August 2017

WEST GATE TUNNEL PROJECT

IAC Air Quality Expert Conclave Statement

Submitted to:
West Gate Tunnel Project Inquiry & Advisory Committee

REPORT

Report Number. 1521107-257-R-Rev0

Distribution:

West Gate Tunnel Project IAC
Iain Cowan
Frank Fleer
Diane Keogh
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Paul Torre

Golder Associates

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1.0 INTRODUCTION

A joint Inquiry and Advisory Committee (IAC) has been appointed to consider the Environment Effects Statement (EES), a draft planning scheme amendment affecting Hobsons Bay, Maribyrnong, Melbourne, Port of Melbourne, Brimbank and Wyndham planning schemes, works approval application and public submissions associated with the West Gate Tunnel Project in accordance with the approved Terms of Reference.

Direction 34 from the West Gate Tunnel Project IAC Directions Hearing on 19 July 2017 required experts in like topics, including air quality, to "*meet to identify and discuss the key issues and the facts and assumptions relevant to these issues*".

Direction 36 further required that, in relation to air quality, the Environment Protection Authority (EPA) Victoria be invited to nominate a person with relevant experience to attend.

The Protocol for Experts Conclave issued by the IAC (dated 28 July 2017 but received 3 August 2017) required that the conclaves be held in week commencing 7 August 2017 and specified various procedural requirements for the conduct of the conclaves.

In accordance with the Protocol, the Air Quality Expert Witness Conclave was held on 10 August 2017 between the hours of 9 am to 1 pm at the offices of Golder Associates, 570 – 588 Swan Street, Burnley, with attendance limited to the following:

Name	Organisation	Representing
Iain Cowan	Environmental Resources Management	City of Maribyrnong
Frank Fleer	Golder Associates (Chair)	Western Distributor Authority
Diane Keogh	Not applicable	Spotswood South Kingsville Residents Group
Jason Shepherd	Golder Associates	Note taker
Graeme Starke	SLR Consulting Australia	Hobsons Bay City Council
Paul Torre	EPA Victoria	Not applicable

In accordance with the Protocol, a list of key issues was provided by each expert and circulated on 8 August 2017. The following statement lists the key issues identified by the participating experts and summarises the conclave outcomes, noting where agreement was reached.

Diane Keogh noted that her expertise does not include modelling, consequently her signature to this document does not infer agreement to the modelling matters discussed by the other experts.

2.0 GRAEME STARKE

1. *During construction phase temporary ventilation structures are assessed for a need for a quantitative emissions impact assessment prior to implementation.*

It was agreed by Iain Cowan, Frank Fleer, Graeme Starke and Paul Torre that the need for modelling of the temporary ventilation structures should be considered once more source details are available (e.g. locations). It was also agreed that modelling of general construction activities is of no value because the details required to construct a meaningful model are rarely available, with the best course of action preparation and implementation of a detailed construction environmental management plan, describing measures to monitor and manage air quality.

2. *Maximum predicted incremental PM_{10} impacts should be presented to assess likelihood of additional exceedances.*

Frank Fleer noted that maximum predicted incremental PM_{10} impacts will be tabled at the IAC hearing.

3. *The impact assessment needs to address the risk of impact to existing or planned tall buildings potentially impacted by the ventilation stack plume.*

As of 6 July 2017, Hobsons Bay Planning Scheme Amendment C88 for Precinct 15 was placed on exhibition. Maribyrnong Planning Scheme Amendment C63 for the Bradmill Precinct to the north is currently under a development plan that was approved by the Minister for Planning on 5 May 2011.

Precinct 15: building heights of two to three storeys along Kyle Road and New Street, three to five storeys on Blackshaws Road and up to six storeys in the remainder of the precinct.

Bradmill Precinct: Low rise dwellings of one to two storeys fronting Francis Street to provide an appropriate interface to the existing residential development. Transition to medium density (two to four storey) residential development internal to the site. Higher density housing (two to six storeys) near the Neighbourhood Activity Centre.

Paul Torre suggested that elevated receptors be considered near the northern ventilation structure, including the Harris Street fly-over.

Golder Associates noted that additional modelling to assess impacts on elevated receptors will be tabled at the IAC hearing.

