Cyfoeth Naturiol Cymru
Natural Resources Wales

Air Quality Modelling and Risk Assessment Team

Summary of AQMRAT findings for a Proposed RDF/SRF Production Facility at Nine Mile Point Industrial Estate

August 2016

Submitted Applicant's Air Quality Impact Assessment

- Submitted dispersion modelling from the proposed facility at Nine Mile Point industrial estate was carried out using ADMS 5.1.
- Submitted dispersion modelling considered a small number of receptors (4 in total) in the immediate vicinity of the facility.
- The submitted modelling did not consider the potential valley effects on plume dispersion from the proposed facility.
- The submitted modelling used hourly sequential meteorological data from Rhoose. Rhoose is a coastal location with relatively flat even terrain.
- The submitted modelling predicted a maximum process contribution (PC) to both long term and short term (99.79th percentile) NO_2 of 1.3 $\mu g.m^{-3}$ and 6.6 $\mu g.m^{-3}$ respectively.

AQMRAT Air Quality Impact Assessment

- AQMRAT modelling utilised hourly sequential meteorological data extracted from the Met Offices Numerical Weather Prediction Unified Model (with a horizontal resolution of 1.5km), the met data was predicted at the proposed site location. In the absence of local meteorological measurements, this is regarded as the best available met data[1].
- AQMRAT modelling utilised applicant supplied input parameters (i.e., NOx emission concentration of 300 mg/m^3 and emission rate 1.6 g/s).
- Due to concerns raised by local residents regarding local climatological conditions unique to the valley, AQMRAT modelling utilised the cold air drainage model KLAM_21[2,3] of the Deutscher Wetterdienst (German Weather Service) with local topography and land use to simulate nocturnal drainage winds and their effects on pollutant dispersion within the subsequent cold air layer inversion formed. Cold air drainage flow only occurs at a certain climatic conditions which forms a temperature inversion layer limiting the dispersion of pollutant. Such conditions are predicted to occur up to about 150 times (up to about 110 nights) a year.
- AQMRAT modelling predicted short term NO_2 (99.79th percentile) PC at 1 Duffryn Road of up to about 153 $\mu g.m^{-3}$ (annual mean of 6.6 $\mu g.m^{-3}$).
- The AQO (99.79th percentile) for NO_2 was not predicted to be exceeded at any modelled receptors throughout the valley.

[1] For more details see: http://www.metoffice.gov.uk/research/modelling-systems/unified-model/weather-forecasting

[2] Sievers, U., 2005: "Das Kaltluft-Abfluss-Modell KLAM_21. Theoretische Grundlagen, Anwendungen und Handhabung des PC-Modells". *Berichte des Deutschen Wetterdienstes* 227.

[3] Kossmann, M. and U. Sievers, 2007: "KLAM_21 drainage wind modelling of wintertime air pollution events in Christchurch, New Zealand". *Proc. 29th International Conference on Alpine Meteorology*, Chambery, France, 29–32.

- KLAM_21 and ADMS was used in the air quality impact assessment. AERMOD was used in the model sensitivity analysis.

Comments on Impacts at Adjacent Industrial Units

- Additional modelling was undertaken by AQMRAT using ADMS 5.1 and KLAM_21 to investigate the short term NO_2 impact at the adjacent industrial units. ADMS (with Calm module) was used to study the impact under stable conditions with low boundary height (i.e., due to temperature inversion). ADMS predicted ground level concentrations of NO_2 on the Nine Mile point industrial estate remained below the AQO.
- KLAM_21 modelling predicted very high hourly mean NO_2 concentrations at industrial units located immediately downstream (easterly direction) of the proposed SRF/RDF facility when the stack was within the cold air layer. However, KLAM_21 assumes that after the emission, the pollutant in the plume is uniformly distributed vertically throughout the cold air layer. In reality, the plume may not instantly be mixed vertically after release under stable conditions due to its momentum and buoyancy. A sensitivity analysis using ADMS under stable (Category G) meteorological conditions suggested that plume grounding at the adjacent industrial units was unlikely.

