Thurrock Flexible Generation Plant

Environmental Statement Volume 6
Appendix 12.6: Assessment of Traffic-related Emissions

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Environmental Impact Assessment

Environmental Statement

Volume 6

Appendix 12.6

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Table of Contents

List of Tables

List of Figures

Summary

This appendix summarises the assessment of traffic-related emission associated with the proposed Thurrock Flexible Generation Plant.

Qualifications

This appendix has been prepared by Will Hunt, a consultant who has experience in air quality assessments including modelling of traffic-related emissions.

It has been checked by Kathryn Barker, a Member of the Institute of Air Quality Management (IAQM) and an Associate Member of the Institution of Environmental Sciences.

It has been reviewed by Fiona Prismall, a Chartered Environmentalist, Member of the Institution of Environmental Sciences and Fellow of the IAQM. Fiona is the IAQM committee secretary. Fiona was a member of the working groups that produced the IAQM 2014 'Guidance on the assessment of dust from demolition and construction', the Environmental Protection UK & IAQM 2017 'Land-use Planning & Development Control: Planning for Air Quality' guidance and the IAQM 2019 'A guide to the assessment of air quality impacts on designated nature conservation sites'.

1. Introduction and Approach

1.1 Atmospheric Dispersion Modelling of Pollutant Concentrations

1.1.1 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

1.1.2 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in Volume 6: Appendix 12.2.

1.1.3 The ADMS-Roads model has been used in this assessment to predict the air quality impacts from changes in traffic on the local road network. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the United Kingdom (UK) by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Modelled Scenarios

1.1.4 During the operational phase, Thurrock Flexible Generation Plant is not expected to generate large amounts of traffic and the impacts were screened out on the basis that the EPUK & IAQM thresholds were not met.

1.1.5 For the construction phase, the development is expected to increase heavy duty vehicles by more than 25 AADT (Annual Average Daily Traffic) close to an Air Quality Management Area (AQMA). As such this appendix assesses the emissions of traffic generated during the construction phase.

1.1.6 The following scenarios were modelled:

- Without Development – 2022 Base flows; and
- During Construction – 2022 Base flows + average traffic from construction.

1.2 Model Input Data

Traffic Flow Data

1.2.2 Traffic data used in the assessment have been provided from the Transport Assessment in Volume 6, Appendix 10.1. The traffic flow data provided for this assessment are summarised in Table 1.1. The modelled road links are illustrated in Figure 1.1.

Table 1.1: Traffic Data Used Within the Assessment – Construction Phase

Road Link ID	Road Link Name	Speed (km.hr^{-1})	Daily Two Way Vehicle Flow			
			Without Development		During Construction	
			Total Vehicles	HDV	Total Vehicles	HDV
1	A13 between M25 junction 30 and A126	113	132736	17487	132906	17570
2	A13 between A126 and A1012	113	110772	16744	110942	16827
3	A13 between A1089 and A1012	113	114614	16382	114784	16465
4	A1089,between Marshfoot Road roundabout and A13	113	37249	11960	37419	12043
11	Coopers Shaw Road / Church Road / Station Road, between Gun Hill Road and EMR East Tilbury junction	97	1138	269	1308	352
15	A13, between Orsett Cock roundabout and A1089	113	102630	10220	102800	10303
16	A1089 Dock Approach Road, between Marshfoot Road roundabout and ASDA roundabout	113	42502	12112	42672	12195
17	A1089 St Andrews Road, between ASDA	64	18521	9640	18691	9723

Road Link ID	Road Link Name	Speed (km.hr^{-1})	Daily Two Way Vehicle Flow			
			Without Development		During Construction	
			Total Vehicles	HDV	Total Vehicles	HDV
	Roundabout and Port of Tilbury Gate 1					
18	A1089 St Andrews Road, between Tilbury Gate 1 and Proposed Tilbury 2 Road	64	8953	3976	9123	4059
19	Proposed Tilbury 2 Road, between A1089 St Andrews Road and Fort Road	97	4640	2673	4810	2756
20	Fort Road between Proposed Tilbury 2 Road and Brennan Road	97	1786	307	1956	391
21	Fort Road between Brennan Road and Coopers Shaw Road	97	2204	334	2374	417

Notes: (km.hr^{-1}) = kilometres per hour
HDV = Heavy Duty Vehicle - vehicles greater than 3.5 t gross vehicle weight including buses
LDV = Light Duty Vehicle

1.2.3 The average speed on each road has been reduced by 10 km.hr^{-1} to take into account the possibility of slow-moving traffic near junctions and at roundabouts in accordance with LAQM.TG16 (Defra, 2016).

