

Appendix 6.5 – Model Verification

Nitrogen Dioxide

Most nitrogen dioxide (NO₂) is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions. Verification of concentrations predicted by the ADMS-Roads model has followed the methodology presented in TG22.

Modelled 2024 annual mean concentrations of NO₂ have been compared with the concentration measured by the roadside diffusion tubes in Pickwick and Melksham (37 and 44). These sites are located adjacent to the A4 and A350 and are considered most representative of the roads affected by traffic generated by the Proposed Development.

The measured NO₂ concentrations have been converted into an equivalent measured road-NO_x concentrations using the Defra NO_x from NO₂ calculator and the relevant 2024 mapped annual mean background NO₂ concentrations (see Table 6.13). A comparison of the measured and modelled road-NO_x concentrations is presented in Figure 6.5A.

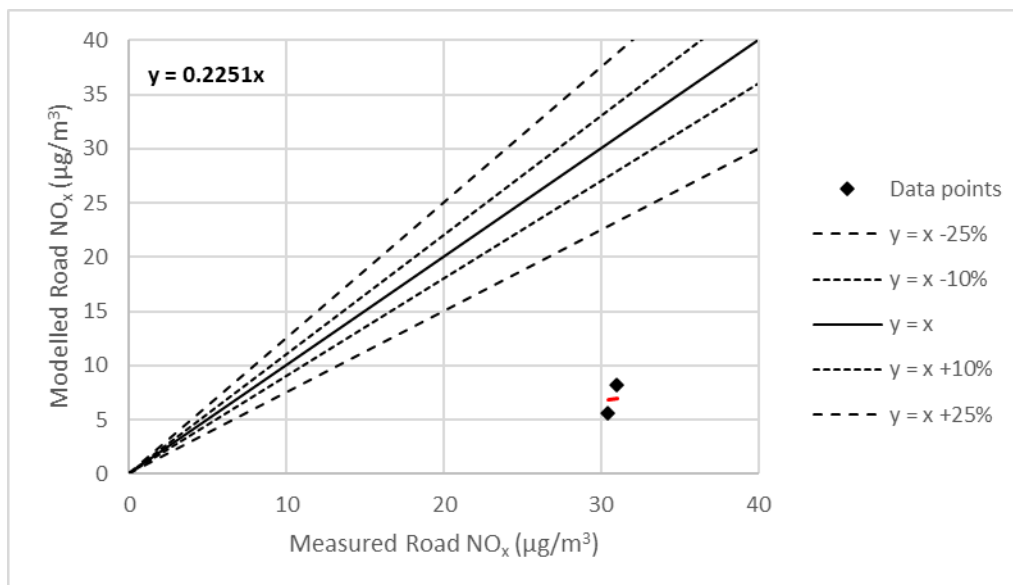


Figure 6.5A: Modelled Road-NO_x and Measured Road-NO_x Concentrations

A primary adjustment factor is determined as the ratio between the measured road-NO_x contribution and the model derived road-NO_x contribution, forced through zero ($1/0.2251 = 4.5$). This factor is applied to the modelled road-NO_x concentration for each monitoring location to provide an adjusted modelled road-NO_x concentration. An equivalent adjusted road-NO₂ concentration is then calculated using the Defra NO_x to NO₂ calculator, which can be added to the background to provide an adjusted modelled NO₂ concentration. A comparison between the adjusted modelled NO₂ concentration and the measured NO₂ concentration at each monitoring location is presented in Figure 6.5B.

The average performance of the model can be expressed as the Root Mean Square Error (RMSE), which in accordance with LAQM.TG22 should ideally be less than 10% of the relevant air quality standard (in this case, the annual mean NO₂ objective of 40 µg/m³). The RMSE for the comparison of the modelled and measured NO₂ concentrations is 2.2 µg/m³, 5.6% of the air quality objective. On this basis the modelled concentrations are considered to provide an acceptable estimate of local air quality and further adjustment is not required.

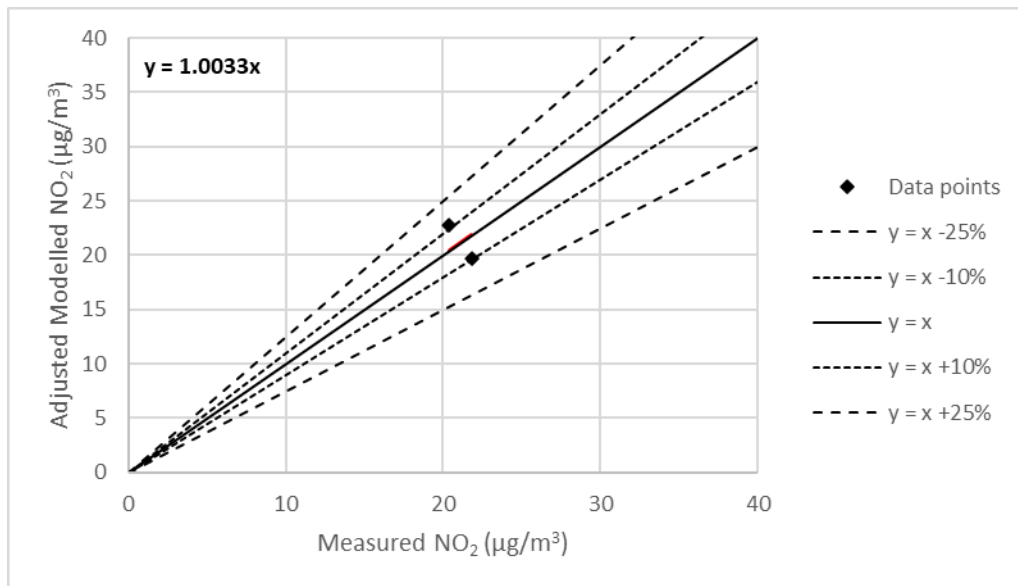


Figure 6.5B: Modelled Road-NO_x and Measured Road-NO_x Concentrations

Particulate Matter

In the absence of a particulate monitoring site for verification purposes, the derived primary adjustment factor has also been applied to the modelled road-PM₁₀ and road-PM_{2.5} concentrations, in accordance with LAQM.TG22.