Where the road was considered to be one lane in each direction, this was modelled as a single carriageway with emissions from both directions combined. Where the road has more than one lane, the separate carriageways were modelled.

When modelling using a line source, AERMOD requires that the width of the road is provided to the model. For roads with one lane in each direction, this was the width of the road. For roads with more than one lane in each direction, this was the width of the carriageway in that direction.

AERMOD also requires the height of the release. This was set to be 1.5m above the road surface to account for the difference in position of a car and truck exhaust.

Roads designated as elevated, were modelled as elevated sources based on the heights contained in the Map Book Series E – Typical Cross Sections of the EES.
Figure 4-4 Roads incorporated to the dispersion model
Emissions

A description of the method used to estimate emissions using COPERT Australia is included in Section 4.1. The emission estimates using COPERT were based on the traffic numbers contained in Technical Report G of the EES.

COPERT Australia outputs the emissions for the entire modelled link in g/sec. AERMOD requires the emission in g/m2/sec. Consequently the emission rate provided by COPERT for that hour was divided by the area of the road link based on the width and length.

4.2.3 Existing Background

The modelled roads and tunnel stacks are not the only sources of particulate matter, NO\textsubscript{2} and CO in the local environment. NO\textsubscript{2} and CO are products of combustion, and thus are commonly found in ambient air. Particulates are released from the wider road network, but are also present as a result of anthropogenic and natural sources including wind generation from inland areas, salt spray and bushfire. To provide a cumulative assessment, it is therefore important that this existing background is taken into account.

The EPA measures background air quality for reporting against the National Environment Protection Measure for Ambient Air Quality (Ambient Air NEPM). Measurements for reporting against the NEPM need to be taken away from major road and industrial sources to provide a true representation of background.

Hourly varying background for PM\textsubscript{10}, NO\textsubscript{2}, CO and ozone (O\textsubscript{3}) was provided by the Victorian EPA for the Footscray monitoring station for the years 2012 to 2016 inclusive. Within the dataset, there were hours of missing data, these missing data were set to be equal to the 70\textsuperscript{th} percentile of the remainder of the dataset for each year.

Figure 4-5 and Figure 4-6 shows the 1 hour average datasets for CO, NO\textsubscript{2} and O\textsubscript{3} as well as 1 hour and the equivalent 24 hour PM\textsubscript{10} concentration respectively. For PM\textsubscript{10} AERMOD uses the hourly data to calculate the 24 hour average. As can be seen from Figure 4-6, there are currently exceedances of the 24 hour standard at the background station without the addition of the project.
Figure 4-5 1 hour average background data for CO, NO₂ and O₃ used in the modelling
The background data is provided to AERMOD in the form of an hourly average in the units (ppm for CO, ppb for NO₂ and O₃ and µg/m³ for PM₁₀) as provided. AERMOD converts the background from ppm and ppb to µg/m³ before using it in the cumulative prediction of ground level concentrations.

PM₂.₅ data was reported as a 24 hour average every three days, rather than as an hourly average as required by AERMOD for direct inclusion in the modelling. The 70th percentile of these 24 hour results for each year was calculated and added to the model result for each sensitive receptor.

4.2.4 Modelled Receptors

As outlined in Section 3, one of the advantages of modelling all of the sources in one model is the provision of contour plots for the entire project. Due to time constraints in preparing this expert witness statement and the run time of the model with the number of required grid points to produce a reliable contour plot, this assessment has not included contour plots; however they will be available in time for the Panel Hearing.

This assessment has therefore concentrated on sensitive receptors identified in Technical Report G that fall within Council’s administrative area. Additional sensitive receptors have been selected where they are in close proximity to the road network (Figure 4-7).
Figure 4-7 Modelled Sensitive Receptors
4.2.5 Conversion of NO to NO₂

As discussed in Section 3.1.6, combustion generates both nitric oxide (NO) and NO₂. NO can be converted to NO₂ through oxidation in the atmosphere. AERMOD contains an algorithm to convert NO to NO₂ through the ozone limiting method (OLM). The OLM considers that ozone is the dominant oxidant in the atmosphere, and that conversion of NO released is limited by the amount of ozone.

Technical Report G of the EES considered that primary emission of NO₂, as a percentage of NOx, from vehicles was 15%, but did not account for conversion of the NO to NO₂. This assessment has similarly considered the primary emission of NO₂ to be 15% of the NOx within the OLM settings of AERMOD.

AERMOD also limits the resultant concentration based on the stated NO₂/NOx equilibrium that is typical in the atmosphere. Figure 4-8 provides the equilibrium ratio of NO₂/NOx based on typical ozone concentration, temperature, level of cloud cover and angle of the sun. Using data from the EPA Footscray monitor, the 70th percentile concentration of O₃ is 21ppb. It is considered that 50% cloudy is a reasonable estimation of typical conditions in Melbourne. Thus the NO₂/NOx ratio has been set at 68%. Under overcast conditions, this has the potential to be an under estimate, but on clearer days this is an over estimate.