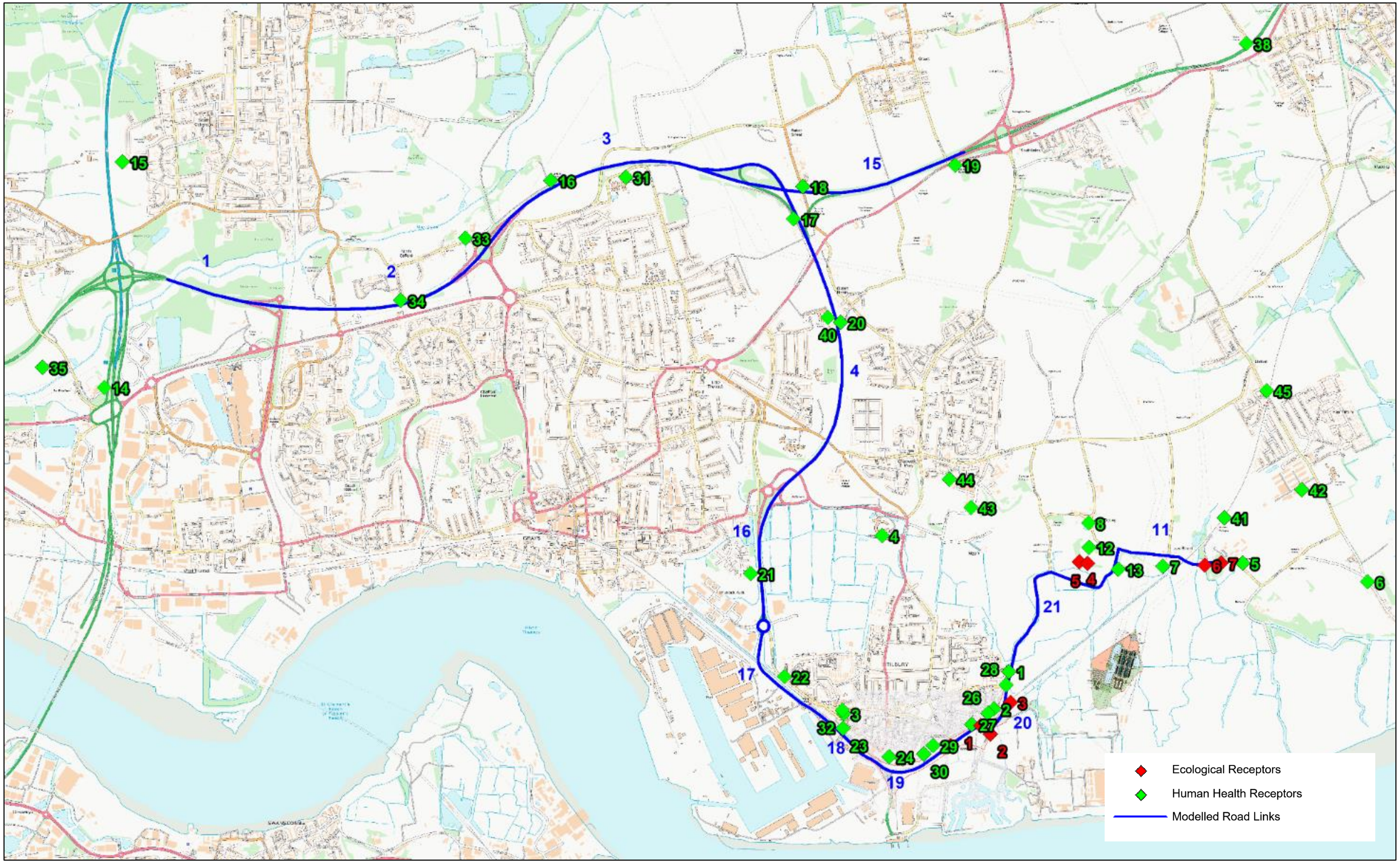

Figure 1.1: Modelled Receptors and Road Links

Vehicle Emission Factors

1.2.4 The modelling has been undertaken using Defra's 2019 emission factor toolkit (version 9.0) which draws on emissions generated by the European Environment Agency (EEA) COPERT 5 emission calculation tool.

