PORTISHEAD BRANCH LINE PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

VOLUME 4

APPENDIX 7.2

Air Quality Modelling Methodology

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Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire Councils working together to improve your local transport

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SECTION 1

Air Quality Modelling Methodology

1.1 Introduction

1.1.1 This Appendix describes the methodology used to assess air quality impacts arising from the Portishead Branch Line (MetroWest Phase 1) DCO Scheme ("the DCO Scheme"). The tools and models used were the most up to date available at the time the air quality assessment was carried out in March 2016.

1.1.2 Annual mean concentrations of nitrogen oxides (NO_x) and particulate matter smaller than 10 microns in aerodynamic diameter (PM_{10}) were predicted using the ADMS-Roads dispersion model (version 4.0). The model uses detailed traffic information for the local road network together with meteorological data to predict pollutant concentrations at specific locations specified by the user.

1.1.3 Air quality modelling was carried out using estimated traffic emissions in various emissions scenarios. The resulting air pollutant concentrations are compared against the applicable legislation and are used to predict air quality impacts from the DCO Scheme.

1.2 Meteorological Data

1.2.1 The model was run using a full year of hourly sequential meteorological data for year 2013 from the meteorological station at Bristol Filton Airport, which is less than 10 km to the north-east of the DCO Scheme. Data from this station were considered to be most representative of the meteorological conditions across the study area as it was the closest meteorological site to the DCO Scheme and had the most similar terrain to the study area considered in the air quality modelling.

1.2.2 The 2013 wind rose for Bristol Filton Airport is shown in Figure 1-1. The predominant wind direction is westerly.

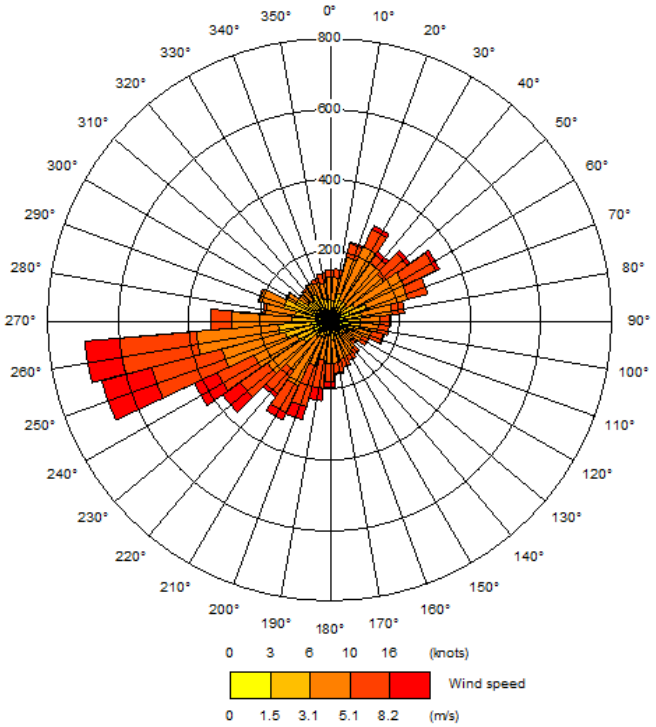

Figure 1-1: Year 2013 Wind Rose for Bristol Filton Airport

1.3 Study Area

1.3.1 The study area is described in Section 7.3 of the Preliminary Environmental Information Report (the PEI Report) Chapter 7 Air quality. The transport assessment considered the whole Bristol City Council (BCC) road network and the network in the north and east of North Somerset District Council (NSDC). The study area included all roads that screened in against EPUK and IAQM criteria (around Portishead and adjacent to Parson Street, Bedminster and Bristol Temple Meads stations) and roads within 200 m of any railway line where additional diesel locomotive movements are planned. For completeness, the modelling of these receptors also included the new passenger service between Portishead and Pill to account for all pollutant sources in the air quality modelling.

1.4 Traffic Data

1.4.1 Annual Average Daily Traffic (AADT) flows, annual average vehicular speeds and proportion of Heavy Duty Vehicles (HDVs) on roads across the study area were based on traffic data provided by CH2M and reported in the PEI Report, Appendix 16.1 Transport Assessment.

1.5 Modelling Scenarios

1.5.1 The scenarios considered were:

- 2013 - Base Year;
- 2021 - Do-Minimum for the assumed Opening Year (without the DCO Scheme, no improvements along existing railway and no new rail service between Portishead and Bristol; including any committed development);
- 2021 - Do-Something for the assumed Opening Year (with the DCO Scheme; including any committed development).

1.5.2 Operational air quality impacts associated with changes in road traffic and the proposed changes to road access to the railway stations at Portishead and Pill were assessed for the study area defined in Section 7.3.7.

1.6 Background Concentrations

1.6.1 Background pollutant concentrations are spatially and temporally variable. Background NO_2 and PM_{10} concentrations representative of conditions in the study area have been established for the opening year scenario.

1.6.2 Concentrations have been obtained from Defra (https://laqm.defra.gov.uk/review-and-assessment/tools/tools.html), which provide predictions based on a grid at a resolution of 1 km^2 across the whole of the UK. The concentrations used here are based on the 2011 base year background maps (published in July 2014).

1.7 NO_X to NO_2 Conversion Factors

1.7.1 Modelled diesel locomotive and road-traffic NO2 were calculated from modelled NOx concentrations using the latest version of the NOx to NO2 calculator (version 4.1). This calculator allows the derivation of NO2 from NOx wherever NOx is predicted by modelling emissions from roads. The calculator can also be used to calculate the road component of NOx from roadside NO2 diffusion tube measurements.

1.8 Emission Inventory

Road Emissions

1.8.1 Vehicle emission factors for NO_x and PM_{10} have been derived from Emission Factor Toolkit version 6.0.2 (Defra, 2014). NO_x emission factors are taken from the European Environment Agency (EEA) COPERT 4 (v10) emission calculation tool, and take into account the real world emission performance of Euro 5 and 6 diesel cars. Vehicle emission factors for PM_{10} include emissions associated with brake and tyre wear.

Railway Emissions

1.8.2 Railway emissions have been calculated for classes of trains that are considered representative for the base year and that are expected to be in service in the future. Class-specific emission factors have been sourced for passenger and freight trains from available previous studies (Hobson and Smith, 2011). An emission inventory has been produced considering the following three class of trains:

- Class 150 (2 coaches);
- Class 166 (3 coaches); and
- Class 66 (freight trains).

1.8.3 According to project information, the DCO Scheme is also expected to have Class 165 (2 coaches) trains on service. Emissions factors associated with diesel locomotives Class 166 are higher than those estimated for locomotives Class 165. In the absence of more specific information regarding the ratio of Class 165 to Class 166 and following a conservative approach, the modelling exercise has been carried out assuming that all additional trains on service will be Class 166.

1.8.4 To represent the variability of emissions related to the number and type of trains in service on different lines, hourly emission profiles have been built for each line considered, class of train and scenario. The time-varying emissions factor files were based on actual train time tables and preliminary scheme information. These have been incorporated into the ADMS model to represent railway-associated emissions from the existing and the future railway lines.

1.8.5 The modelling could not take into account emissions from the DCO Scheme associated with trains idling near Portishead Station, Pill Station or the Bedminster Down Relief Line. Idling at Portished Station was assumed to be limited to 6 minutes for the assessment, although recent analysis of the timetable indicates a dwell time of 3 minutes. The associated emissions are expected to be negligible. Idling time and frequency near Parson Street Junction are not known at this stage and due to the complexities with estimating these and representing them in an air quality model, this was excluded from our modelling approach.