Figure 4-8 NOx/NO₂ equilibrium ratios based (United States EPA, 2015)

4.3 Assessment Criteria

To determine whether the predicted concentrations at sensitive receptors are at acceptable concentrations, this assessment has adopted the criteria from the...
State Environment Protection Policy for Air Quality Management (SEPP(AQM)) as shown in Table.

**Table 4.3** SEPPP(AQM) Criteria for modelled species

<table>
<thead>
<tr>
<th>Species</th>
<th>Averaging Period</th>
<th>Criteria (ug/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂¹</td>
<td>1-hour</td>
<td>190</td>
</tr>
<tr>
<td>CO¹</td>
<td>1-hour</td>
<td>29000</td>
</tr>
<tr>
<td>PM₁₀²</td>
<td>24-hours</td>
<td>60</td>
</tr>
<tr>
<td>PM₂·₅²</td>
<td>24-hours</td>
<td>36</td>
</tr>
<tr>
<td>PAH as BaP¹</td>
<td>3-minute</td>
<td>0.73</td>
</tr>
</tbody>
</table>

1. Design Criteria from Schedule A
2. Intervention Criteria from Schedule B

It should be noted that the intervention criteria from Schedule B, rather than the Design Criteria from Schedule A have been selected for PM₁₀ and PM₂·₅. These criteria have been adopted for these species as the design criteria for PM₁₀ and PM₂·₅ are for stack sources only. The project contributes from both stack sources and open road sources, this combination of emissions means that the design criteria are not strictly relevant, and the intervention criteria represent the most appropriate criteria for these species.

### 4.4 MODELLING RESULTS

*Table 4.4* provides the modelling results for the modelled sensitive receptors, with highlighted cells indicating exceedances of the assessment criteria as discussed in Section 4.3.

**Table 4.4** Predicted Concentrations (µg/m³) for modelled sensitive receptors with highlighted receptors that are predicted to exceed the assessment criteria

<table>
<thead>
<tr>
<th>ERM Sensitive Receptor Number</th>
<th>Technical Report Sensitive receptor number</th>
<th>NO₂</th>
<th>CO</th>
<th>PM₁₀</th>
<th>PM₂·₅</th>
<th>BAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>145.8</td>
<td>1834.2</td>
<td>80.7</td>
<td>9.4</td>
<td>0.0002</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>177.2</td>
<td>1834.6</td>
<td>81.1</td>
<td>10.7</td>
<td>0.0003</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
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<td>81.0</td>
<td>10.2</td>
<td>0.0003</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
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<td>1836.0</td>
<td>81.6</td>
<td>11.9</td>
<td>0.0004</td>
</tr>
<tr>
<td>5</td>
<td>23</td>
<td>251.5</td>
<td>2313.9</td>
<td>84.6</td>
<td>18.7</td>
<td>0.0007</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>137.0</td>
<td>1863.3</td>
<td>81.0</td>
<td>9.8</td>
<td>0.0002</td>
</tr>
<tr>
<td>7</td>
<td>26</td>
<td>137.4</td>
<td>1871.9</td>
<td>80.9</td>
<td>9.5</td>
<td>0.0002</td>
</tr>
<tr>
<td>8</td>
<td>28</td>
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<td>1840.7</td>
<td>80.7</td>
<td>9.1</td>
<td>0.0001</td>
</tr>
<tr>
<td>9</td>
<td>29</td>
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<td>1837.5</td>
<td>80.7</td>
<td>9.2</td>
<td>0.0001</td>
</tr>
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<td>81.1</td>
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<td>12</td>
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<td>80.5</td>
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<td>80.4</td>
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<td>1834.2</td>
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<td>9.0</td>
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<td>1991.2</td>
<td>80.9</td>
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</tr>
<tr>
<td>Sensitive Receptor Number</td>
<td>Technical Report G Sensitive receptor number</td>
<td>NO2</td>
<td>CO</td>
<td>PM10</td>
<td>PM2.5</td>
<td>BAP</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------</td>
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<td>121.2</td>
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<td>80.4</td>
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<tr>
<td>18</td>
<td>39</td>
<td>127.6</td>
<td>1837.0</td>
<td>80.5</td>
<td>8.8</td>
<td>0.0001</td>
</tr>
<tr>
<td>19</td>
<td>40</td>
<td>120.6</td>
<td>1837.4</td>
<td>80.5</td>
<td>9.4</td>
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</tr>
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<td>20</td>
<td>41</td>
<td>130.6</td>
<td>1869.6</td>
<td>80.8</td>
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<td>0.0002</td>
</tr>
<tr>
<td>21</td>
<td>42</td>
<td>116.9</td>
<td>1838.7</td>
<td>80.5</td>
<td>8.7</td>
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</tr>
<tr>
<td>22</td>
<td>43</td>
<td>114.1</td>
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<tr>
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<td>80.7</td>
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<td>81.3</td>
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</tr>
<tr>
<td>25</td>
<td>46</td>
<td>116.0</td>
<td>1838.9</td>
<td>80.5</td>
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<td>0.0001</td>
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The results indicate that for the receptors modelled in Technical Report G of the EES, concentrations of NO2 would be below the assessment criterion of 190 µg/m3. Widening the number of sensitive receptors modelled indicates likely exceedances near to the Westgate freeway and along Williamstown Road to the junction with Francis Street. The predicted concentrations at sensitive receptors along these roads (particularly receptors 33 to 43) exceed the assessment criteria significantly. Given the proximity of these receptors to the freeway alignment (less than 20 m in some instances) there is potential for over estimation of impact for these receptors due to model inaccuracy in the

