

Appendix 14.1: Model Verification

Background Concentrations

A1.1 Background concentrations of nitrogen dioxide have been taken from the national maps of background concentrations available from the Air Quality Archive (Defra, 2010b). The background concentrations for the automatic monitor location are presented in Table A1.1.

Table A1.1: Background Concentrations used in the Verification for 2010

	Grid square	NO_x	NO₂
New Cross Road	536500,176500	46.7	29.4

Traffic Data

A1.2 Annual Average Daily Traffic (AADT) flows, and the proportions of HDVs, for New Cross Road have been determined from the London Atmospheric Emissions Inventory (LAEI) (GLA, 2009). Traffic speeds were based on those presented in the LAEI, taking into account the proximity to a junction and speeds experienced during a site visit. Traffic data used in the model verification are presented in Table A1.2.

Table A1.2: AADT Traffic Data used in the Model Verification

Road Link	2010
New Cross Road	38,128 (12.4%)

Nitrogen Dioxide

A1.3 Most nitrogen dioxide (NO₂) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the annual mean road-NO_x concentrations during 2010 at the New Cross Road, automatic monitoring site. Concentrations have been modelled at 3 m, the height of the monitor's inlet.

A1.4 The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic; measured minus background) has been compared with the 'measured' road-NO_x. Measured road-NO_x was calculated from the measured NO_x concentration with the background NO_x concentration subtracted.

A1.5 An adjustment factor was determined as the ratio of the measured road contribution and the model derived road contribution. This factor was then applied to the modelled road-NO_x concentration for each receptor 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 NO₂ concentration within the recently updated NO_x from NO₂ calculator available on the Air Quality Archive website (Defra, 2010b).

A1.6 The final modelled total nitrogen dioxide concentration is then compared to the measured total nitrogen dioxide concentration in order to derive a secondary adjustment factor. The secondary adjustment factor accounts for the potential difference in the relationship between NO_x and NO₂ measured by the New Cross Road automatic station and the relationship between NO_x and NO₂ that is built into Defra's NO_x from NO₂ calculator.

A1.7 The data used to calculate the adjustment factor are provided below:

- Measured NO₂ : 63.2 µg/m³ (annual mean from 2009 but assumed to be 2010 for verification, which is a worst-case assumption)
- 'Measured' total-NO_x: 135.8 µg/m³
- 'Measured' road-NO_x (total – background): 135.8 – 46.7 = 89.0 µg/m³
- Modelled road-NO_x = 17.8 µg/m³
- Primary Road-NO_x adjustment factor: 89.1/317.8 = **4.99**
- Final Modelled Total NO₂ (using Defra NO_x:NO₂ calculator) = 59.6 µg/m³
- Secondary Road NO₂ adjustment factor: 63.2/59.6 = **1.06**

A1.8 The secondary adjustment factor of 1.06 accounts for the fact that the final modelled NO₂ concentration calculated using Defra's NO_x from NO₂ calculator is lower than the total NO₂ concentration measured at the New Cross Road automatic monitoring station.

PM₁₀ and PM_{2.5}

A1.9 The model has been run to predict annual mean road-PM concentrations during 2010. A similar process to calculate the road-NOx adjustment factor was followed. The measured road-PM₁₀ and modelled road-PM₁₀ concentrations are compared to provide the factor.

A1.10 The data used to calculate the adjustment factor are provided below:

- Measured PM₁₀ : 25.0 µg/m³ (annual mean from 2009 but assumed to be 2010 for verification)
- 'Measured' road-PM₁₀ (measured – background at monitor): 25.0 – 20.1 = 4.9 µg/m³
- Modelled road-PM₁₀ = 1.2 µg/m³
- Road- PM₁₀ adjustment factor: 4.9/1.2 = 3.973

A1.11 PM_{2.5} concentrations are not measured at this analyser and therefore the PM₁₀ adjustment factor has been applied to the modelled road-PM_{2.5}.