A47 Wansford to Sutton Dualling

Scheme Number: TR010039

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Appendix 5.1 – Air quality modelling process

APFP Regulation 5(2)(a)

Planning Act 2008

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

July 2021

Infrastructure Planning

Planning Act 2008

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

A47 Wansford to Sutton Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 5.1 - Air quality modelling process

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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 the Proposed Scheme). 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 (in Wittering) was set to 0.2m due to the area being largely agricultural with only a slight urban environment. The remainder of the study area had a surface roughness set to 0.3m which was representative of agricultural (max 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.

Terrain

5.2.5. A gradient of greater than 1:10 can impact dispersion. Following a review of the study area, terrain was not required to be considered within the assessment, therefore no terrain file was included in the model.

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, available at the time of the assessment, would be downloaded 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 was 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 1.

Table 1: PM_{10} backcasting factor derivation

Site ID	Site Type	PM_{10} Annual Mean ($\mu g/m^3$)					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 Peterborough City Council, East Northamptonshire Council and Huntingdonshire District Council ranging from years 2015 to 2018 are presented in Table 2.

Table 2: Local authority monitoring results 2015-2018

Site ID	Name	Type	Annual Mean Concentrations (µg/m^3)				
			2014	2015	2016	2017	2018
Peterborough City Council							
1	BORG	Roadside	32.7	31.8	32.9	30.7	32.7
2	Taverners TR1	Roadside	30.9	29.5	29.1	31.2	-
3	Barnard Way	Urban Background	15.8	15.1	14.4	14.6	14.2
4	Lythemere	Urban Background	16.0	15.6	17.4	16.4	15.7
5	Wittering	Roadside	23.2	21.9	22.7	19.5	18.7
6	Lincoln Road	Roadside	29.0	30.8	29.4	31.3	28.6
7	Taverners TR2	Kerbside	40.2	37.5	37.4	40.0	38.8
8	Taverners TR3	Roadside	24.2	23.4	24.6	26.7	-
9	Taverners TR4	Roadside	27.2	26.0	25.0	26.7	-
10	Maxwell	Industrial	-	19.7	-	-	-
12	Taverners TR5	Kerbside	30.9	29.9	26.6	28.3	-
13	Taverners TR6	Kerbside	31.9	30.2	25.6	27.8	-
14	Taverners TR7	Kerbside	33.7	31.6	30.7	29.7	-
15	Taverners TR8	Kerbside	32.2	30.5	26.6	28.1	-
16	2TA PAR	Kerbside	32.2	34.5	30.1	23.4	-
17	2TA PAR	Kerbside	29.2	33.9	32.7	25.6	-
Huntingdonshire District Council							
PFH	Huntingdon	Roadside Auto	38.9	32.2	39.4	31.9	28.0
St Neots 1	The Paddocks	Kerbside	19.6	20.5	22.1	21.6	17.5
St Neots 3	71 Avenue Road	Urban Background	19.0	16.6	18.3	16.9	15.0
St Neots 4	20 Harland Rd	Urban Background	15.3	14.3	16.8	15.4	13.9

Site ID	Name	Type	Annual Mean Concentrations (µg/m^3)				
			2014	2015	2016	2017	2018
St Neots 5	8-10 High Street	Kerbside	36.0	31.7	31.3	31.2	28.7
St Neots 6	35 High Street	Kerbside	31.6	28.7	29.6	29.9	28.4
St Neots 7	17 Arundel Crescent	Suburban	20.3	19.9	20.5	19.9	17.4
St Neots 9	5 Duchess close	Suburban	23.5	24.5	28.4	28.1	22.4
Southoe 1	2 Lees Lane	Roadside	19.2	17.4	18.6	16.2	16.2
Buckden 1	6 Perry Road	Roadside	26.8	21.2	24.9	20.8	21.9
Buckden 2	4 High Street	Roadside	25.3	25.6	25.8	25.6	19.7
Buckden 3	34 High Street	Roadside	32.2	28.9	29.6	27.7	25.4
Buckden 4	11 Taylors Lane	Roadside	19.5	19.4	22.3	18.7	15.8
Brampton 1	RAF Brampton	Roadside	14.1	14.4	15.4	14.3	13.1
Brampton 2	RAF Brampton Stokemans Way	Roadside	-	16.8	16.3	15.6	15.2
Brampton 3	1 Laws Crescent	Roadside	25.6	22.7	27.0	23.9	21.0
Brampton 4	25 Dorling Way	Roadside	-	18.8	19.8	17.4	16.3
Brampton 5	7 Hansell Road	Roadside	16.9	15.9	17.5	15.7	13.4
Catworth	1 Thrapston Road	Rural	21.7	21.6	18.9	20.3	15.8
PFH 1	Pathfinder House	Roadside	49.5	44.2	45.1	42.5	40.8
PFH 2	Pathfinder House	Roadside	52.0	44.7	46.1	44.4	41.4
PFH 3	Pathfinder House	Roadside	52.8	46.6	44.8	44.9	43.3
Huntingdon 1	23 Lodge Close	Suburban	18.5	17.1	19.3	15.9	17.0
Huntingdon 2	19 Nursery Road	Kerbside	22.7	21.0	22.2	25.4	23.5
Huntingdon 3	6 George street	Kerbside	41.1	40.7	39.9	38.8	34.0
Huntingdon 4	1 St Peters Road	Kerbside	28.9	29.9	28.7	28.3	27.4
Huntingdon 5	18 Blethan Drive	Roadside	27.0	27.6	26.9	26.5	24.6
Huntingdon 6	40 Hartford Road	Roadside	25.2	23.7	25.2	24.7	21.6