4.4.1 Nitrogen Dioxide
near field. Having said this, however, the results do indicate that exceedance of the assessment criteria is likely in this location even if the absolute value of the model is not precise at this proximity to the source.

Given that the receptors at which exceedances of the assessment criterion are predicted occur at existing road alignments, it is considered likely that the exceedances would occur without the Project due to the volume of traffic that uses these roads and the proximity of the sensitive receptors in these locations. Thus it is considered that there are no exceedances of the NO$_2$ assessment criterion at sensitive receptors as a result of the Project alone.

4.4.2 Carbon Monoxide

The results for carbon monoxide indicate that predicted ground level concentrations at all sensitive receptors are below the assessment criterion and thus the impact is acceptable and in accordance with the requirements of the SEPP(AQM).

4.4.3 PM$_{10}$

The SEPP(AQM) requires that for averaging periods greater than 1 hour, the maximum results are reported. Table 4.4 indicates that all receptors exceed the 24 hour standard, however this is due to the inclusion of background within the modelled result, which for the maximum result over five modelled years includes 24 hour periods when the background concentration is above the assessment criterion.

It is important, therefore, to determine whether the project has the potential to result in additional exceedances of the 24 hour standard. To determine additional exceedances, rank 2, 3, 4, 5 were also taken from the results and compared to the number of exceedances in the background for that year. Where a higher rank than the number of exceedances of the background for that year has a predicted concentration higher than the assessment criteria, this indicates that the project will result in additional days of exceedance of the standard for that year.

Table 4.5 Additional days of exceedance in each modelled year at sensitive receptors

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1. Only sensitive receptors with additional exceedances are presented.

This result indicates that for the modelled years only 2012 has predicted additional exceedances, this is due to concentrations in 2012 which are close to the criteria but do not exceed the assessment criteria. This results in exceedances of the assessment criteria for only a small project contribution.

#### 4.4.4 PM$_{2.5}$

The results for PM$_{2.5}$ indicate that predicted ground level concentrations at all sensitive receptors are below the assessment criterion and thus the impact is acceptable and in accordance with the requirements of the SEPP(AQM).

#### 4.4.5 PAH as Benzo-a-pyrene

The results for PAH as Benzo-a-pyrene indicate that predicted ground level concentrations at all sensitive receptors are below the assessment criterion and thus the impact is acceptable and in accordance with the requirements of the SEPP(AQM).

#### 4.5 PERFORMANCE OF THE EXHAUST STACKS

The predicted model results indicate that all elevated concentrations occur alongside roads. Concentrations decrease at further distance from the road network, with no location indicating elevated concentrations as a result of plume grounding. It is considered, therefore that the tunnel ventilation system does not significantly contribute to ground level concentrations in comparison to the road network.

#### 4.6 RECOMMENDATIONS TO MITIGATE IMPACTS FROM VEHICLE EMISSIONS ASSOCIATED WITH THE PROJECT

The major impacts associated with the modelled roads are along the existing road network, and are not associated with proposed new roads as part of the Project. Thus, it is anticipated that the predicted exceedances of the assessment criteria would occur whether or not the Project were to proceed.
As the Project does not in itself result in exceedances, there is no need for additional mitigation. The areas of predicted exceedance of the assessment criteria along the existing road network are the result of current vehicle emission and fuel standards. The only way to reduce these exceedances is either through a change in transport policy and/or fuel/vehicle emission standards.
CONCLUSION

Dr. Iain Cowan of ERM was engaged by Maddocks on behalf of Maribyrnong City Council to evaluate the potential impact to ambient air quality as a result of the Westgate Tunnel project (the Project).