Meteorological Data

1.2.5 ADMS-Roads requires detailed meteorological data as an input. The most representative observing station for the region of the study area that supplies all the data in the required format is Gravesend approximately 2.2 km south-west of the Application Site. Meteorological data from that station from 2016 have been used within the dispersion model.

Receptors

1.2.6 Sensitive human-health receptors for this assessment are the same as used for the assessment of stack emissions. The modelled human-health receptors are shown in Table 1.2.

Table 1.2: Modelled Sensitive Human-Health Receptors

Receptor ID	Receptor Name	x	y
1	Fort Road	565363.5	176620.23
2	Sandhurst Road	565234.12	176294.09
3	School	563916.5	176251.66
4	Gateway Academy	564254.88	177811.98
5	Gravel Pit Cottages	567413.69	177569.72
6	Princess Margaret Rd	568506.69	177406.66
7	Walnut Tree Farm	566712.81	177539.77
8	The Green	566062.12	177920.91
9	West Street	564726.56	174465.66
10	Milton School	565429	174068.98
11	Royal Pier Road	565056.81	174392.27
12	West Tilbury Hall	566066	177709
13	Cooper Shore	566322	177515
14	R1	557439	179107
15	R2	557597	181084
16	R3	561350	180920
17	R4	563478	180584
18	R5	563560	180866
19	R6	564894	181056
20	R7	563889	179678
21	R8	563101	177478
22	R9	563399	176576
23	R10	563911	176123
24	R11	564314	175875
25	R12	564434	175856
26	R13	565181	176256
27	R14	565039	176156
28	R15	565339	176504
29	R16	564701	175973
30	R17	564617	175897
31	R18	562008	180949
32	R19	563904	176281
33	R20	560604	180416
34	R21	560035	179870
35	R22	556895	179284
36	R23	555379	179902
37	R24	558144	183519
38	R25	567446	182119
39	R26	558009	184058
40	R27	563778	179720
41	16/01232/OUT	567251.38	177966.7
42	18/00664/CONDC	567931.31	178212.42
43	16/00412/OUT	565033.75	178056.05
44	15/00379/OUT	564844.19	178304.12
45	16/01475/SCR	567622.38	179078.84

Receptor ID	Receptor Name	x	y
46	GR/17/674	564174	172500
47	20141214	564292	172307

1.2.7 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties. The approaches used to predict the concentrations for these different averaging periods are described below.

1.2.8 There are four Local Wildlife Sites (LWS) that are within 200 m of the construction traffic route and ecological receptors were modelled at the nearest point of each LWS to the roads.

1.3 Long-term Pollutant predictions

1.3.1 Annual-mean NO_x and PM_{10} concentrations have been predicted at selected sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_x emissions is converted to NO_2 to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO_2 concentrations have been derived from the modelled road-related annual-mean NO_x concentration using the Defra's calculator (Defra, 2017).

1.4 Short-term Pollutant Predictions

1.4.1 In order to predict the likelihood of exceedances of the hourly-mean AQS objectives for NO_2 and the daily-mean AQS objective for PM_{10}, the following relationships between the short-term and the annual-mean values at each receptor have been considered.

1.5 Hourly-mean AQS Objective for NO_2

1.5.1 Research undertaken in support of LAQM.TG16 has indicated that the hourly-mean limit value and objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean NO_2 concentration is less than 60 µg.m^{-3}. The threshold of 60 µg.m^{-3} NO_2 has been used the guideline for considering a likely exceedance of the hourly-mean nitrogen dioxide objective.

1.6 Daily-mean AQS Objective for PM_{10}

1.6.1 The number of exceedances of the daily-mean AQS objective for PM_{10} of 50 µg.m^{-3} may be estimated using the relationship set out in LAQM.TG16:

*Number of Exceedances of Daily Mean of 50 µg.m-3 = -18.5 + 0.00145 * (Predicted Annual-mean PM_{10})3 + 206 / (Predicted Annual-mean PM_{10} Concentration)*

1.6.2 This relationship suggests that the daily-mean AQS objective for PM_{10} is likely to be met if the predicted annual-mean PM_{10} concentration is 31.8 µg.m^{-3} or less.

