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Dear Andrew

Dispersion Modelling Results - NorthConnex Northern Ventilation Outlet Constant VOC Emissions Modelling Scenario (4mg/m³)

The NorthConnex tunnel air quality impact assessment was undertaken between November 2013 and December 2014. Following completion of the Environmental Impact Statement (EIS) and the subsequent Supplementary Preferred Infrastructure Report (SPIR), a range of small additional dispersion modelling activities were required to assist NSW Roads and Maritime Services (RMS) with setting project specific emissions limits and ensuring the ventilation outlets comply with the Department of Planning and Environment's conditions of consent.

Supplementary modelling was undertaken for the northern ventilation outlet post completion of the SPIR and after receipt of the development consent conditions to examine the model predictions with an increased stack elevation to match the preferred tender design plus five metres stack elevation (200.8mAHD). As the results for the Northern Outlet were higher than those for the Southern Outlet (as shown in the SPIR), compliance achieved for the northern outlet infers compliance for the southern outlet.

The following letter reports on the findings of a modelling exercise which examined the level of compliance associated with the Northern Ventilation outlet operating at a total volatile organic compound (VOC) concentration of 4mg/m³. The dispersion modelling assumptions accompanying the modelling at a stack emission limit of 4mg/m³ were as follows:

- Dispersion model scenarios run for 2009, 2010 and 2011 meteorological data sets were used to assess the predicted operational impacts in 2019 (opening year) and 2029 (10 years after opening year).
- The scenarios modelled were defined in the SPIR as Design Scenario B, which consisted of constant pollutant emissions concentration for the tunnel under all operational conditions.
- Predictions have been made for total Polycyclic aromatic hydrocarbons (PAH) (as Benzo[a]Pyrene or BaP), benzene, toluene, xylene, 1-butadiene, acetaldehyde, formaldehyde and the results of the modelling assessed against the NSW Environment Protection Authority (EPA) criteria sourced from the NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.
- All model assumptions and stack parameters were the same as for the SPIR with the exception of stack height. The stack height above ground level assessed was 26.63m to align with the stack height being 20m above the level of Woonona Avenue and an ultimate elevation of 200.8mAHD (as per the development approval level).
- Constant VOC emission concentration of 4mg/m³.
- PAH concentration assumed to be 0.000741mg/m³ (calculated using the same ratio as the increased VOC limit calculations).

The results of the dispersion modelling are shown in **Tables 1 – 3**.

Table 1 Total PAH Results - Design Scenario B (2019 and 2029)

Scenario	Design Scenario B (2019)			Design Scenario B (2029)		
Pollutant	PAH (as BaP)			PAH (as BaP)		
Averaging Period	1 Hr 99.9 th Percentile			1 Hr 99.9 th Percentile		
Modelled year	2009	2010	2011	2009	2010	2011
Maximum	0.0031	0.0030	0.0038	0.0042	0.0032	0.0042
Criterion	0.4			0.4		

Table 2 Speciated VOC Results - Design Scenario B (2019)

Scenario	Design Scenario B (2019)								
Pollutant	1,3-butadiene			acetaldehyde			benzene		
Averaging Period	1 Hr 99.9 th Percentile								
Modelled year	2009	2010	2011	2009	2010	2011	2009	2010	2011
Maximum	0.15	0.15	0.19	0.35	0.34	0.43	0.55	0.53	0.68
Criteria	40			42			29		
Pollutant	formaldehyde			xylenes			toluene		
Averaging Period	1 Hr 99.9 th Percentile								
Modelled year	2009	2010	2011	2009	2010	2011	2009	2010	2011
Maximum	0.81	0.78	1.01	0.76	0.73	0.95	0.93	0.89	1.16
Criteria	20			190			360		

Table 3 Speciated VOC Results - Design Scenario B (2029)

Scenario	Design Scenario B (2029)								
Pollutant	1,3-butadiene			acetaldehyde			benzene		
Averaging Period	1 Hr 99.9 th Percentile								
Modelled year	2009	2010	2011	2009	2010	2011	2009	2010	2011
Maximum	0.23	0.18	0.23	0.37	0.28	0.36	0.87	0.67	0.86
Criteria	40			42			29		
Pollutant	formaldehyde			xylenes			toluene		
Averaging Period	1 Hr 99.9 th Percentile								
Modelled year	2009	2010	2011	2009	2010	2011	2009	2010	2011
Maximum	0.89	0.68	0.88	1.26	0.96	1.24	1.53	1.18	1.52
Criteria	20			190			360		

Based on the results presented above, it is predicted that operating the ventilation outlet at 4mg/m³ would result in no exceedances of any of the speciated VOC's or for PAH (as BaP).

If you have any questions about any of the above, please let me know.

Yours faithfully

Principal Engineer
David Rollings