A review of the EES air quality assessment (Technical Report G) highlighted the following potential contentions:

- Within Technical Report G, emission estimation for the main products of combustion (carbon monoxide, nitrogen dioxide, PM$_{10}$ and PM$_{2.5}$) used the PIARC emission factors, whilst emission estimation for the air toxics used COPERT Australia. Modelling for the open road network used AusRoads, which is a Victorian EPA formulation of the CALINE model series. CALINE has been shown by the USEPA to under-estimate predicted concentrations based on tracer experiments of sulphur hexafluoride and USEPA has recommended the use of AERMOD as a replacement for the modelling of roads using the LINE source algorithm. An accurate cumulative assessment has not been completed within the EES as the assessment used AERMOD for the tunnel ventilation system and AusRoads for the open road network using different years for the assessment of each. Only where overlap of modelled years for the separate assessments occurred was a cumulative evaluation completed. This is not in accordance with the requirements of EPA Publication 1551. The modelling only considers primary nitrogen dioxide by considering 15% of emitted oxides of nitrogen as nitrogen dioxide. Once emitted to the atmosphere, the remaining 85% of emitted nitric oxide is available for oxidation to nitrogen dioxide. The potential for oxidation has not been considered in the assessment.

- The number of roads considered in the assessment is not sufficient by international standards for road assessments.

- The Assessment used meteorological 2009 to 2013 to model the emissions from the tunnel, whilst the years 2011 to 2016 for the open road sections (whilst only reporting results for 2012).

To determine whether these contentions result in a material difference in predictions of ambient air quality, this assessment has undertaken emission estimation using COPERT Australia and atmospheric dispersion modelling using AERMOD.

The results of the modelling indicate:

- There is no predicted exceedance of the assessment criterion for carbon monoxide, PM$_{2.5}$ or polycyclic aromatic hydrocarbons (PAH) expressed as benzo-a-pyrene (BaP) at any of the assessed sensitive receptors.
• Exceedance of the NO₂ assessment criterion contained in the SEPP(AQM) along the Westgate Freeway and Williamstown Road to the junction with Francis Street. It is considered by the author that:

• The sensitive receptors at which exceedance of the assessment criterion occurs are located along heavily trafficked existing roads. Exceedance of the assessment criterion would likely occur at these locations in any case without the proposed development.

• Exceedance of the PM₁₀ standard at all receptors when the maximum 24 hour concentration is considered in accordance with the requirements of Schedule C of the SEPP(AQM) due to elevated background concentrations in 2014 which exceeded the standard.

• A number of receptors at which an additional day of exceedance of the PM₁₀ standard would be expected for the model year 2012. This is due to the elevated background in 2012, which was just below the assessment criterion, thereby only requiring a small increase in ambient concentrations from the road network to result in an exceedance of the PM₁₀ standard.

Overall, it is considered that the Project is unlikely to impact ambient air quality, and any exceedances that are predicted will be likely to occur without the Project being implemented.


Annex A

Dr. Iain Cowan Curriculum Vitae
Dr. Iain Cowan, APAC Technical Director for Air Quality and Climate Change is a Certified Air Quality Professional by the Clean Air Society of Australia and New Zealand and provides more than 16 years experience in the estimation of emissions, dispersion modelling and monitoring of ambient air quality, greenhouse gas species and odour. Iain has extensive experience with several advanced atmospheric dispersion modelling packages including CALPUFF, Ausplume, AERMOD, TAPM, ADMS-Urban, EDMS, CHARM, and AusRoads. Iain is a Certified Air Quality Professional which was awarded by the Clean Air Society of Australia and New Zealand.

Iain has extensive experience in the estimation and modelling of emissions generated by transport sources. This knowledge has been developed since Iain’s doctorate in the parameterisation of atmospheric dispersion models for use in GIS, which focussed on emissions from road sources. During his consulting career, Iain has undertaken numerous assessments for road, rail and ship related emissions in addition to dust emissions from mine operations, rail infrastructure and for stockpiles at port facilities. In general terms, this modelling has been undertaken in preparation for environmental impact assessments, as part of regulatory compliance and the planning process, for expert witness testimony and for the assessment of emergency releases.

Dr. Cowan has modelled and monitored air quality for many prestigious projects and clients including Orica, ExxonMobil, Chevron, Santos, AGL, Australian Pipeline Association, Origin Energy, Lihir Gold, CSL, Melbourne Airport in Australia as well as the London Olympic Bid, the Welsh Development Agency, the Highways Agency and the London Development Agency in the UK.