4. *Given predicted increases in maximum ambient concentrations of particulates on Millers Road validation of the AUSROADS model should have been undertaken to ensure it performs accurately in the meteorological conditions being modelled.*

AUSROADS is the regulatory model for this purpose, consequently model validation was not part of the scope of this assessment. Roadside monitoring is currently being conducted at a number of locations as part of the West Gate Tunnel Project, the results of which will be tabled at the IAC hearing. It was agreed by Iain Cowan, Frank Fleer, Graeme Starke and Paul Torre that the scope of ambient air quality monitoring conducted following project opening should include PM_{10} and $PM_{2.5}$ at an appropriate location on Millers Road.

5. *Combined emissions should have been assessed against Schedules A and C of the SEPP(AQM).*

Schedule C of the State Environment Protection Policy (Air Quality Management) [SEPP(AQM)] refers to the modelling of emissions to air and does not contain modelling criteria. The combined impacts assessment contained in EES Technical Report G was conducted at locations near the ventilation stacks which were predicted to have significant contributions from surface roads, with the results compared with the relevant State Environment Protection Policy (Ambient Air Quality) [SEPP(AAQ)] environmental quality objectives and the National Environment Protection (Air Toxics) Measure (Air Toxics NEPM) monitoring investigation levels. One of the combined impact receptors was at the intersection of Blackshaws and Millers Roads, however it is acknowledged that combined impacts were not assessed against Schedule A modelling criteria. Paul Torre noted that an air quality impact assessment against Schedule A is undertaken with the general

background and that there is no EPA Victoria requirement to undertake combined impacts modelling. The combined impact modelling demonstrated that the contributions from the tunnel ventilation structures to the maximum predicted ground level concentrations were relatively insignificant, with surface roads the major contributor. This item was not agreed, however, Iain Cowan, Frank Fleer, Graeme Starke and Paul Torre agreed that this was not material to the outcomes of the assessment.

3.0 IAIN COWAN

6. Emission estimation - COPERT Australia vs PIARC for main products of combustion.

Particulate matter is the major consideration for projects of this type. COPERT Australia and PIARC particulate emission factors are similar. CO will not be an issue.

Frank Fleer noted that EPA Victoria has never reported an exceedance of NO_2 at any ambient or roadside monitoring station. Paul Torre supported this, further noting that there is no evidence to support the assertion that NO_2 concentrations could exceed the SEPP(AQM) Intervention Level:

- All of EPA Victoria's measured roadside and ambient air monitoring data shows levels well below the ambient air quality standard which is below the Intervention Level.
- NO_2 levels in large Australian cities are generally well below the levels in other major cities in the world. The high NO_2 roadside measurements in other countries does not apply in Melbourne. The proportion of diesel fuelled vehicles in the Australian motor vehicle fleet is markedly lower compared to other countries with high NO_2 air pollution impacts.
- EPA Victoria and CSIRO for Future Air are not predicting significant increases in NO_2.
- NSW EPA projected NO_2.emission trends to reduce despite the increase in vehicle kilometres travelled.

Iain Cowan noted that as population and traffic increase, especially if there is an increase in diesel vehicles in Australia, then there is potential for an increase in roadside NO_2 which needs to be considered in the monitoring and not discounted because it's never been a problem up until now and have an assumption that emissions will decrease over time. Whilst it is accepted that there is not the same push for diesel in Australia as there was in Europe, nevertheless there is an expected increase in the uptake of diesel compared to petrol and we know that this produces more primary NO_2, so it is worth including some monitoring to ensure that it remains at acceptable levels.

The need for roadside NO_2 monitoring was not agreed by Frank Fleer and Paul Torre.

7. Emission estimation – real world driving verses test bed emission factors.

It was agreed that real world driving emissions are likely to be higher than test bed emission factors. An EPA Victoria December 2013 study indicated that differences between PIARC and road tunnel monitoring studies were; $PM_{2.5}$ 1-11%, NO_X 11% and CO 38%. This issue was acknowledged.

