APPENDIX 8.3 – Details of Cal3QHC(R) Dispersion Model

Cal3QHCR is a complex computational line source dispersion model that is used to estimate concentrations of pollutants associated with emissions from road traffic. It is a US Environmental Protection Agency (EPA) regulatory model and is an enhanced version of the USEPA CALINE3 line source dispersion model incorporating methods for estimating queue lengths and contributions of emissions from vehicles idling at signalised road junctions.

The model is able to estimate concentrations of carbon dioxide (CO), nitrogen dioxide (NO_2), particulate matter (PM) and inert pollutants. It features the inclusion of up to 200 user selected road-link sources and up to 1000 user selected discrete receptor locations in each modelling scenario, and the ability to input historic hourly meteorological data, to aid the prediction of the dispersion of road traffic emissions; including the main meteorological parameters affecting dispersion such as wind speed and direction. Other inputs to the model include vehicular emission factors obtained from the UK Emissions Factors Database (UK-EFT), held at the National Atmospheric Emissions Inventory (NAEI), and either individual hourly or annual average daily traffic flow data.

The estimation of NO_2 concentrations at modelling receptor locations can either be calculated by the model, using NO_x to NO_2 conversion based on ozone-limited photostationary state relationship algorithms from the USEPA CALINE4 model, or external to the model using the empirical methodology provided in the UK Government guidance document LAQM.TG(03). For this assessment NO_x to NO_2 conversions have been made external to the model.

The model has some built-in assumptions, as such there are certain limitations to the models application; for example, wind speeds should be at least 1 m/s. Wind speeds below this have not been validated for the model. The model is also highly sensitive to very low mixing heights, i.e. lower than 100m, which would typically occur at night. More detail on these, and other assumptions and limitations can be found in the Users' Guide.