1.6.3 The daily mean objective is not considered further within this assessment if the annual-mean PM10 concentration is predicted to be less than 31.5 µg.m^{-3}.

1.7 Fugitive PM_{10} Emissions

1.7.1 Transport PM_{10} emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM_{10} exhaust emissions; therefore, the relative importance of fugitive PM_{10} emissions is increasing. Current emission factors for particulate matter include brake dust and tyre wear (which studies suggest may account for approximately one-third of the total particulate emissions from road transport); however, no allowance is made for re-suspended road dust as this remains unquantified.

1.8 Significance Criteria for Development Impact on the Local Area

Human-Health Receptors

1.8.1 The EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document (EPUK & IAQM, 2017) advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

1.8.2 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 1.3 provides the EPUK & IAQM approach for describing the human-health air quality impacts at sensitive receptors.

Table 1.3: Impact Descriptors for Individual Sensitive Receptors

Long term average concentration at receptor in assessment year (sensitivity)	% Change in concentration relative to Air Quality Assessment Level			
	1	2-5	6-10	>10
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 -94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 - 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

*AQAL for NO_2 and PM_{10} = 40 µg.m^{-3}, for $PM_{2.5}$ = 25 µg.m^{-3}

1. AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

2. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.

3. The table is only designed to be used with annual mean concentrations.

4. Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.

5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.

6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.

7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

1.8.3 The human-health impact descriptors above apply at individual receptors. The EPUK & IAQM guidance states that the impact descriptors *"are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances. "*

1.8.4 Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

Ecological Receptors

Critical Levels

1.8.5 Critical levels are maximum atmospheric concentrations of pollutants for the protection of vegetation and ecosystems and are specified within relevant European air quality directives and corresponding UK air quality regulations. PCs and, if appropriate, Predicted Environmental Concentrations (PECs) of NO_X have been calculated for comparison with the 30 µg.m^{-3} critical level. Background NO_X concentrations at each designated site have been derived from the UK Air Pollution Information System (APIS) (n.d.) database.

Critical Loads

1.8.6 Critical Loads refer to the quantity of pollutant deposited, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Nutrient nitrogen deposition and acid deposition are considered in this Appendix.

Critical Loads – Nutrient Nitrogen Deposition

1.8.7 Percentage contributions to nutrient nitrogen deposition have been derived from the modelled NO_X concentrations. Deposition rates have been calculated using empirical methods recommended by the Environment Agency, as follows:

i. The dry deposition flux (µg.m^{-2}.s^{-1}) has been calculated by multiplying the ground level NO_2 concentrations (µg.m^{-3}) by the deposition velocity of 0.003 m.s^{-1} for forests/tall habitats and 0.0015 m.s^{-1} for grassland/short habitats.
ii. Units of µg.m^{-2}.s^{-1} have been converted to units of kg.ha^{-1}.year^{-1} by multiplying the dry deposition flux by the standard conversion factor of 96 for NO_X.

iii. Predicted contributions to nitrogen deposition have been calculated and compared with the relevant critical load range for the habitat types associated with the designated site. These have been derived from the APIS database.

Critical Loads – Acid Deposition

1.8.8 The acid deposition rate, in equivalents keq.ha^{-1}.year^{-1}, has been calculated by multiplying the dry deposition flux (kg.ha^{-1}.year^{-1}) by a conversion factor of 0.071428 for N. This takes into account the degree to which a chemical species is acidifying, calculated as the proportion of N within the molecule.

1.8.9 Wet deposition in the near field is not significant compared with dry deposition for N (Hertel *et al*., 2011) and therefore for the purposes of this assessment, wet deposition has not been considered.

1.8.10 Predicted contributions to acid deposition have been calculated and compared with the minimum critical load function for the habitat types associated with the designated site as derived from the APIS database.

Significance Criteria – Ecological Receptors

1.8.11 In this case, the only nature conservation sites within 200 m of the construction traffic route are Local Wildlife Sites (LWSs). Maximum PCs and PECs of NO_X and nutrient nitrogen / acid deposition have been compared against the relevant critical level/load for the relevant habitat type/interest feature. Based on current DEFRA and Environment Agency (EA) (2016) guidelines and the Institute of Air Quality Management (IAQM) *A guide to the assessment of air quality impacts on designated nature conservation sites* (IAQM, 2019), the following criteria have been used to determine if the impacts are significant:

1.8.12 For local nature sites:

- If the short-term PC is less than 100% of the relevant critical level/load the effect is considered not significant; and
- If the long-term PC is less than 100% of the relevant critical level/load the effect is considered not significant.