8. Dispersion model selection – under estimation of AusRoads (CALINE models) in tracer experiments.

Frank Fleer noted that AUSROADS is the regulatory model and thus the model that should be adopted. Iain Cowan considered that as the AUSROADS model is based on the CALINE suite of models, and as this suite of models has been shown to under estimate concentrations in urban environments there is a high likelihood that AUSROADS underestimates concentrations under specific meteorological conditions and the model results should be considered in that context. It was agreed, however, that an alternative model would be unlikely to change the conclusion of the assessment that used AUSROADS.

9. Secondary NO_2 generation.

It was acknowledged that secondary formation of NO_2 occurs, with reduced O_3 concentrations occurring near to roads as NO and O_3 react to form NO_2. NO_2 concentrations at Primula Avenue (adjacent to the West Gate Freeway) have not been measured at levels approaching the SEPP(AAQ) environmental quality objective. It was agreed by Iain Cowan, Frank Fleer, Graeme Starke and Paul Torre that there is no material difference to the conclusions reached from the modelling.

10. Modelled years for stack different to modelled years for roads.

Different years were modelled due to there being many missing hours in the 2009 and 2010 meteorological datasets. AUSROADS does not assess any days that have one or more missing hours therefore many days of the year would not have been assessed for these years. For this reason, the years 2011 to 2014 were assessed. Due to time constraints, only one year, the worst case year, 2012, was used for the EES. It was

agreed by Iain Cowan, Frank Fleer, Graeme Starke and Paul Torre that this isn't an issue, with Environmental Resources Management modelling also showing that 2012 was the worst case for the combined impacts.

11. *Baseline data from EPA monitors verses additional data from project monitors that has not yet been released, and what does this mean to the outcome of the assessment.*

A report comparing data from the West Gate Tunnel Project ambient air quality monitoring stations (AAQMSs) against data from the EPA Victoria Footscray AAQMS will be tabled at the IAC hearing, with the purpose of confirming whether Footscray data is acceptable as background pollutant concentrations.

12. *The need for a true cumulative assessment where roads and stacks are assessed in the same model.*

It was agreed by Iain Cowan, Frank Fleer, Graeme Starke and Paul Torre that, while this would have been preferable, the stack contributions were relatively insignificant and the current regulatory models do not allow this to occur. EPA Victoria may in the future consider allowing AERMOD for the modelling of surface roads as area sources as the promulgator of AERMOD (USEPA) has suggested this model as a replacement for CALINE3, however further evaluation will be necessary.

4.0 DR DIANE KEOGH

13. *The representativeness of emission factors used in modelling determines the quality of modelling.*

Agreed.

14. *The particulate matter emission factors for $PM_{2.5}$ and PM_{10} used in the AQIA modelling are neither representative, scientifically based, nor fit for purpose, and therefore the model outputs cannot be used to form the basis of any health impact assessment*

Not agreed by Frank Fleer.

15. *PIARC does not publish size-segregated emission factors for $PM_{2.5}$ or PM_{10} motor vehicle exhaust emissions.*

PIARC provides emission factors for exhaust particulate ($PM_{2.5}$) in the form of opacity factors and a factor for converting from opacity to $PM_{2.5}$ mass emission rate. Non-exhaust $PM_{2.5}$ emission factors are also provided. Passenger cars and light commercial vehicles are deemed to have the same factors. Heavy commercial vehicles are 3.7 times greater. This item was not agreed by Diane Keogh. Diane Keogh agreed $PM_{2.5}$ non-exhaust emission factors are provided by PIARC.

16. *PIARC emission factors do not correspond to motor vehicle emission tests but are used in ventilation calculations for contaminants in tunnels, as the drive cycles have been specifically developed to represent in-tunnel driving behaviour. They are not suitable for modelling motor vehicle emissions on surface roads.*

Vehicle speeds and volumes were adjusted to account for hourly varying diurnal patterns observed for each road type. It was noted that COPERT Australia is not tunnel specific, however, particulate matter emission factors for COPERT Australia are similar to those for PIARC. This item was not agreed by Diane Keogh.

17. *PIARC does not publish emission factors for Australia for particulate matter, nor size-segregated $PM_{2.5}$ or PM_{10} exhaust emission factors. They only publish emission factors for Australia for use in modelling tunnel emissions for:-*

    a) CO and NOx for petrol passenger cars;

    b) CO, NO_x and Opacity (a visibility measure, based on % of dust, soot and smoke blocking light, as a surrogate for particle emissions, thus dealing with particulate matter in terms of visibility, not health) for diesel passenger cars and HGVs

As noted above, PIARC does publish emission factors for $PM_{2.5}$. This item was not agreed by Diane Keogh.

