A47 North Tuddenham to Easton Dualling

Scheme Number: TR010038

Volume 6
6.3 Environmental Statement Appendices
Appendix 5.1 - Air Quality Dispersion Modelling Process

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

March 2021

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

The A47 North Tuddenham to Easton Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 5.1 - Air Quality Dispersion Modelling Process

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Rev 0	March 2021	Application Issue

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Appendix 5.1- Air Quality Dispersion Modelling Process

5.1. Introduction

5.1.1. The Atmospheric Dispersion Modelling System (ADMS) Roads dispersion modelling software has been developed by Cambridge Environmental Research Consultants Ltd (CERC) and is a software which models air pollution using road traffic as a source of pollutant emissions. ADMS Roads version 5.0.0.1 was used for this study.

5.2. Modelling parameters

5.2.1. The following model input parameters were used for this assessment.

Road parameters

5.2.2. ADMS Roads requires inputs of road widths (and height if canyons have been specified, although this was not required for this project). Road widths were determined using the Ordnance Survey Mastermap data within ArcGIS.

Surface roughness length

5.2.3. The surface roughness length at the meteorological measurement site (at Norwich Airport) was set to 0.3m due to the area being largely agricultural or rural with only a slight urban environment. The remainder of the study area had a surface roughness set to 0.5m which was representative of parkland and open suburbia areas.

Monin-Obukhov length

5.2.4. The Monin-Obukhov length is a parameter used to measure the stability of the atmosphere. It describes the turbulence length which is dependent on the meteorological conditions. For very stable conditions, in rural areas, a typical value can range between 2m to 20m. In large urban areas, an urban heat island effect can occur as result of the buildings and traffic warming the air above the town/city. This can prevent the atmosphere ever becoming stable. A minimum Monin-Obukhov length will vary depending on how large the area is. A minimum Monin-Obukhov length of 10m was set for this study area, which was representative of small towns with a population of less than 50,000.

5.3. Background concentrations

5.3.1. The background concentrations across the study area have been obtained from maps published by Defra. The downloaded data covered all local authorities within the ARN, on a 1km x 1km grid from years 2017 to 2030.

5.3.2. As per consultation with Highways England, it was agreed the most recent 2017 based background maps would be downloaded for the assessment and factored back to the baseline year of 2015. A backcasting factor obtained from Highways England was used to cast the NO_x 2017 background maps to the year 2015. This factor has been derived by calculating the average annual mean NO_x concentration from 55 background AURN monitoring stations for the relevant years and then divided by the average of the data from the same set of background AURN monitoring stations for the year 2017. This produced a factor of 1.004 for the year 2015. This 2017 mapped backgrounds were multiplied by this factor to obtain 2015 NO_x values.

5.3.3. As Defra did not provide a backcasting factor for PM_{10} concentrations, a similar process was undertaken to cast the 2017 PM_{10} backgrounds back to 2015. Annual mean PM_{10} data were downloaded from the two nearest automatic monitoring stations for the years 2014 to 2018. A factor was produced by dividing the 2017 annual mean concentration with the 2015. An average was taken of the two factors produced which was then applied to the downloaded 2017 PM_{10} background maps. Full details on how the PM_{10} factor was produced can be found in Table 5.1.

Table 5.1: Backcasting factor for PM_{10} Concentrations

Site ID	Site Type	PM_{10} Annual Mean (µg/m^3)					Factor (2015/2017)	Average
		2014	2015	2016	2017	2018		
Castle Meadow	Roadside	21	21	20	23	27	0.9130	0.9253
Lakenfields	Urban Background	16	15	16	16	16	0.9375	

5.4. Local authority monitoring

5.4.1. The monitoring results for South Norfolk Council and Breckland Council ranging from years 2015 to 2018 are presented in Table 5.2.

Table 5.2: Local Authority Monitoring Data

Site ID	Name	Type	Annual Mean Concentrations (µg/m^3)				
			2014	2015	2016	2017	2018
Breckland Council							
D1	HS Dereham	Suburban	35.4	33.9	34.3	30.9	27.3
D2	Station Road Dereham	Suburban	28.6	27.8	28.6	25.0	22.5
D3	Wellington Street Dereham	Suburban	14.7	-	11.2	13.7	20.0
South Norfolk							
DT1	46A Old Newmarket Rd	Suburban	21.5	17.1	20.2	21.2	19.7
DT2	131 Longwater Lane	Suburban	20.3	18.1	21.2	21.6	20.1
DT3	90 The Street	Suburban	18.0	15.4	19.3	20.0	18.6
DT4	87 Denmark St	Suburban	24.1	21.0	29.2	26.7	24.8
DT5	131 Victoria Road	Suburban	33.0	26.0	30.0	28.2	26.2
DT6	21 Church Plain	Suburban	12.0	10.4	13.5	20.2	18.8
DT7	A140 Long Stratton	Roadside	27.8	32.0	33.5	37.2	34.6
DT8	Fairland Street	Kerbside	23.4	18.4	23.3	22.0	20.5
DT9	Kirby Bedon	Kerbside	26.7	21.4	25.4	24.9	23.2
DT10	209 Norwich Rd	Suburban	16.7	12.0	18.0	16.5	15.3
DT11	2 Thickthorn Cottages	Roadside	15.9	12.8	15.8	14.9	13.9
DT12	Rightup Lane	Suburban	21.4	16.3	21.9	21.2	19.7
DT13	233 Norwich Rd	Suburban	14.2	11.9	15.9	16.1	15.0
DT14	28 Norwich Rd	Suburban	18.1	13.3	17.0	16.2	15.1
DT15	Harleston	Roadside	28.1	25.1	27.6	26.2	24.4
DT16	Diss Road	Roadside	20.5	18.1	21.4	26.2	24.4
DT17	84 West Road	Roadside	13.1	10.8	19.4	20.5	19.1
DT18	Long Stratton Chinese	Roadside	27.4	25.9	29.8	26.6	24.7

Site ID	Name	Type	Annual Mean Concentrations (µg/m^3)				
			2014	2015	2016	2017	2018
DT19	Long Stratton Traffic Light	Roadside	36.3	30.6	36.9	34.3	31.9
DT20	Long Stratton Funeral	Suburban	35.9	33.6	32.9	31.0	28.8
DT21	Long Stratton Southbound	Suburban	35.1	26.9	31.1	28.5	26.5
DT22	Long Stratton Coop	Roadside	26.4	23.2	25.2	20.5	19.1
DT23	3 Norwich Road	Suburban	16.2	13.0	16.7	15.6	14.5
DT24	14 Station Road	Suburban	17.1	13.9	17.4	16.1	15.0
DT25	Long Stratton Bus Stop	Roadside	31.7	29.3	30.1	29.0	27.0
DT26	Newmarket Road	Roadside	24.4	21.4	25.5	24.1	22.4
DT27	Lord Nelson Dr	Roadside	28.3	23.1	28.4	25.4	23.6
DT28	Riverside Court	Suburban	0.0	16.3	14.1	13.9	12.9
DT29	25 Broad St	Suburban	28.2	31.5	27.8	24.2	22.5