1.9 Uncertainty

1.9.1 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

1.9.2 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

1.9.3 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the uncertainty range informed by an analysis of relevant, available data.

1.9.4 The atmospheric dispersion model used for this assessment, ADMS Roads, has been validated by its supplier and is widely used by professionals in the UK and overseas. A site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values.

1.9.5 LAQM.TG16 requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their R&A duties. Model verification refers to the checks that are carried out on model performance at a local level. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.

1.9.6 For the verification and adjustment of NO_X/NO_2 concentrations for R&A purposes, it is recommended that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.

1.9.7 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able to verify the models they use for R&A purposes; however, for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. Notwithstanding this, a small number of monitoring locations have been identified within the study area and a model verification study has been undertaken for the Application Site and is included below.

Model Verification

1.9.8 The EPUK & IAQM guidance considers an exceedance of an air quality objective AQAL to be significant adverse effect unless provision is made to reduce the resident's or occupant's exposure by some means.

1.9.9 For the verification and adjustment of NO_x/NO_2 concentrations, the guidance recommends that the comparison considers a broad spread of automatic and diffusion monitoring. Thurrock Council monitors roadside NO_2 concentrations passively using diffusion tubes at multiple locations in the vicinity of the Application Site.

1.9.10 A model verification study was undertaken, and no correction factor was deemed necessary. The model verification study is shown in Annex A to this appendix.

2. Assessment of Construction-Phase Air Quality Impacts from Traffic

2.1 Human-Health Receptors

2.1.1 This section of the report summarises the construction-phase air quality impacts of the key pollutants associated with the construction traffic of the proposed scheme.

Nitrogen Dioxide (NO_2)

2.1.2 Table 2.1 presents the annual-mean NO_2 concentrations predicted at the facades of modelled receptors.

Table 2.1: Predicted Annual-Mean NO_2 Impacts at Modelled Receptors

Receptor ID	Concentration (µg.m^{-3})		During Construction - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	During Construction		
Fort Road	29.1	29.1	0	Negligible
Sandhurst Road	28.9	28.9	0	Negligible
School	29.1	29.1	0	Negligible
Gateway Academy	29.0	29.0	0	Negligible
Gravel Pit Cottages	28.8	28.8	0	Negligible
Princess Margaret Rd	28.8	28.8	0	Negligible
Walnut Tree Farm	28.8	28.8	0	Negligible
The Green	28.8	28.8	0	Negligible
West Street	28.8	28.8	0	Negligible
Milton School	28.8	28.8	0	Negligible
Royal Pier Road	28.8	28.8	0	Negligible
West Tilbury Hall	28.8	28.8	0	Negligible
Cooper Shore	28.9	28.9	0	Negligible
R1	28.9	28.9	0	Negligible
R2	28.9	28.9	0	Negligible
R3	36.4	36.6	1	Negligible
R4	32.7	32.8	0	Negligible
R5	38.9	39.2	1	Slight
R6	32.3	32.4	0	Negligible
R7	33.0	33.1	0	Negligible
R8	30.1	30.2	0	Negligible
R9	29.6	29.6	0	Negligible
R10	29.6	29.6	0	Negligible
R11	29.0	29.0	0	Negligible
R12	29.0	29.0	0	Negligible
R13	28.9	29.0	0	Negligible
R14	29.2	29.2	0	Negligible
R15	29.1	29.2	0	Negligible
R16	29.0	29.0	0	Negligible
R17	29.0	29.0	0	Negligible
R18	31.9	31.9	0	Negligible
R19	29.1	29.1	0	Negligible
R20	31.3	31.4	0	Negligible
R21	41.0	41.3	1	Moderate
R22	28.9	28.9	0	Negligible
R23	28.8	28.8	0	Negligible
R24	28.8	28.8	0	Negligible
R25	28.8	28.8	0	Negligible
R26	28.8	28.8	0	Negligible
R27	30.6	30.6	0	Negligible
16/01232/OUT	28.8	28.8	0	Negligible
18/00664/CONDC	28.8	28.8	0	Negligible
16/00412/OUT	28.9	28.9	0	Negligible