Fields of Competence
- Dispersion modeling using AERMOD, CALPUFF TAPM, Ausplume, AusRoads, ADMS, CALINE, CAL3QHCR, EDMS and Charm.
- Transport related emissions
- Measurement and monitoring of air quality
- Mining emissions
- Industrial emissions
- Odorous emissions
- Emissions Inventory Generation
- Expert witness testimony

Education
- PhD Environmental Engineering, University of Surrey, UK, 2004
- BSc Honours, Environmental Geology, Royal Holloway College, University of London, UK, 2000

Languages
- English, native speaker
- French, conversational

Key Industry Sectors
- Transportation
- Mining
- Oil and gas
- Power generation
- Chemical production
- Manufacturing
- Contaminated land
- Waste (landfills, composting and water)
- Expert Witness Testimony

Honors and Awards
- CASANZ Certified Air Quality Professional
- Clean Air Society Young Achiever Award
- EPSRC Stipend for PhD Research
Publications
- Corbet, L.C; Cowan, I.M; Stella, N. and Brooke. A.; 2009, The Integration of two regulatory dispersion models for a holistic approach to air quality assessment; Clean Air Society for Australia and New Zealand Conference, 6th – 10th September 2009; Perth, Australia
- Cowan, I.M.; 2007, Use of GIS as an air quality screening tool for planners and policy makers – Partnerships between local government and academia; International Union of Air Pollution Professionals World Congress, 10th-13th September 2007; Brisbane, Australia
- Cowan, I.M.; 2004; The Development and Application of and Advanced Screening Model to Predict Air Quality Thesis (PhD). University of Surrey

Key Projects
Transport
- Singapore Cross Island Line 2015 – Internal technical peer review of baseline measurements and qualitative impact assessment for the construction of the proposed Cross Island Line in Singapore.
- Singapore North-South Expressway 2015 - Internal technical peer review for baseline measurements and qualitative impact assessment for the Singapore North South Expressway.
- CLP HK CCGT Development – Technical lead on the air quality assessment for the development of two CCGTs in Hong Kong. The project required modelling for specific regions of Hong Kong incorporating emissions estimation and dispersion modelling of road sources within tunnels and tunnels linked to sections within noise walls.
- Brent Cross Shopping Centre 2015 – Assessment of traffic impacts on roads as a result of road realignment and construction of new roads for a shopping centre upgrade in north London. The assessment used the emission estimation model published by the UK Department of Transport together with ADMS-Roads to predict impacts at nearby sensitive receptors.
- Goodman – Assessment of a traffic impacts on roads surrounding a proposed transport interchange depot (rail to road) in Slough, UK. The assessment UK emission factors for the vehicle fleet together with ADMS-Roads to assess the impacts of the increase in trucks to the air quality in the local environment.
- Cikampek-Palimanan Toll Road – Assessment of a proposed toll road in Indonesia. Modelling included determination of diurnal emission rates followed by dispersion modelling using CALQ3HCR.
Hoddle Street Study 2009 – High level qualitative option review and detailed dispersion modelling of options for the redevelopment of Hoddle Street in Melbourne. Qualitative review of multiple options based on vehicle numbers / traffic mix and expected relative emissions from the options. Detailed modelling undertaken using AusRoads and AusVeh emission factors for anticipated traffic volumes for three potential route options.

Melbourne Airport Limited – Undertook complete modelling exercise of airport pollution sources including the aircraft, roads, parking facilities, jet engine testing and training fires to develop a concentration map of pollution using US FAA dispersion model EDMS. Modelling incorporated all aircraft movements from the terminals to the runway, take-off and landing and use of runway / taxiways varying with wind direction.

Bankstown Airport - Assessment of the impact on local air quality of moving the engine run-up bay from the current position to a new location at the north-eastern end of Bankstown airport. The assessment has used the regulatory dispersion model AUSPLUME to model concentrations of oxides of nitrogen (NOx), carbon monoxide (CO) and oxides of sulphur (SOx).


Welsh Development Agency – Guidance on Multi-Modal Assessment (GOMMS) Impact assessment for the construction of a bypass

Wiltshire County Council – Development of a specialised emissions inventory for modelling of transport emissions in a town with roads at high gradient. Modelling was undertaken using ADMS-Roads and used to assess options for reducing ground level concentrations by changing traffic flows on the road network.

Highways Agency 2004-2006– Secondment to the Highways Agency (major road regulator within England) to assist with the implementation and development of policy with regard to the assessment of the impacts of road projects on local air quality.

Bristol NHS Trust – Impact assessment using ADMS-Roads of the redevelopment of two hospitals on local air quality incorporating the increase in vehicle numbers and the use of emissions control technologies for new generators.

Expert Witness Testimony

Nuchev Pty Ltd – Expert at VCAT regarding the potential for odour and dust impact to surrounding land use as a result of a proposed goat dairy in central Victoria. Evidence was given as to the potential for odour impact, dust generation and transference to nearby sensitive receptors. Assessment of the impacts was undertaken based on odour flux hood monitoring at a goat farm and using the AERMOD dispersion model adopting the low wind speed option to capture worst case dispersion conditions.