18. *Inappropriate multipliers, ratios and summing of emission factor data has been used to derive $PM_{2.5}$ and PM_{10} exhaust emission factors, combining different size fractions and different fuels.*

This item was not agreed by Frank Fleer.

19. *There are numerous, relevant, real world emission factors for $PM_{2.5}$ and PM_{10} available in the international published literature which could have been used in the modelling.*

This item was not agreed by Frank Fleer.

20. *The AQIA modelling lacks transparency. The values of all emission factors used in the modelling for each of the different vehicle types and environments have not been provided in the report*

These factors will be tabled at the IAC hearing.

21. *The same emission factors (unpublished) were used for modelling emissions on surface roads and at ventilation stacks.*

Frank Fleer noted that the basis of modelling both surface roads and ventilation stack emissions were the same exhaust emission factors, as recorded in the Air Quality Impact Assessment, with PM_{10} and $PM_{2.5}$ non-tailpipe emissions included for the ventilation stacks.

Diane Keogh did not agree as the values of emission factors used in the modelling were neither published in the Air Quality Impact Assessment report, nor presented at this conclave.

22. *Different particulate matter emission factors should have been used for the different environments e.g., on surface roads, ramps, in tunnels and near ventilation stacks.*

Different emission factors were used on surface roads, ramps and in tunnels depending on the traffic speed and the gradient of the road. Diane Keogh did not agree as the values of emission factors used in the modelling were neither published in the Air Quality Impact Assessment report, nor presented at this conclave.

23. *Motor vehicle non-exhaust emissions (brake and tyre wear emissions) have not been modelled, and these emissions make a considerable contribution to total vehicle emissions (e.g., approx. 26% of total vehicle emissions in Australia) thereby potentially underestimating emission levels*

Non-tailpipe emissions were included in the modelling of the West Gate Tunnel Project ventilation structure emissions to air.

It is acknowledged that surface roads did not include non-tailpipe emissions. The primary objective of the surface road modelling was to compare the “with project” (project) and “without project” (base) scenarios. The inclusion of non-tailpipe emissions does not alter the outcomes of this comparison.

Subsequent sensitivity testing of the surface road assessment along Francis Street and the West Gate Freeway with non-exhaust emissions included has concluded that as would be expected both baseline and project particulate ground level concentrations increase by approximately the same amount, such that the difference between base and project scenarios is similar with and without non-tailpipe emissions included. This information will be tabled at the IAC hearing.

24. *In-tunnel emissions have not been modelled.*

In-tunnel concentration modelling was not part of the scope of work. The tunnel ventilation engineers have done this and calculated the ventilation flowrates required to maintain safe levels in the tunnel.

25. *Motor vehicle particle emissions span a wide size range, from ultrafine size to PM_{10}.*

By number, most particles generated by motor vehicles are ultrafine in size, making a lesser contribution to the $PM_{2.5}$ mass concentration. Diane Keogh noted that in order to assess the contribution of motor vehicles to particle emission levels, it is critical that the full size range of particles, including ultrafine particles, be measured and monitored.

There are currently no ambient air quality standards for ultrafine particulate matter internationally, and no standardised approach to monitoring. This item was not agreed, however it was noted that this is an area of research and future consideration by EPA Victoria.

26. *No ultrafine particle inventory or modelling for roads, ramps or tunnels has been done or is planned*

Refer to Item 13.

27. *The latest background data from the Footscray monitoring station has not been used in the AQIA. The data used was for 2009-2013, and this time period is not representative of current pollution levels. Background data for Footscray is available for 2013-2017 at the Victorian EPA*

The years 2009 to 2013 were used as they represent the most recent complete and continuous datasets of PM_{10}, $PM_{2.5}$, CO and NO_2 concentrations. The $PM_{2.5}$ monitoring method was changed in 2014. The general

consensus is that air quality is set to improve over next decade, therefore using 2009 to 2013 data to represent the background concentrations in 2022 and 2031 can be considered conservative. This item was agreed by Iain Cowan, Frank Fleer, Graeme Starke and Paul Torre, but not agreed by Diane Keogh.