Receptor ID	Concentration (µg.m-3)		During Construction - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	During Construction		
15/00379/OUT	28.9	28.9	0	Negligible
16/01475/SCR	28.8	28.8	0	Negligible
GR/17/674	28.8	28.8	0	Negligible
20141214	28.8	28.8	0	Negligible
Maximum	41.0	41.3	1	-
Minimum	28.8	28.8	0	-

2.1.3 Predicted annual-mean NO_2 concentrations during the construction phase at the façades of the modelled receptors are below the AQS objective for NO_2 for all receptors except R21 where the predicted NO_2 concentration exceeds the AQS objective both during construction and without the development. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

2.1.4 As all predicted annual-mean NO_2 concentrations are below 60 µg.m^{-3}, the hourly-mean objective for NO_2 is likely to be met at all receptors. The short-term NO_2 impact can be considered 'negligible' and is not considered further within this assessment.

2.1.5 Overall, the impact on the surrounding area from NO_2 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{10})

2.1.6 Table 2.2 presents the annual-mean PM_{10} concentrations predicted at the façades of modelled receptors.

Table 2.2: Predicted Annual-Mean PM_{10} Impacts at Modelled Receptors

Receptor ID	Concentration (µg.m-3)		During Construction - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	During Construction		
Fort Road	19.4	19.4	0	Negligible
Sandhurst Road	19.3	19.3	0	Negligible
School	19.4	19.4	0	Negligible
Gateway Academy	19.3	19.3	0	Negligible
Gravel Pit Cottages	19.3	19.3	0	Negligible
Princess Margaret Rd	19.3	19.3	0	Negligible
Walnut Tree Farm	19.3	19.3	0	Negligible
The Green	19.3	19.3	0	Negligible
West Street	19.3	19.3	0	Negligible
Milton School	19.3	19.3	0	Negligible
Royal Pier Road	19.3	19.3	0	Negligible
West Tilbury Hall	19.3	19.3	0	Negligible
Cooper Shore	19.3	19.3	0	Negligible
R1	19.3	19.3	0	Negligible
R2	19.3	19.3	0	Negligible
R3	20.3	20.4	0	Negligible
R4	20.0	20.0	0	Negligible
R5	20.6	20.7	0	Negligible
R6	19.7	19.7	0	Negligible
R7	20.1	20.1	0	Negligible
R8	19.6	19.6	0	Negligible
R9	19.6	19.6	0	Negligible
R10	19.6	19.6	0	Negligible
R11	19.4	19.4	0	Negligible
R12	19.4	19.4	0	Negligible
R13	19.4	19.4	0	Negligible
R14	19.5	19.5	0	Negligible
R15	19.4	19.4	0	Negligible
R16	19.4	19.4	0	Negligible
R17	19.4	19.4	0	Negligible

Receptor ID	Concentration (µg.m^{-3})		During Construction - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	During Construction		
R18	19.7	19.7	0	Negligible
R19	19.4	19.4	0	Negligible
R20	19.6	19.6	0	Negligible
R21	21.0	21.0	0	Negligible
R22	19.3	19.3	0	Negligible
R23	19.3	19.3	0	Negligible
R24	19.3	19.3	0	Negligible
R25	19.3	19.3	0	Negligible
R26	19.3	19.3	0	Negligible
R27	19.6	19.6	0	Negligible
16/01232/OUT	19.3	19.3	0	Negligible
18/00664/CONDC	19.3	19.3	0	Negligible
16/00412/OUT	19.3	19.3	0	Negligible
15/00379/OUT	19.3	19.3	0	Negligible
16/01475/SCR	19.3	19.3	0	Negligible
GR/17/674	19.3	19.3	0	Negligible
20141214	19.3	19.3	0	Negligible
Maximum	21.0	21.0	0	-
Minimum	19.3	19.3	0	-

2.1.7 Predicted annual-mean PM_{10} concentrations during the construction phase at the façades of the modelled receptors are well below the AQS objective for PM_{10}. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

2.1.8 As all predicted annual mean PM_{10} concentrations are below 31.5 µg.m^{-3}, the daily-mean PM_{10} objective is expected to be met at all receptors and the short-term PM_{10} impact is not considered further within this assessment.