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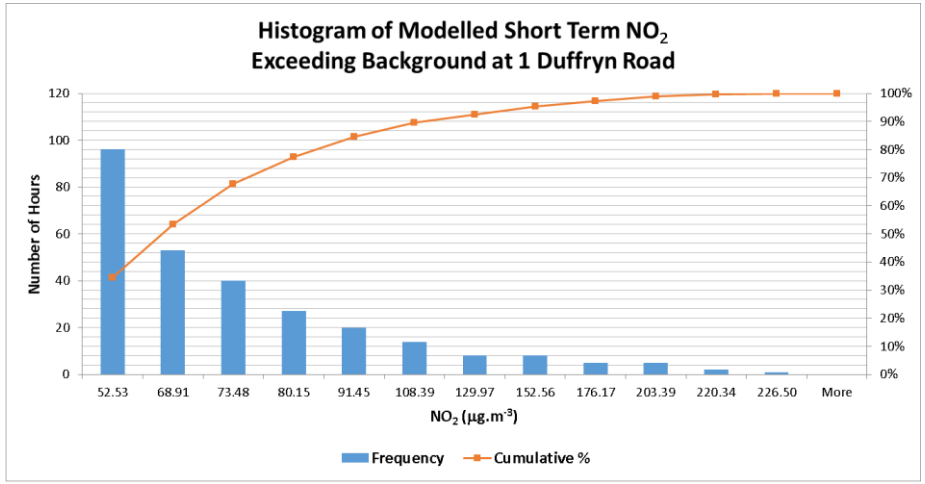

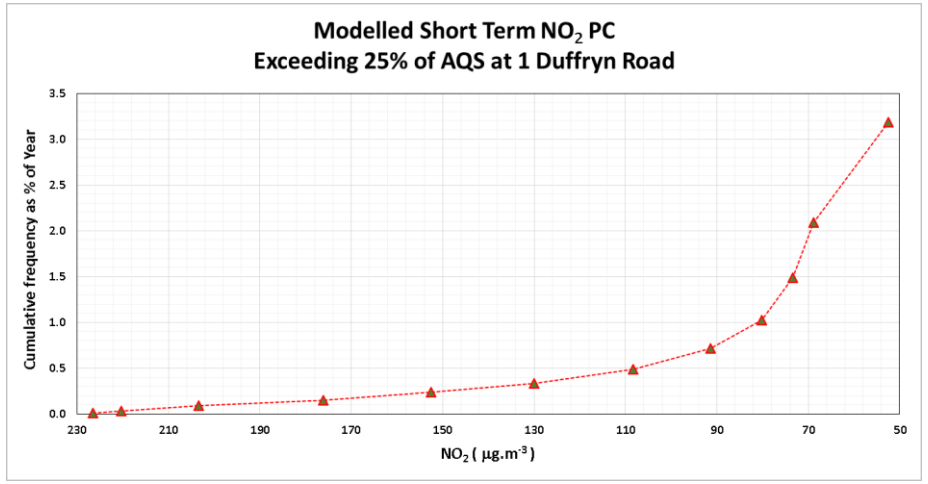

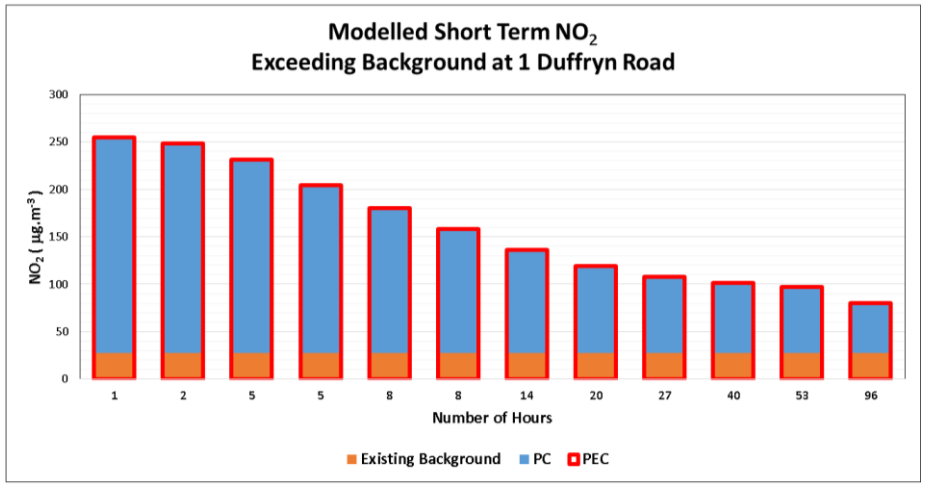

KLAM_21 modelled distribution of NO2 in cold air flow after t = 5hrs in the Sirhowy Valley