

APPENDIX 8.5

Sensitivity assessment of modelling input parameters

The sensitivity of the modelling results to variations in the model input parameters was investigated. The key parameters which are likely to influence the air dispersion modelling algorithms are outlined below:

- Meteorological Station
- Surface roughness
- Urban boundary layer options / rural option
- Land Use Characterisation

Meteorological Station

The influence of the meteorological station on the ambient ground level concentration has been investigated. For the detailed modelling Cork Airport (2014 – 2018) and the onsite station (2007) were used. As part of the sensitivity assessment Roches Point data (2014 – 2018) was also modelled to determine the sensitivity of this parameter to the modelled concentration (Roches Point is an automated station which does not record cloud cover and thus Cork Airport cloud cover was substituted for the missing data). As shown in Table A8.90, changing the meteorological station leads to an increase in the annual average concentration and a decrease in the 99.8th percentile of one hour means compared to the onsite station in 2007.

Surface Roughness

The influence of surface roughness on the ambient ground level concentration has been investigated. For the detailed modelling the surface roughness for the rural boundary layer option was selected which is representative of the area as outlined in Table A8.81. As part of the sensitivity assessment surface roughness of 0.001 and 1.0 were also modelled to determine the sensitivity of this parameter to the modelled concentration. As shown in Table A8.90, changing the surface roughness to 1.0 which is representative of an urban area leads to a small increase in the annual average concentration and a small decrease in the 99.8th percentile of one hour means. Reducing the surface roughness to 0.001 leads to a small increase in the maximum one hour (as a 99.8th percentile) and a small decrease in the annual average.

Land Use Characterisation

The influence of the land use characterisation near the facility on the ambient ground level concentration has been investigated. For the detailed modelling, land use characterisation was undertaken as outlined in Table A8.82 based on the location of the facility at an urban / rural interface. As part of the sensitivity assessment modelling assuming solely a rural character (0-360°) consisting of grasslands was also modelled to determine the sensitivity of this parameter to the modelled concentration. As shown in Table A8.90 assuming that the land use surrounding the facility is entirely grasslands leads to a minor short-term decrease relative to the predicted level (base case). Table A8.90 also shows that the scenario where the urban boundary layer was used (instead of the default rural boundary layer) leads to a small change in the predicted level (relative to the base case).

Average / Wet Bowen Ratio Comparison

The influence of the Bowen ratio (which characterises the available surface moisture) on the ambient ground level concentration has been investigated. For the detailed modelling, an average Bowen ratio was selected based on the rainfall totals for Cork. As part of the sensitivity assessment modelling assuming higher rainfall pattern (wet) was undertaken to determine the sensitivity of this parameter to the modelled concentration. As shown in Table A8.90, the effect of changing the Bowen ratio from average to wet is a negligible for the maximum one hour (as a 99.8thile) and the annual average.

Table A8.90 Dispersion Model Results – Sensitivity Study (Based on Ringaskiddy Onsite data 2007)

| Pollutant / Scenario | Mean Background ($\mu\text{g}/\text{m}^3$) ⁽¹⁾ | Averaging Period | Process Contribution NO ₂ /NO _x ($\mu\text{g}/\text{m}^3$) | Predicted Emission Concentration ($\mu\text{g}/\text{Nm}^3$) | Standard ($\mu\text{g}/\text{Nm}^3$) | Ringaskiddy Facility emissions as a % of ambient limit value |
|--|---|---|--|--|--|--|
| NO ₂ / Default (Varying Surface Roughness as shown in Table 8.75, Rural Boundary Layer, Average Bowen ratio, Land Use as shown in Table 8.75) | 12 | Annual Mean ⁽³⁾ | 0.89 | 12.9 | 40 ⁽²⁾ | 2% |
| | 105.1 | 99.8 th ile of means ⁽⁴⁾ 1-hr | 90.9 | 138.7 | 200 ⁽²⁾ | 45% |
| NO ₂ / Roches Point 2014 - 2018 | 12 | Annual Mean ⁽³⁾ | 1.63 | 13.6 | 40 ⁽²⁾ | 4% |
| | 105.1 | 99.8 th ile of means ⁽⁴⁾ 1-hr | 62.1 | 109.9 | 200 ⁽²⁾ | 31% |
| NO ₂ / Surface Roughness 0.001 | 12 | Annual Mean ⁽³⁾ | 0.81 | 12.8 | 40 ⁽²⁾ | 2% |
| | 105.1 | 99.8 th ile of means ⁽⁴⁾ 1-hr | 97.8 | 145.5 | 200 ⁽²⁾ | 49% |
| NO ₂ / Surface Roughness 1.0 | 12 | Annual Mean ⁽³⁾ | 1.02 | 13.0 | 40 ⁽²⁾ | 3% |
| | 105.1 | 99.8 th ile of means ⁽⁴⁾ 1-hr | 65.4 | 113.1 | 200 ⁽²⁾ | 33% |
| NO ₂ / Rural Option (All grassland) | 12 | Annual Mean ⁽³⁾ | 0.90 | 12.9 | 40 ⁽²⁾ | 2% |
| | 105.1 | 99.8 th ile of means ⁽⁴⁾ 1-hr | 84.2 | 131.9 | 200 ⁽²⁾ | 42% |
| NO ₂ / Urban Boundary Layer | 12 | Annual Mean ⁽³⁾ | 0.93 | 12.9 | 40 ⁽²⁾ | 2% |
| | 105.1 | 99.8 th ile of means ⁽⁴⁾ 1-hr | 83.0 | 130.7 | 200 ⁽²⁾ | 42% |
| NO ₂ / Bowen Ratio - Wet | 12 | Annual Mean ⁽³⁾ | 0.89 | 12.9 | 40 ⁽²⁾ | 2% |
| | 105.1 | 99.8 th ile of means ⁽⁴⁾ 1-hr | 91.0 | 138.7 | 200 ⁽²⁾ | 46% |

(1) Includes contribution from traffic and background sources and incorporating the cumulative assessment results.

(2) S.I. 180 of 2011.

(3) Conversion factor following guidance from USEPA (Tier 2 analysis, annual average) based on a site-specific ratio of 0.75.

(4) Conversion factor following guidance from UK (IPPC H1).