2.1.9 Overall, the impact on the surrounding area from PM_{10} is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter ($PM_{2.5}$)

2.1.10 Table 2.3 presents the annual-mean $PM_{2.5}$ concentrations predicted at the façades of modelled receptors.

Table 2.3: Predicted Annual-Mean $PM_{2.5}$ Impacts at Modelled Receptors

Receptor ID	Concentration (µg.m^{-3})		During Construction - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	During Construction		
Fort Road	12.6	12.6	0	Negligible
Sandhurst Road	12.5	12.5	0	Negligible
School	12.6	12.6	0	Negligible
Gateway Academy	12.5	12.5	0	Negligible
Gravel Pit Cottages	12.5	12.5	0	Negligible
Princess Margaret Rd	12.5	12.5	0	Negligible
Walnut Tree Farm	12.5	12.5	0	Negligible
The Green	12.5	12.5	0	Negligible
West Street	12.5	12.5	0	Negligible
Milton School	12.5	12.5	0	Negligible
Royal Pier Road	12.5	12.5	0	Negligible
West Tilbury Hall	12.5	12.5	0	Negligible
Cooper Shore	12.5	12.5	0	Negligible
R1	12.5	12.5	0	Negligible
R2	12.5	12.5	0	Negligible
R3	13.2	13.2	0	Negligible
R4	12.9	13.0	0	Negligible
R5	13.3	13.4	0	Negligible
R6	12.8	12.8	0	Negligible
R7	13.0	13.0	0	Negligible
R8	12.7	12.7	0	Negligible
R9	12.7	12.7	0	Negligible
R10	12.7	12.7	0	Negligible

Receptor ID	Concentration (µg.m^{-3})		During Construction - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	During Construction		
R11	12.6	12.6	0	Negligible
R12	12.6	12.6	0	Negligible
R13	12.5	12.5	0	Negligible
R14	12.6	12.6	0	Negligible
R15	12.6	12.6	0	Negligible
R16	12.6	12.6	0	Negligible
R17	12.6	12.6	0	Negligible
R18	12.8	12.8	0	Negligible
R19	12.6	12.6	0	Negligible
R20	12.7	12.7	0	Negligible
R21	13.6	13.6	0	Negligible
R22	12.5	12.5	0	Negligible
R23	12.5	12.5	0	Negligible
R24	12.5	12.5	0	Negligible
R25	12.5	12.5	0	Negligible
R26	12.5	12.5	0	Negligible
R27	12.7	12.7	0	Negligible
16/01232/OUT	12.5	12.5	0	Negligible
18/00664/CONDC	12.5	12.5	0	Negligible
16/00412/OUT	12.5	12.5	0	Negligible
15/00379/OUT	12.5	12.5	0	Negligible
16/01475/SCR	12.5	12.5	0	Negligible
GR/17/674	12.5	12.5	0	Negligible
20141214	12.5	12.5	0	Negligible
Maximum	13.6	13.6	0	-
Minimum	12.5	12.5	0	-

2.1.11 Predicted annual-mean $PM_{2.5}$ concentrations during the construction phase at the façades of the modelled receptors are below the AQS objective for $PM_{2.5}$ at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

2.1.12 Overall, the impact on the surrounding area from $PM_{2.5}$ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

2.2 Ecological Receptors

2.2.1 This section shows the results of the assessment of construction traffic-related emissions on designated ecological sites within 200 m of the construction traffic route.

2.2.2 The maximum predicted annual-mean NO_x concentrations are compared with the critical level in Table 2.4. The maximum predicted nutrient nitrogen deposition rates are compared with the critical load in Table 2.5. The maximum predicted acid deposition rates are compared with the critical load function in Table 2.6.