Site ID	Name	Type	Annual Mean Concentrations (µg/m^3)				
			2014	2015	2016	2017	2018
Godmanchester 1	25 Cambridge Villas	Roadside	23.8	22.7	24.8	22.0	22.1
Wood Green Animal Shelter	Goat Enclosure	Rural	-	12.4	13.7	14.1	12.7
Fenstaton 1	Hilton Road	Roadside	32.8	31.5	31.2	31.9	25.0
Fenstaton 2	20 Conington Road	Roadside	22.5	19.9	20.0	20.7	18.8
Fenstaton 3	1 Pear Tree Close	Rural	-	13.7	13.8	13.6	12.4
St Ives 1	2 The Pound	Urban Background	18.7	17.6	18.6	19.0	16.3
St Ives 2	59 Greenfields	Suburban	-	21.3	22.9	23.2	19.3
Ramsey 1	5 Blenheim Road	Urban Background	18	17.8	19.7	18.1	17.2
Stibbington 1	7 Great North Road	Roadside	26.5	29.6	28.6	29.8	22.8
Sawtry 1	81 Fen Lane	Suburban	21.8	20.9	22.3	23.0	20.3
Alconbury 1	54 Manor Lane	Roadside	21.4	19.9	21.8	19.2	19.0
East Northamptonshire Council							
ENC 1	Oakleas Rise	Urban Background	19.9	17.5	19.8	19.7	17.5
ENC 3	8 Wheelwright Close, Raunds	Roadside	25.8	-	-	24.1	20.8
ENC 4	Brook St opp. Hill St, Raunds	Roadside	19.4	15.9	17.9	19.4	17.1
ENC 5	High St, Irthlingborough	Urban Background	-	-	-	-	19.7
ENC 7	34 Elizabeth Way, Higham	Urban Background	15.0	11.9	14.5	15.8	13.5
ENC 8	90 Wharf Road, Higham Ferrers	Roadside	-	-	-	-	16.8
ENC 9A	High Street, Higham Ferrers	Roadside	21.7	18.7	20.0	22.4	20.3
ENC 10A	Station Approach, Rushden	Roadside	-	-	-	21.7	21.4
ENC 11	Rectory Road, Rushden	Kerbside	20.0	16.4	19.6	19.7	18.3

Site ID	Name	Type	Annual Mean Concentrations (µg/m^3)				
			2014	2015	2016	2017	2018
ENC 12	Depot Newton Road, Rushden	Roadside	37.0	29.2	37.5	35.7	32.8
ENC 13	Park Place, Rushden	Roadside	-	-	-	-	36.4
ENC 14	Higham Rd	Roadside	-	-	-	32.2	33.3
ENC 15	Beaconsfield Terrace	Roadside	27.7	25.4	29.3	28.2	28.0
ENC 16	Newton Rd	Roadside	-	-	-	25.3	22.1
ENC 17	Newton Road Cross Roads	Roadside	35.9	31.6	35.7	37.1	33.4
ENC 18	Farnham Drive	Roadside	19.8	16.4	19.0	19.7	16.6
ENC 19	Washbrook Road, Rushden	Kerbside	34.3	30.2	35.5	33.9	33.2
ENC 20	Wentworth Drive, Oundle	Roadside	-	-	-	17.4	15.7
ENC 21A	North St, Oundle	Roadside	-	-	-	-	23.2
ENC 22	Woodfield, Collyweston	Urban Background	-	-	-	-	16.6
ENC 23	48 Higham Road, Rushden	Roadside	19.7	13.9	15.5	17.1	15.5
ENC 24	30 Bridge St, Thrapston	Roadside	-	-	-	-	36.8
ENC 25	113 Huntingdon Rd, Thrapston	Roadside	37.1	28.3	36.0	36.3	34.6
ENC 26	32 Market Road, Thrapston	Urban Background	-	-	-	-	24.0
ENC 28	Brick Kiln Road, Raunds	Roadside	23.7	20.0	22.7	23.5	21.4