Calleja Property Pty Ltd – Expert witness at VCAT regarding the potential for dust generation during land reprofiling on a former landfill. Evidence given as to the methods that would be needed to overcome issues in relation to dust generation. Preparation of witness testimony included the use of dispersion modelling to assess potential impact from dust generating activities.
Regional Infrastructure Pty Ltd – Expert witness at Planning Panels Victoria hearing regarding the proposed development of a livestock exchange in Miners Rest, Western Victoria. Atmospheric dispersion modelling was completed using CALPUFF to demonstrate that the impact to the local community was at acceptable levels.

Barringhup Community Group – Expert witness at VCAT regarding the potential for odour generation from a proposed broiler farm cluster in Barringhup Victoria. This involved micro-meteorological modelling to determine the potential for gully flows which have been shown to result in significant impact from broiler farms in nearby locations.

Biomix Pty Ltd – Expert witness at VCAT regarding potential for odour generation from a proposed composting facility in northern Victoria.

Maddingley Brown Coal – Expert witness at VCAT regarding potential for odour generation from composting activities for permit amendment application.

Anonymous – Expert witness at VCAT regarding potential for odour generation impacting a local community from a proposed broiler farm in central north Victoria. Dispersion modelling incorporated micrometeorological modelling of complex terrain and odour dispersion in a river valley system.

Wodonga City Council – Expert witness at VCAT regarding the application for secondary consent for a drying and dewatering facility on a prescribed waste handling and composting facility.

Gadens Lawyers – Expert witness at Planning Panels Victoria regarding the requirement of a buffer for an existing egg laying farm within the urban growth boundary.

Innova Soil Technology – Expert witness at VCAT for proposed thermal soil remediation facility. Services included review of the application and opinion as to whether the application met the legislative requirements for meeting control of emissions to best practice and maximum extent achievable.

EPA – Expert witness at VCAT hearing for two proposed broiler farms adjacent to four existing broiler farms near to Nagambie, Victoria. Dispersion modelling using CALPUFF of odour from the existing and proposed broiler farms was undertaken to demonstrate existing and future impact with the proposed farms. Dispersion modelling of odour from the broiler farms was undertaken using the CALPUFF modelling system to take advantage of the lower thresholds for wind speed that can result in high odour impact. Modelling using five years of meteorology was undertaken to assess the impact from highly variable broiler growth cycles.

Brimbank City Council – Expert witness at VCAT for a proposed solid inert waste landfill adjacent to an existing concrete batching / crushing plant in north-east Melbourne. In preparation for the VCAT hearing. Three months of dust deposition monitoring were undertaken, and dispersion modelling using CALPUFF of the existing concrete batching / batching plant and proposed development of a solid inert waste landfill.
AGL Limited – Assessment of proposed peak loading gas fired power station in the west of Victoria. Advanced dispersion modelling used the CALPUFF modelling system, and has incorporated observed ground level and upper air observed meteorological conditions. The assessment has considered start-up conditions on a sub-hourly basis and base load operations on an hourly basis, in addition to taking account of a further proposed base load power station by another operator in the vicinity. Following submission of the Works Approval Application to EPA, a presentation of the potential impacts was made to the Victorian Planning Panel through expert witness testimony.

Yarra Ranges Shire Council – Expert witness at VCAT hearing for compost odour impacting a local community. Flux hood measurements of odour emissions from compost piles were used with dispersion modelling using CALPUFF of odour from the compost facility to determine impact to the surrounding community.

Otway Shire Council – Expert witness at VCAT hearing for proposed broiler farm with potential to impact on local community. Review of dispersion modelling undertaken by the proponent and dispersion modelling to show impact using alternative modelling methodologies.

Grinders Coffee – Expert witness at VCAT hearing for proposed expansion of operation at a coffee roasting facility. Preparation of expert witness testimony included dispersion modelling of proposed emissions from the facility, and assessment of impacts on the surrounding community.

Ambient Monitoring

- Jawa 1 CCGT – Development and implementation of an ambient monitoring plan to determine baseline ambient nitrogen dioxide concentrations in proximity to a proposed CCGT in Indonesia.

- Calleja Properties Pty Ltd – Expert witness testimony on the impacts of dust from the regrading of a landfill cap to accommodation future use. Assessment incorporated the design and recommendation of a monitoring system to prevent impact to nearby sensitive receptors.

- Brunei Shell Company Pty Ltd – Design and implementation of ambient monitoring of particulate and volatile organic compound concentrations during a routine flaring event at a nearby school. ERM selected the monitoring equipment and undertook monitoring throughout the flaring event to determine impact at a sensitive use location nominated by community.

