

APPENDIX 11.2

ADMS Model Verification

Appendix 11.2 – ADMS Model Verification

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM.TG(16).

According to LAQM.TG(16), no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations. Model verification can only be undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed. LAQM.TG(16) recommends that a combination of automatic and diffusion tube monitoring data is used; although this may be limited by data availability. Six monitoring locations with appropriate traffic data collated by Pell Frischmann were selected for this study.

Table 2.1 compares monitored and modelled NO₂ concentrations at these monitoring locations.

Table 11.2.1: Monitored and Modelled Road Contributions of NO₂ at Roadside Monitoring Sites

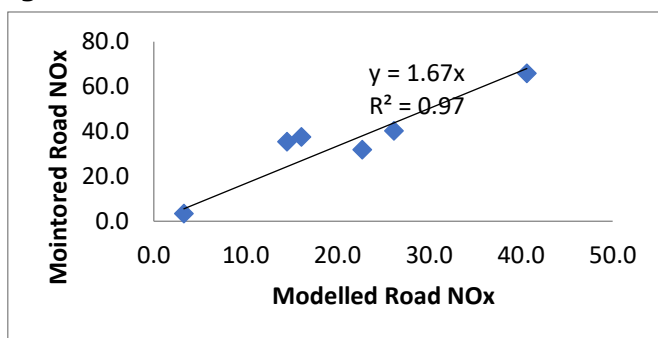
Monitor ID	Type	Concentrations (µg.m ⁻³)		
		Monitored	Modelled	% Difference
TD1	DT	29.5	19.1	-35.2%
TD2	DT	27.5	23.0	-16.4%
MSAQ3	DT	31.7	25.0	-21.2%
MSAQ5	DT	28.6	17.9	-37.3%
MSAQ29	DT	44.1	33.0	-25.1%
MSAQ31	DT	13.2	13.1	-0.5%

Note: DT = Diffusion Tube

The data in Table 11.2.1 shows that the model is under-predicting concentrations at all locations to a varying degree. This is a pattern frequently seen in model verification studies, and is likely to be the result of local dispersion characteristics. As some of the modelled results were outside 25% of the monitored results, it was decided to proceed with adjustment as the model was systematically under predicting NO₂ concentrations. This was done in order to ensure conservative results.

As it is primary NO_x, rather than secondary NO₂, emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x.

Plots of modelled versus monitored NO_x concentrations on a graph shows a positive correlation. The graph is included in Figure 2.1 below.

Figure 11.2.1 Monitored vs Modelled Road NO_x

By plotting a trend line through the points on the graph, a factor of **1.67** was derived. Table 11.2.2 shows total monitored versus modelled NO₂ following the adjustment of the road contribution of NO_x by this factor. It shows that, following this adjustment, all modelled concentrations of NO₂ are within 25% of monitored concentrations at these locations. As a result, the adjustment factors were considered appropriate for the adjustment of modelled road contributions of NO_x for the Proposed Development.

Table 11.2.2: Monitored and Adjusted Modelled Total NO₂ at Roadside Monitoring Sites

Monitor ID	Type	Concentrations (µg.m ⁻³)		
		Monitored	Modelled	% Difference
TD1	DT	29.5	24.1	-18.3%
TD2	DT	27.5	30.4	10.5%
MSAQ3	DT	31.7	33.4	5.2%
MSAQ5	DT	28.6	23.4	-18.2%
MSAQ29	DT	44.1	44.9	1.9%
MSAQ31	DT	13.2	14.3	8.6%

Note: DT = Diffusion Tube

As there is insufficient PM₁₀ or PM_{2.5} monitoring data in the study area, it was not possible to perform model verification for these pollutants. As such, the NO₂ adjustment factor has also been applied to PM₁₀ and PM_{2.5} model results, in accordance with LAQM.TG(16).

Root Mean Square Error

Root Mean Square Error (RMSE) is used to define the average error or uncertainty of the model. According to LAQM.TG(16), the RMSE should ideally be within 10% of the relevant air quality standard, but is acceptable where it is within 25% of the AQS. The model verification process calculated a post-adjusted RMSE of 3.4µg.m⁻³, which equates to 8.5% of the annual mean AQS for NO₂ and is therefore considered to be acceptable.