Table 2.4: Predicted Annual-mean NOx Concentrations at Designated Sites – Traffic-related Emissions

Designated Site	CL (µg.m^{-3})	PC (µg.m^{-3})	PC/CL (%)
West Tilbury Hall LWS	30	0.010	0
Low Street Pit LWS	30	0.053	0
Lytag Brownfield LWS	30	0.024	0
Tilbury Marshes LWS	30	0.210	0

Table 2.5: Predicted Nutrient Nitrogen Deposition at Designated Sites – Traffic-related Emissions

Designated Site	Interest Feature	CL (kgN.ha^{-1}.yr^{-1})	PC (kgN.ha^{-1}.yr^{-1})	PC/CL (%)
West Tilbury Hall LWS	Acid grassland	10	0.001	0
Low Street Pit LWS	Acid grassland	10	0.004	0
Lytag Brownfield LWS	Acid grassland	10	0.001	0
Tilbury Marshes LWS	Coastal & floodplain grazing marsh	20	0.014	0
	Coastal saltmarsh	20	0.014	0

Table 2.6: Predicted Acid Deposition at Designated Sites – Traffic-related Emissions

Designated Site	Interest Feature	CL (keq.ha^{-1}.yr^{-1})	PC (keq.ha^{-1}.yr^{-1})	PC/CLF (%)
West Tilbury Hall LWS	Acid grassland	0.48	0.0001	0
Low Street Pit LWS	Acid grassland	0.223	0.0003	0
Lytag Brownfield LWS	Acid grassland	0.48	0.0001	0

2.2.3 The maximum PCs from traffic-related emissions are below 100% of the critical level at all Local Wildlife Sites and the effects can therefore be screened out as insignificant at these sites.

2.3 Significance of Effects

2.3.1 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

2.3.2 The impacts predicted at individual receptors and the geographical extent over which such impacts occur, can be used to inform the judgement on the impact on the surrounding area as a whole, and whether the resulting overall effect is significant or not. The IAQM guidance states, *"Whilst it may be that there are 'slight', 'moderate', or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances." and "…a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health."*

2.3.3 The results of the modelling indicate that with the development, the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at modelled human-health receptors are below the relevant long and short-term AQS objectives at all receptors except R21 where the predicted NO_2 concentration exceeds the AQAL both with and without the development. When the magnitude of change in annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on modelled receptors are categorised as 'negligible'. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be 'negligible', using the descriptors adopted for this assessment.

2.3.4 For ecological receptors, the PCs are all less than 1% of the critical level/load and the impacts can be screened out as insignificant.

2.4 Conclusion

2.4.1 Using professional judgement, the resulting air quality effect from construction traffic is considered to be 'not significant' overall.

3. References

Department for Environment, Food & Rural Affairs (DEFRA) and Environment Agency (EA) (2016) Air emissions risk assessment for your environmental permit. [Online]. Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit [Accessed 07 October 2019]

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Institute of Air Quality Management (IAQM) (2019) A guide to the assessment of air quality impacts on designated nature conservation sites. London, IAQM.

Annex A: Model Verification

A.1 The approach to model verification that LAQM.TG16 recommends for local authorities when they carry out their LAQM duties is summarised earlier in this appendix. For the verification and adjustment of NO_x /NO_2 concentrations, the guidance recommends that the comparison considers a broad spread of automatic and diffusion-tube monitoring. Thurrock Council monitors roadside NO_2 concentrations passively using diffusion tubes at three locations in the vicinity of the Application Site.

A.2 The concentrations monitored over recent years are provided in Table A.1.

Table A.1 Measured Annual-mean NO_2 Concentrations (µg.m^{-3})

Monitoring Site	Measured Annual-mean NO_2 Concentrations (µg.m^{-3})				
	2013	2014	2015	2016	2017
TILC	40.39	37.86	32.63	39.02	41.02
ER	56.68	53.27	50.61	51.81	50.83
HL	33.3	35.48	28.74	33.52	33.67

A.3 The monitored annual-mean NO_2 concentrations have been compared with the modelled annual-mean NO_2 concentrations. This comparison is provided in Table A.2 below.

Table A.2 Comparison of Monitored and Modelled Annual-mean Road NO_2 Concentrations (µg.m^{-3})

Monitoring Site	Annual-mean NO_2 Contribution (µg.m^{-3})		
	Monitored	Modelled	% Difference (Monitored-Modelled)
TILC	41.02	35.6	-13.4
ER	50.83	41.5	-18.4
HL	33.67	36.9	5.3

*Measured in 2017

A.4 It should be borne in mind that the monitored concentrations are themselves only estimates to the true concentrations at each point; the EU Directive on air quality designates passive NO_2 samplers indicative measures with a potential uncertainty of +/-30 %. Ignoring any uncertainty errors in the monitoring results,

A.5 As the percentage difference between the monitored and modelled annual-mean road NO_2 concentrations is below 25%, no correction factor has been deemed necessary.