28. *Victorian motor vehicle fleet data used in the modelling was out of date e.g., 2010 and 2012 which is not representative of the current fleet*

2010 ADR fleet data provided by Robin Smit was used to generate the COPERT Australia emission factors. This data was not provided by ABS. The data is weighted towards older technology and can therefore be considered conservative for assessing impacts in 2022 and 2031. This item was not agreed by Diane Keogh

29. *The percentage of HDVs used in the modelling is not stated*

The percentage of HCVs (for each hour for each Scenario) can be calculated simply from the fleet data in the appendices to EES Technical Report G.

30. *In line with GHD's comment in their peer review, the NO_2 to NO_x ratio used in the modelling should be reviewed as to its suitability and relevance for Australian conditions*

The rationale behind the NO_2 to NO_x ratio is described in the report. The GHD report does not state that the NO_2 to NO_x ratio used in the modelling should be reviewed as to its suitability and relevance for Australian conditions. What is actually stated is that the "*emission factor is derived from two conservative methodologies of the PIARC NO_x worst-case assumption and a relatively high (constant) NO_2 to NO_x ratio*". What GHD then recommends is that "*future modelling of road tunnel projects could benefit by considering an NO_2 to NO_x ratio that varies with NO_x concentration*", in order to provide a less conservative assessment.

Maximum tunnel ventilation stack contributions (Scenario B) of NO_2 were equal to 1% of the criterion and as such increasing this ratio would make no material difference. Preliminary data from roadside monitoring AAQMS at Primula Avenue has an average concentration similar to that predicted at roadside locations along the West Gate Freeway suggesting that the factor of 15% is appropriate. This item was not agreed by Diane Keogh.

31. *No measurement data has been presented for comparison purposes to assess model skill outputs*

Not in the scope of work to validate the model. Frank Fleer and Paul Torre noted that this is not required for the West Gate Tunnel Project air quality impact assessment.

32. *Data from the 5 temporary monitoring stations, including at the Donald McLean Reserve, need to be made publicly available online through the Victorian EPA*

    In summary, the $PM_{2.5}$ and PM_{10} particulate matter modelling in the Air Quality Impact Assessment needs to be redone using appropriate, real world, size-segregated $PM_{2.5}$ and PM_{10} emissions for different vehicle types that are relevant to the different environments being modelled (in-tunnel, at stack, on ramps and surface roads). More recent background monitoring data from the Footscray monitoring station and Victorian vehicle fleet data also needs to be used in the remodelling.

The method of reporting ambient air quality data from the West Gate Tunnel Project AAQMSs is the responsibility of the Western Distributor Authority, however Appendix H of EES Technical Report G includes Environmental Performance Requirement AQP4, which notes that monitoring results will be made publicly available. This item was not agreed by Diane Keogh.

33. *Insufficient specific mitigation strategies are outlined or planned – need monitoring for this. However agree that potential mitigation plans need to be prepared upfront.*

EES Technical Report G lists a significant number of mitigation strategies, with further detail to be provided in the Construction Environmental Management Plan once detailed project design is completed. This item was not agreed.

34. No permanent particulate matter monitoring is planned

Appendix H of EES Technical Report G includes Environmental Performance Requirement AQP4 which notes that ambient air quality monitoring will be undertaken for five years post opening of the Freeway, or such lessor period as agreed with EPA Victoria.

35. Air quality monitoring should be carried out pre and post construction, and on a regular basis, and include campaigns for $PM_{2.5}$, PM_{10}, ultrafine particles and black carbon

It was agreed that ambient air quality monitoring of PM_{10} and $PM_{2.5}$ for five years post project completion was appropriate.

36. An Air Quality Community Consultative Committee needs to be established

A Community Consultative Committee doesn't have the powers suggested by Diane Keogh in her expert witness statement, but could assist in the dissemination and explanation of information to the community. On this basis there was agreement that a Community Consultative Committee would be of value.

37. A project be funded to develop a best estimate for preventative limitation of emissions guideline for ultrafine particle emissions (in the absence of an ambient or in-tunnel guideline or standard) for use when reviewing results of monitoring and measurement campaigns to advance scientific knowledge and aid future epidemiological studies

Frank Fleer and Paul Torre noted that this is not required for the West Gate Tunnel Project air quality impact assessment.