- Sell & Parker – Air quality assessment as part of an EIS which included atmospheric dispersion modelling and design of a boundary monitoring plan with trigger levels to prevent impact to the surrounding land use.

- Anonymous – Internal peer review for a the design and implementation of a baseline monitoring study of particulate matter in Singapore for a major redevelopment project.

- Orica Mining Services – Development of an ambient monitoring plan for use during construction to ensure ambient concentrations of dust generation were in acceptable limits. Work included sourcing and specification of monitoring equipment and discussion / sign-off from the regulator.
Annex B

Instructions
IN THE MATTER OF AN INQUIRY UNDER THE ENVIRONMENT EFFECTS ACT 1978
IN THE MATTER OF AN ADVISORY COMMITTEE APPOINTED UNDER THE PLANNING AND
ENVIRONMENT ACT 1987

JOINT INQUIRY AND ADVISORY COMMITTEE CONCERNING THE WEST GATE TUNNEL
PROJECT

PLANNING PANELS VICTORIA

Proponent:
WESTERN DISTRIBUTOR AUTHORITY ON BEHALF OF THE
DEPARTMENT OF ECONOMIC
DEVELOPMENT, JOBS, TRANSPORT
& RESOURCES

In partnership with
TRANSURBAN

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BRIEF TO EXPERT – AIR QUALITY

______________________________
From
MARIBYRNONG CITY COUNCIL
ENVIRONMENTAL EFFECTS STATEMENT

UNDER THE ENVIRONMENT EFFECTS ACT 1978

WEST GATE TUNNEL

Proponent:
WESTERN DISTRIBUTOR AUTHORITY (ON BEHALF OF THE DEPARTMENT OF ECONOMIC DEVELOPMENT, JOBS, TRANSPORT & RESOURCES)

In partnership with TRANSURBAN

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BRIEF TO EXPERT – AIR QUALITY

On behalf of MARIBYRNONG CITY COUNCIL
MEMORANDUM TO EXPERT – AIR QUALITY

Purpose

The purpose of this brief is to seek a quotation to provide an independent air quality expert witness statement relating to the West Gate Tunnel Environment Effects Statement (EES) for Maribyrnong City Council (Council), and appear as an expert witness for Council at the Independent Planning Panel hearing if required.

A joint Inquiry and Advisory Committee (IAC) has been appointed to consider submissions relating to the EES and the associated works approval application. The hearings are scheduled to commence from 14 August 2017 and are expected to run for about 5 weeks. A directions hearing is to be convened on 19 July 2017. We estimate that expert statements will be due to be filed by 31 July 2017, though this is to be confirmed by the IAC.

Background

The Western Distributor was developed by Transurban and submitted to the Victorian Government as a market-led project in March 2015. It is now known as the West Gate tunnel Project (WGT Project).

The WGT Project proposes a tunnel under Yarraville and an elevated motorway connecting the West Gate Freeway with the Port of Melbourne, CityLink and the city, providing an alternative river crossing to the West Gate Bridge. The project also involves the widening of the West Gate Freeway (from the M80 interchange to the West Gate Bridge) and associated links to the M80 Ring Road and Princes Freeway.

The project has three (3) physical components, comprising:

- West Gate Freeway;
- Tunnels; and
- Port, CityLink and city connections.

The West Gate Freeway component includes widening works between the M80 interchange and the West Gate Bridge, providing six lanes in each direction to increase existing capacity. The land configurations have been developed as two sets of three lanes in each direction. The outer three lanes would provide access at all existing connections to the West Gate Freeway and the inner three lanes would provide express routes between the city and the Princes Freeway.

The tunnel component includes two tunnels (one eastbound, one westbound) under Yarraville that would allow for three lanes of traffic in each direction. The tunnels would extend from southern portals (entrances) located west of Williamstown Road to northern portals located in the vicinity of the intersection of Whitehall Street and Somerville Road, west of the Maribyrnong River.

The port, CityLink and city connections component includes a crossing of the Maribyrnong River, connections to the port of Melbourne, connections to the Port of Melbourne, elevated roads along Footscray Road and connections to the city. The city connections include inbound and outbound connections to CityLink, Dyonon Road and the extension of and connection to Wurundjeri Way. This component also includes the improvement and extension of the Federation Trail, enhancing connectivity for pedestrian and bicycle users.

The project would be set in a highly urbanised area that includes long-established and diverse neighbourhoods and communities, shopping and commercial centres, industrial areas, parks and reserves, and community and recreational facilities.
In December 2015, the Victorian Government announced its intention to partner with Transurban to build the Western Distributor, with the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) assuming responsibility for the project. The Western Distributor Authority (WDA) is the proponent for the purposes of the IAC hearings, though this is an administrative arm within DEDJTR.

