NSW GOVERNMENT | Health

Mr Marcus Ray
Deputy Group Secretary Planning & Assessment
Department of Planning, Industry and Environment
GPO Box 390
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Our ref H19/122645

Dear Mr Ray

Western Harbour Tunnel and Beaches Link and Gore Hill Freeway Connection: Statement on potential health impacts of emissions from road tunnel ventilation stacks

NSW Health has reviewed the draft air quality assessment and draft human health risk assessment of the Environmental Impact Statement (EIS) for the two projects in relation to the impacts of the ventilation stacks 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 draft air quality assessments.

The draft EISs show that the contribution of tunnel ventilation stacks to ground-level air pollution concentrations will be relatively small compared to the contribution of emissions from traffic on surface roads and other background sources. The draft EISs also predict that stack-related concentrations may be mitigated to varying degrees by reductions in emissions from surface traffic. The assessments show an improvement in air quality for many local areas, although it should be noted that these improvements are dependent on future traffic predictions. The tunnel ventilation system offers an opportunity to manage outdoor air quality and so it is important for the proponent to demonstrate the design of the system keeps ground-level concentrations 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 assumes Euro 6 engine standards were adopted in Australia from 2019, which has not been the case. The experts advised that this could lead to underestimation of emissions from ventilation stacks and that this should be addressed in the EIS.

In response to these concerns, the proponent conducted an additional analysis that showed in-tunnel emissions of nitrogen oxide and nitrogen dioxide may be 20% higher than predicted in the EIS. The analysis showed the assumption had no effect on estimated particulate matter emissions.

The NSW Advisory Committee on Tunnel Air Quality's independent experts have reviewed the proponent's additional analysis and advised NSW Health that its findings are plausible. Further, they advised that, because the Euro 6 assumption only applied to in-tunnel emissions, the effect of underestimation is limited to estimates of stack and portal emissions.

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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 ($PM_{2.5}$) and nitrogen dioxide (NO_2), which forms from nitrogen oxide in the atmosphere.

$PM_{2.5}$ 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 $PM_{2.5}$ is 8 $\mu g/m^3$. In Sydney, the concentration of $PM_{2.5}$ at air quality monitoring stations used to assess compliance with the national standard ranges from about 7.5 $\mu g/m^3$ in Richmond to about 9 $\mu g/m^3$ 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 $PM_{2.5}$ and NO_2. There is very good evidence that $PM_{2.5}$ 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 $PM_{2.5}$ causes cancer. Exposure to $PM_{2.5}$ 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 $PM_{2.5}$ has health effects at the relatively low concentrations that are observed in Sydney.

The evidence of health effects of ambient $PM_{2.5}$ is largely derived from broad scale epidemiological studies of adults where $PM_{2.5}$ 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 $PM_{2.5}$.

Vehicles are the primary source of NO_2 and so NO_2 is a good indicator of traffic related pollution. The national standard for annual average NO_2 is approximately 60 $\mu g/m^3$. In Sydney, the concentration of NO_2 at air quality monitoring stations used to assess compliance with the national standard ranges from about 8 $\mu g/m^3$ in Richmond to about 25 $\mu g/m^3$ in Chullora.

Exposure to NO_2 is also associated with respiratory and cardiovascular health effects. There is consensus that short-term exposure to NO_2 (generally measured as a 24hr average) causes respiratory illness. However, as NO_2 levels tend to be closely correlated with $PM_{2.5}$ and other pollutants emitted from vehicles, scientific studies have produced uncertain results as to how much NO_2 actually causes observed effects, independent of exposure to PM2.5 and other traffic-related pollutants.

Project-related changes in emissions of air pollution

The EISs predict that emissions from vehicle will decline over the next 20 years, whether or not the tunnels are built. If the tunnels are not built, nitrogen oxide emissions are expected to fall by 52% by 2037 and $PM_{2.5}$ emissions will fall by 21%, compared to emissions in 2016. This is because engines become less polluting as technology improves. If both tunnels are built, it is predicted that emissions of nitrogen oxide and $PM_{2.5}$ will fall by 49% and 16% respectively. The declines in emissions are smaller because construction of the tunnels is expected to increase the distances people travel in cars and trucks.

Project-related changes in ground-level air pollution concentrations

The EISs predict that construction of the tunnels will lead to a reduction in traffic on most surface roads, although there are increases on some roads that feed into the tunnels. Air

pollution released by vehicles using the tunnels will be emitted through five ventilation stacks. The redistribution of traffic and emission of air pollution through ventilation stacks are predicted to cause changes in ground-level air pollution concentrations.

Emitting traffic-related air pollution through ventilation stacks has the potential to improve dispersion in the atmosphere and reduce ground-level concentrations compared to emission of air pollution by vehicles on surface roads.

The EISs provide estimates of the changes in concentration at 42 sensitive locations (childcare centres, schools and healthcare facilities) and 35,000 other "residential, workplace and recreational" locations with and without construction of the tunnels. Information is presented about the concentration from ventilation stacks, surface roads and other background sources.

Focusing on $PM_{2.5}$ at the 42 sensitive locations, $PM_{2.5}$ levels are expected to be higher at 15 locations in 2037 than they would be without construction of the tunnels, with a range from 0 $\mu g/m^3$ (0.1%) higher to 0.18 $\mu g/m^{3*}$ (2.2%) higher. Levels are expected to be lower at 27 locations, with a range from 0 $\mu g/m^3$ (0.1%) lower to 0.96 $\mu g/m^{3*}$ (9.2%) lower.

The sensitive location predicted to have a 2.2% higher concentration was in Annandale, with a concentration of 8 $\mu g/m^3$ without tunnels and 8.2 $\mu g/m^{3*}$ with the tunnels. The sensitive location predicted to have a 9.2% lower concentration was close to Manly Road in Seaforth with a concentration of 10.5 $\mu g/m^3$ without tunnels and 9.5 $\mu g/m^{3*}$ with the tunnels.

In regard to $PM_{2.5}$ attributable to ventilation stacks, the EISs predict that the annual average stack-related ground-level $PM_{2.5}$ concentration at the most affected sensitive location will be 0.1 $\mu g/m^3$ in 2037. Without the proposed tunnels, the maximum contribution of $PM_{2.5}$ from existing ventilation stacks of other Sydney tunnels is predicted to be 0.05 $\mu g/m^3$.

For NO_2, the contribution at the most affected sensitive location is 0.43 $\mu g/m^3$ compared to 0.13 $\mu g/m^3$ without construction of the tunnels. Noting the advice of the independent experts that emissions of NO_2, these values may be underestimated by 20%.

Overall, the draft EISs predict that the contribution of tunnel ventilation stacks is relatively small compared to the contribution of emissions from traffic on surface roads and other background sources. The draft EISs also predict that stack-related concentrations may be mitigated to varying degrees by reductions in emissions from surface traffic. The assessments show an improvement in air quality for many local areas, although it should be noted that these improvements are dependent on future traffic predictions. The tunnel ventilation system offers an opportunity to manage outdoor air quality and so it is important for the proponent to demonstrate the design of the system keeps ground-level concentrations as low as reasonably practicable.

Yours sincerely

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Chief Health Officer and Deputy Secretary
Population and Public Health
8/11/19

*Inconsistencies are due to rounding in the EIS