38. The industrial land at Simcock Ave, Spotswood should be rehabilitated to green space to offset the loss of green space at the Donald McLean Reserve due to the construction of the Hyde Street truck ramp right next to the Reserve

This item is not relevant to the air quality impact assessment.

39. There are risks to human health only relying on in-tunnel fans to disperse pollution and people to wind up their windows. Filtration is needed in the tunnels and covered bikeway

Whilst in-tunnel conditions are not part of the scope of the air quality impact assessment, the EES Technical Report G suggests CO and NO_2 in-tunnel air quality criteria. There are no short-term in-tunnel standards for particulate matter. Time spent in tunnel is likely to be of the order of minutes, not hours or days. This item was not agreed.

40. No special mitigation is planned to reduce diesel exhaust generated from the Hyde Street truck ramp which will be used by a likely high polluting diesel truck fleet. In 2016 in terms of vehicle kilometres travelled, less than half the trucks registered in Victoria were Euro V compliant (basis of the current Australian standard).

This is restating the expert's witness statement.

41. Diesel exhaust causes lung cancer and people using the Donald McLean Reserve (right next to the ramp) and children aged 3-5 years attending the Emma McLean Kindergarten (200m from the ramp), who can spend up to 10 hours per day outside, are at risk of exposure. Planting suitable vegetation, installing of fixed barriers, measurement studies at sensitive land use locations, and studies of children's health at the Kindergarten need to be undertaken. Reviews should be undertaken of all sensitive land use areas within 300-500 metres to assess potential health risks

There is unlikely to be any significant impact at a distance of 200 m from the West Gate Freeway. Buffer distances for dangerous goods transport are not relevant to the air quality impact assessment. Whilst it is acknowledged that there is no lower limit on health effects of $PM_{2.5}$, existing air quality standards relate to what is acceptable to the community. This item was not agreed by Diane Keogh.

42. *A report is needed from the Project on the specific contribution of the truck fleet to all modelled pollution levels, in all environments*

The air quality impact assessment is aimed at considering the impact of all vehicles. This item was not agreed by Diane Keogh.

43. *An anti-idling policy needs to be introduced and enforced during the construction phase*

Agreed, but on a time of idling basis.

44. *Truck ramps should be fitted with a full deluge system (to cope with spills and accidents) as they will be located too close to sensitive land use areas in Spotswood and will generate diesel exhaust*

Not relevant to the air quality impact assessment.

45. *Legislation is needed in Victoria to prescribe or recommend buffer distances of 300-500 m for sensitive populations from busy roads carrying, eg. more than 50,000 or 100,000 vehicles per day*

Not relevant to the air quality impact assessment.

46. *Air quality standards need to be developed for $PM_{2.5}$ and PM_{10} emissions in tunnels by the Victorian EPA.*

Existing ambient air quality standards for PM_{10} and $PM_{2.5}$ pertain to 24 hour and annual average concentrations. Frank Fleer and Paul Torre noted that this is not required for the West Gate Tunnel Project air quality impact assessment.

47. *High polluting trucks and vehicles should be alerted as to their behaviour using remote sensing campaigns; and a system devised to fine diesel drivers who are high polluters*

    In summary, there are insufficient mitigation and monitoring strategies planned for this Project which will increase pollution levels in a region that already exceeds, on occasion, ambient air quality standards for $PM_{2.5}$ and PM_{10}, when no exceedances of these standards are permitted in Victoria.

Remote sensing campaigns are not relevant to the air quality impact assessment.

48. It was noted by Diane Keogh during the conclave that ozone modelling was not conducted. Paul Torre noted that modelling for ozone is not required for specific road projects such as the West Gate Tunnel Project because ozone formation is complex, involving the reaction of numerous air pollutants across the Regional Melbourne air-shed rather than near roads.

5.0 EXPERTS STATEMENT

The following agree that this document is a fair and accurate summary of what occurred at the Air Quality Expert Conclave on 10 August 2017:

Iain Cowan

Frank Fleer

Diane Keogh

Graeme Starke

Paul Torre

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