DEDJTR submitted a project outline to the Minister for Planning for consideration under the Environment Effects Act 1978 (Vic). Subsequently, the Minister for Planning declared the Western Distributor Project to comprise ‘public works’ under section 3 of the Environment Effects Act 1978 (Vic), requiring the proponent to prepare an Environmental Effects Statement (EES).

In April 2016, the Minister published EES Scoping Requirements for the project. These requirements identified the specific matters to be investigated and documented in the EES. The EES describes the potential effects of the WGT Project on the environment and recommends ways to avoid, minimise or manage any adverse effects. It also proposes a programme for monitoring and managing environmental effects during the construction and operation of the WGT Project.

Council position on the WGT Project

A report was presented to Council at its Ordinary Meeting, held on 17 May 2016, which outlined the potential benefits and issues of the then Western Distributor project for the City of Maribyrnong. Council resolved at this meeting to support in-principle the Western Distributor Project (as it was then known).

The Reference Design was released in April 2017, following the tender process.

Council passed a resolution finalising its position on the WGT Project at its Ordinary Meeting on 4 July 2017 (copy attached). Council’s submission, which was endorsed during its 4 July meeting, was filed with the IAC on 6 July 2017 with some minor changes. Council has requested to be heard at the Inquiry hearing.

We note that the terms of the Council resolution seek a financial contribution to improve the facilities and amenity on the west side of the Maribyrnong River to offset the effect of the WGT Project on the river environs.

Services Required

Subject to the provision of an acceptable quotation, we are engaging you to prepare an expert witness statement and appear as a witness on behalf of our client.

Please ensure that in preparing the expert witness statement you do the following, to the extent that the matters below are within your area of expertise:

- Assess the:
  - adequacy of the assessment of air quality impacts in the EES, including the detailed technical assessment provided in the Technical Report;
  - effects of the WGT Project on air quality in existing open space and on sensitive receptors (dwellings); and
  - performance of the exhaust stacks;

- Identify any recommendations to mitigate impacts from vehicle emissions associated with the WGT Project.

Please do not assess the human health considerations as these will be addressed by Dr Lyn Denison, who has been retained to advise the IAC (Dr Dennison was part of the Inquiry that considered the East West Link Project).
Further, we will require you to:

- Prepare this expert witness statement in accordance with relevant procedures and practice notes applied by Planning Panels Victoria and any direction to be made by the IAC;
- Meet and liaise with Council officers and Council’s legal representative in preparation for the hearing, as required; and
- Appear as an expert witness before the IAC, if required.

Structure of advice

In articulating any recommendations or conclusions arising from your expert witness statement, we ask that you structure these using the following approach:

- Recommendations relevant to the material forming part of the EES (including any review or amendments required to address any gaps or deficiencies you may identify);
- Recommendations relevant to the design of the proposal (these probably can’t be resolved by amendment to the Environmental Performance Requirements (EPRs) and will need to be considered by government in approving the project);
- Recommendations that are relevant to the construction process (these may be able to be addressed through the EPRs);
- Recommendations relevant to the operation of the proposal, if approved (i.e. that can be addressed through the EPRs); and
- Construction and operational recommendations relevant to government.

Quotation

We request that you provide us with a quotation for the above services, if you have not already done so, including:

- The estimated time in hours required to complete each stage; and
- An hourly rate, in the event additional hours which have not been allocated for in this brief are necessary.

Documents provided

We have previously provided you with an electronic copy of the EES and associated attachments.

On 6 July 2017 we also emailed you a copy of Council’s submission with attachments (as filed with the IAC on 6 July 2017) together with a copy of the resolution adopted by Council at its meeting of 4 July 2017.

Additional documents

Please let us know if there are any other documents relevant to your task of preparing an expert witness statement (including documents referred to in Council’s submission) that you require.

Council’s Representative

Council’s representatives for this engagement will be:

Adrian Havryluk, Manager City Strategy
adrian.havryluk@maribyrnong.vic.gov.au

Phone: 9688 0389
Virginia Howe, Senior Strategic Planner
virginia.howe@maribyrnong.vic.gov.au

Terry Montebello, Partner, Maddocks
Terry.Montebello@maddocks.com.au

Phone: 9688 0235
Phone: 9258 3698

Please contact Briana Eastaugh at Briana.Eastaugh@maddocks.com.au or on 9258 3372 should you have any questions in relation to this brief.

Dated: 6 July 2017

Terry Montebello, Partner
Barnaby McIlrath, Special Counsel

Maddocks Lawyers
ERM has over 160 offices across the following countries and territories worldwide.

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Hungary           South Korea
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Indonesia         Sweden
Ireland           Taiwan
Italy             Thailand
Japan             United Arab Emirates
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