APPENDIX 12.1 – VERIFICATION

Nitrogen Dioxide

Most nitrogen dioxide 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 emission of nitrogen oxides ($NO_x = NO + NO_2$). The model has been run to predict the 2016 annual mean road-NOx contribution at two roadside diffusion tubes (identified in **Table 12.11**).

The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was calculated from the measured NO_2 concentrations and the adjusted background NO_2 concentrations within the NO_x from NO_2 calculator.

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (**Figure 12.1.1**). This factor was then applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO_2 concentration within the NO_x from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (**Figure 12.1.2**).

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary adjustment factor: 1.7523

Secondary adjustment factor: 1.0007

The results imply that overall, the model was under-predicting the road-NOx contribution. This is a common experience with this and most other models. The final NO_2 adjustment is minor.

Figure 12.1.3 compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_2, and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line. All of the monitoring sites lie within the ±25% line.
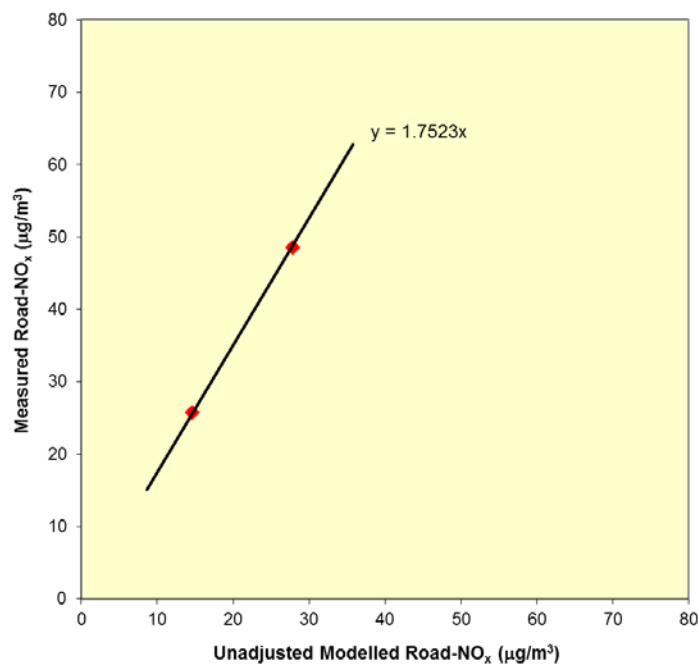
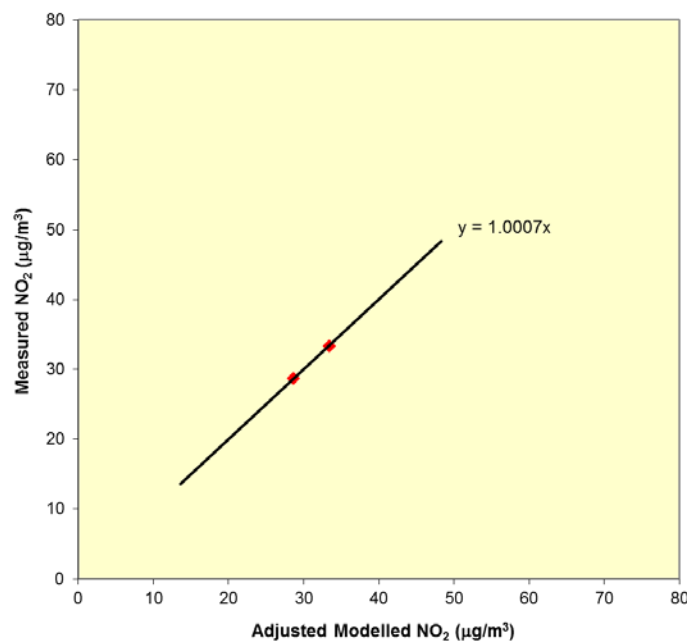**Figure 12.1.1: Comparison of Measured Road-NOx with Unadjusted Modelled Road-NO$_x$ Concentrations**

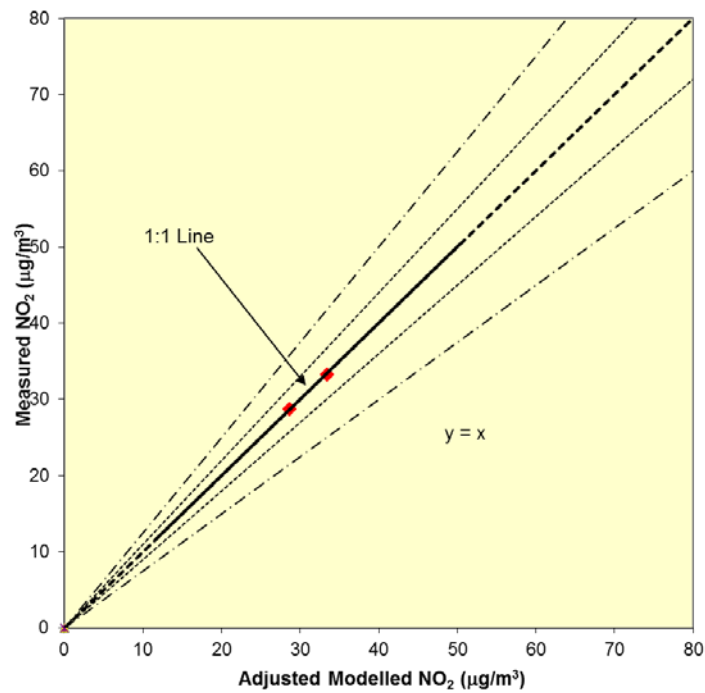**Figure 12.1.2: Comparison of Measured Road-NO$_x$ with Adjusted Modelled Road-NO$_x$ Concentrations**

Figure 12.1.3: Comparison of Final Adjusted NO₂ with Measured NO₂ Concentrations

PM₁₀ and PM₂.₅

There is no PM_{10} or $PM_{2.5}$ monitoring in close proximity to the proposed development site. Therefore, the primary adjustment factor calculated for NO_2 concentrations has been applied to the modelled road-PM_{10} concentrations.