



Health

Mr Marcus Ray  
Deputy Group Secretary Planning and Assessment  
Department of Planning, Industry and Environment  
GPO Box 390  
Sydney NSW 2001

Our ref H20/144091

Dear Mr Ray

**Beaches Link and Gore Hill Freeway Connection (Beaches Link Project): Statement on potential health impacts of emissions from road tunnel ventilation stacks**

I have previously provided a statement on potential health impacts of emissions from road tunnel ventilation stacks for the Western Harbour Tunnel and Beaches Link project on 8 November 2019. Since then further refinements were undertaken for the Beaches Link project and additional assessments relating to air quality and human health impacts were carried out.

NSW Health notes the design refinements for this project and reviewed the technical working papers relating to air quality and human health risk assessment of the Environmental Impact Statement (EIS). NSW Health focussed on the project's ventilation stack impacts on outdoor air quality.

NSW Health has also received a report from independent expert members of the NSW Advisory Committee on Tunnel Air Quality who have appraised the technical working paper on air quality.

In summary, the contribution of tunnel ventilation stacks remains relatively small compared to the contribution of emissions from traffic on surface roads and other background sources. The assessments show an improvement in air quality for many local areas, given future traffic predictions. It is important, however, that the tunnel ventilation system is operated to keep ground-level concentrations of traffic-related air pollutants as low as reasonably practicable.

**Advice from independent expert members of the NSW Advisory Committee on Tunnel Air Quality**

The NSW Advisory Committee on Tunnel Air Quality's independent experts report that they have considered the methodology of the air quality assessments and that it is sound and represents best practice. However, they noted that the emissions modelling for in-tunnel traffic using European Handbook Emission Factors for Road Transport (HBEFA) Version 3.3 may have underestimated the in-tunnel NO<sub>x</sub> emissions as the approach does not consider emission deterioration beyond the 150,000 km vehicle age. However, it is also noted that incorporation of these deterioration factors in the emission modelling would not affect the air concentrations of NO<sub>2</sub> in the tunnel so as to exceed the adopted Air Quality Criteria for NO<sub>2</sub>.

**Health effects of traffic-related air pollution**

Vehicles emit a number of air pollutants including carbon monoxide, nitrogen oxide, particulate matter and volatile organic compounds. The pollutants most likely to have an important health



impact are particulate matter less than 2.5 micrometres in diameter (PM<sub>2.5</sub>) and nitrogen dioxide (NO<sub>2</sub>), which forms from nitrogen oxide in the atmosphere.

PM<sub>2.5</sub> is a mixture of solid and liquid chemicals produced by natural processes and human activity. It is always present in the environment. The national standard for annual average PM<sub>2.5</sub> is 8 µg/m<sup>3</sup>. In Sydney, the concentration of PM<sub>2.5</sub> at air quality monitoring stations used to assess compliance with the national standard ranges from about 7.5 µg/m<sup>3</sup> in Richmond to about 9 µg/m<sup>3</sup> in Liverpool.

Authoritative groups such as the World Health Organization and the United States Environmental Protection Agency have reviewed the evidence of the health effects of PM<sub>2.5</sub> and NO<sub>2</sub>. There is very good evidence that PM<sub>2.5</sub> causes heart and lung disease, reducing people's life expectancy and leading to hospital admissions. The International Agency for Research on Cancer has determined that PM<sub>2.5</sub> causes cancer. Exposure to PM<sub>2.5</sub> is also associated with a number of other effects. Sydney's air quality is very good compared to air quality in most other cities. However, there is evidence that PM<sub>2.5</sub> has health effects at the relatively low concentrations that are observed in Sydney.

The evidence of health effects of ambient PM<sub>2.5</sub> is largely derived from broad scale epidemiological studies of adults where PM<sub>2.5</sub> comes from a wide variety of sources. The findings of these studies have been used in health impact assessment to estimate population-level effects in groups with similar demographic and health profiles to the participants of epidemiological studies. However, there is substantial uncertainty in translating the quantitative findings of population-level epidemiological studies to individuals, specific locations, or to specific sources of PM<sub>2.5</sub>.

Vehicles are the primary source of NO<sub>2</sub> and so NO<sub>2</sub> is a good indicator of traffic related pollution. The national standard for annual average NO<sub>2</sub> is approximately 60 µg/m<sup>3</sup>. In Sydney, the concentration of NO<sub>2</sub> at air quality monitoring stations used to assess compliance with the national standard ranges from about 8 µg/m<sup>3</sup> in Richmond to about 25 µg/m<sup>3</sup> in Chullora.

Exposure to NO<sub>2</sub> is also associated with respiratory and cardiovascular health effects. There is consensus that short-term exposure to NO<sub>2</sub> (generally measured as a 24hr average) causes respiratory illness. However, as NO<sub>2</sub> levels tend to be closely correlated with PM<sub>2.5</sub> and other pollutants emitted from vehicles, scientific studies have produced uncertain results as to how much NO<sub>2</sub> actually causes observed effects, independent of exposure to PM<sub>2.5</sub> and other traffic-related pollutants.

### **Ground-level air pollution concentrations related to reassessment of air quality and refinements to the Beaches Link project**

In situations where tunnel air pollution is at the maximum level permissible under tunnel air quality regulations, the contribution of emissions from ventilation stacks to nitrogen dioxide (NO<sub>2</sub>) concentrations averaged over one hour can be substantial. However, such circumstances tend to occur when contributions to NO<sub>2</sub> from other sources, including surface roads, are lower and it is predicted that the maximum one-hour NO<sub>2</sub> concentration will remain below National Environment Protection Measure standards. The maximum one-hour NO<sub>2</sub> concentrations during the year at locations in the vicinity of ventilation stacks are actually predicted to occur during periods when the ventilation stack emission contributions are zero or close to zero. That is, maximum one-hour averaged NO<sub>2</sub> concentrations are predicted to result from emission sources other than ventilation stacks.

Regarding PM<sub>2.5</sub> attributable to ventilation stacks, in situations where tunnel air pollution is at the maximum permissible under tunnel air quality regulations, the highest contribution at any location is predicted to be 0.90 and 7.85 µg/m<sup>3</sup> for annual and maximum 24-hour PM<sub>2.5</sub>, respectively. Under expected traffic scenarios the highest contribution at any location is predicted to be 0.18 and 1.09 µg/m<sup>3</sup> for annual and maximum 24-hour PM<sub>2.5</sub>, respectively.

For PM<sub>2.5</sub>, any exceedances of National Environment Protection Measure standards at locations in the vicinity of ventilation stacks would be dominated by emission sources other than the ventilation stacks.

In conclusion, the reassessment of air quality and the refinements to the Beaches Link project has predicted minor changes in the impact of emissions from tunnel ventilation stacks compared to that which NSW Health had previously reviewed. The contribution of tunnel ventilation stacks remains relatively small compared to the contribution of emissions from traffic on surface roads and other background sources. The assessments show an improvement in air quality for many local areas, given future traffic predictions. It is important that the tunnel ventilation system is operated to keep ground-level concentrations of traffic-related air pollutants as low as reasonably practicable.

Yours sincerely



Dr Kerry Chant PSM  
**Chief Health Officer and Deputy Secretary  
Population and Public Health**

4/12/20