

## Peer review of

### Air Quality Analysis of NSW Tunnel Data — Published: February 18, 2025

This updated report addresses almost all the points raised in my initial peer review. The expanded explanations of how to interpret the various types of plots are clear. The analysis of the air quality data is far more extensive and provides a stronger case that there is no clear evidence in the ambient monitoring data of tunnel vent impacts, apart from at the M5 Jackson site. At this site, “the isolation of the signal that is potentially associated with the tunnel vents indicates a contribution to NO<sub>x</sub> concentrations of only a few percent (<1 µg m<sup>-3</sup>)”.

#### Comments/Corrections

1. The cluster analysis of the Jackson site in Section 2.1 shows that cluster 1 in the direction of the tunnel vent contributes 6.3% of the overall NO<sub>x</sub> concentration. The report states that subtracting background contributions would likely reduce the possible tunnel vent contribution to below 3% of the overall NO<sub>x</sub> concentration, namely less than 1 µg m<sup>-3</sup>. This seems to me to be a reasonable assumption, but as it is the basis for a key finding of the report, it should be justified in the report. (noted in initial peer review).

Additional text has been added to describe the calculation:

This calculation is based on a background concentration of 8 µg/m<sup>3</sup>, which gives an average increment above background of 3.5 µg /m<sup>3</sup> for the potential stack contribution i.e. only about 30% of the NO<sub>x</sub> concentration for the cluster associated with the vent stack;  $0.3 * 6.3\% = 2\%$ .

2. Section 1.2.2, after third para. Add a note that all percentile plots in the report show the data from the full periods shown in the data tables. Done (and also for polar plots as mentioned in point 8 below).
3. Section 1.2.3, second para, third last sentence. Insert “are” after “which”. Done
4. Figure 3 caption. Insert “in m s<sup>-1</sup>” after “Wind speed”. Done
5. Section 1.2.4, second sentence. Correct “that” to “what”. Done
6. Last sentence before Table 1. Note that both the Flatrock and Botany sites have much higher mean NO<sub>x</sub> concentrations than the other sites. Done
7. Table 1, last line. For completeness, add “The tunnel opened in 2001.” Done
8. The polar plots of NO<sub>x</sub> (and also NO<sub>x</sub> with background subtracted) include all the data from both before and after the tunnel opening. This was confirmed in the report author’s response to my initial review. This should be stated in the report because the percentage of data from before the tunnel openings ranges up to 70% of the total data period used (M5E 0%, NCX 35%, M8 35%, M4E 43%, Rozelle 70%, M4-M5 Link 45%). Much of the discussion about these plots concerns whether or not there is any evidence of contributions from the vent stack emissions. Because of overall changes in traffic flows after the tunnels open, including all data could possibly confuse any vent stack signal in

these plots. Fortunately, the report also includes polar plots of the before-after differences. [Done](#)

9. The NO<sub>x</sub> concentration colour scales in Figure 6, etc are washed out compared to the polar plots themselves, so that it is difficult to estimate concentrations from the figures. The scale seems to be more transparent than the polar plots. (noted in initial peer review) [Done](#)
10. First sentence of para before Figure 12 (wind roses). Add at end of sentence “for the full period listed in Table 3.” Similarly for the other tunnel areas, i.e. in the para before Figures 21, 29, 39, 45, and 52. [Done](#)  
Figure 45 is currently not cited in the text. [Done](#)
11. First para after Figure 13, last sentence. The meaning would be clear by changing “to extract” to “that extracts”. [Done](#)
12. Second para after Figure 13, last sentence. The meaning would be clearer by changing the part after the comma to “its overall contribution to NO<sub>x</sub> concentrations (after subtracting background contributions) would likely be below 3% (i.e. < 1 µg m<sup>-3</sup>) of the overall ...” [Done](#)
13. First para after Figure 17. Third sentence. Correct “Th” to “The”. [Done](#)  
Fourth sentence. Delete “that”. Add close bracket at end of sentence. [Done](#)
14. Figure 18. The sentence before the Figure should be included in the para after the Figure. [Done](#)
15. Second last sentence of para after Figure 19 is incorrect. As it stands, it would mean that a reduction after the tunnel opening would produce a positive number. It should read “These plots show the **before** tunnel data subtracted from the **after** tunnel opening data.” [Done](#)
16. Similarly, in the caption for Figure 22, the “before-after” terminology is confusing. Better to be explicit like in the caption to Figure 23.  
This also applies in the captions for Figures 30 and 41. [Done](#)
17. In the discussion of the difference plots between two sites, such as Figure 23, which shows Carden Park minus James Park, the text correctly says that positive concentration values in the direction of the tunnel vents might indicate a potential tunnel impact at the Carden site. Equally, it should be noted that negative concentration values in the direction of the tunnel vents from the James Park site might indicate a potential tunnel impact at the James Park site. [This is true but I think it could be confusing to discuss this point – where differences have been considered, they are set up in a way that a positive contribution could represent a stack impact.](#)
18. For the polar plot differences between pairs of sites, state whether all the data was used or just the after-tunnel-opening data? [Mentioned earlier when introducing polar plots.](#)
19. Section 4, first para before Figure 25. Mean NO<sub>x</sub> concentrations of 30-60 µg m<sup>-3</sup> are up to double those of sites discussed in previous sections, which adds to the challenge of detecting small contributions from tunnel vents. [Done](#)
20. Para before Figure 26. Correct “NO<sub>2</sub>” to “NO<sub>x</sub>”. The highest mean NO<sub>x</sub> concentrations are at Kingsgrove 1, which is very close to the freeway. [Done](#)

21. Dot points under Figure 30. Delete “kingsgrove-kingsgrove” in first dot point. Delete “to” in the last line of each dot point. Done  
 Second dot point. Add more nuanced discussion. There is a region of positive values in the direction of the tunnel for wind speeds of 6-11 m s<sup>-1</sup> but not at higher wind speeds. As discussed in Section 1.2.3 is more characteristic of a near-surface source than an elevated vent stack. The pattern is not like that seen at the Jackson site in Figures 13 and Figure 15. Added
22. Figure 32 caption is incorrect. It should refer to the Arncliffe sites. Done
23. Table 5. The latitude of the Powells Creek site appears to be incorrect; it is probably -33.8649° but there are inconsistencies between different Westconnex air quality monitoring reports. Noted
24. Para before Figure 36. The mean NO<sub>x</sub> concentrations of 40-80 µg m<sup>-3</sup> are again higher than in earlier sections, which adds to the challenge of detecting small contributions from tunnel vents. Added comment
25. Para before Table 6. Note that the mean NO<sub>x</sub> concentration at Chapman Road (52.8 µg m<sup>-3</sup>) is close to double those at the other three sites, one of which is only 700 m away. This adds evidence that Chapman Road NO<sub>x</sub> is strongly affected by emissions from nearby roads. Done
26. Para before Figure 46, second sentence. Be explicit about the short time series - only 5 months of data after the tunnel opening and 12 months beforehand. This could be a limitation of the analysis if there are seasonal variations in winds. Done
27. Table 7. For completeness, add the tunnel opening date of 20 January 2023 in the last line of the table. Done
28. First sentence of para before Figure 49. Correct “south-east” to “south-west”. Done

4<sup>th</sup> March 2025