AECOM

Thorney Lane Data Centre Emergency Back-up Generation Facility

Environmental Permit Application EPR/SP3224LP

Air Quality Assessment

Amazon Data Services Uk Limited

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Delivering a better world

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1. Introduction

1.1 Overview

This document presents the Air Quality Assessment to accompany an Environmental Permit application submitted by Amazon Data Services UK Limited under the Environmental Permitting (England and Wales) Regulations 2016 (as amended)[1] ("the EP Regulations"). The Environmental Permit is being requested to enable Amazon Data Services UK Limited to operate an emergency back-up generation facility, comprising back-up diesel generators and associated fuel storage and handling areas (the 'installation') at a data centre located at Thorney Lane Buckinghamshire (the 'Site').

This assessment investigates the impacts to air quality associated with the operation of emergency backup generators which will serve as a secondary power supply in the event of grid failure, thereby ensuring uninterrupted operation of the data centre and protection of critical IT infrastructure.

The installation will include 36 containerised diesel-fired emergency generators to provide backup power supply for two data centre buildings (14 no. for data centre building A and 22 no. for data centre building B) and a smaller 'house' generator for each building to cover noncritical operations in an emergency such as offices.

The backup generators are for emergency use only and are not connected to any formal balancing service or frequency response contracts. This means the installation meets the exemption criteria outlined in the UK Government's guidance on Specified Generators[2], which excludes data centre backup generators used solely during transmission instability, provided they are not contracted for grid services.

Although the generators are intended for use only during grid outages, they will require periodic testing and maintenance to ensure ongoing operational readiness. The testing regime is expected to result in total running times of less than 50 hours per year per generator.

The assessment has been conducted in line with the Environment Agency's Air emissions risk assessment for your environmental permit guidance[3]. Emissions to air have been modelled to determine the likely worst-case Process Contributions (PC). These have been added to the ambient background pollutant concentrations (AC) to determine the overall Predicted Environmental Concentration (PEC) at sensitive receptor locations, which have then been assessed against the relevant air quality standards.

An assessment of the potential impacts on human health sensitive and nature conservation sensitive receptors in the locality has been undertaken.

1.2 Scope of Assessment

The scope of the air quality assessment involves the dispersion modelling of emissions from the operation of the emergency generators. The assessment quantifies the potential impact of emissions to air from the generators during both routine testing and emergency operation.

The backup generators will operate as follows:

- Routine testing and maintenance will be undertaken periodically throughout the year to ensure the generators remain in working condition. Total operation under normal conditions will not exceed 50 hours per generator per annum and will be limited to:
  - Biweekly functional testing – 13 hours/year (26 events at 0.5 h).
  - Biannual load testing – 8 hours/year (2 events at 4 h).

[1] H. M. Government, The Environmental Permitting Regulations 2016, Statutory Instrument No. 1154
[2] Specified generator: when you need a permit, available https://www.gov.uk/guidance/specified-generator-when-you-need-a-permit
[3] Environment Agency & Defra, Air emissions risk assessment for your environmental permit, 2023, Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk)

  - General maintenance – 10 hours/year (distributed throughout the year).
- Emergency operation is expected to be infrequent but may involve multiple generators operating simultaneously during a single extended grid outage event. For the purpose of this air quality assessment, it is assumed that emergency operation could occur for up to 72 hours per year.

The assessment considers emissions of the main pollutants associated with the combustion of diesel that have the potential to harm human health and/or sensitive habitats. These include nitrogen oxides (NO_x), carbon monoxide (CO), total hydrocarbons (HC), and particulate matter (PM_{10}). In the atmosphere, nitric oxide (NO) is rapidly oxidised to nitrogen dioxide (NO_2), which has the potential to harm human health. The deposition of NO_2 contributes to nitrogen deposition (Ndep) and acid deposition (Adep), which have the potential to harm sensitive habitats.

2. Impact Assessment Methodology

2.1 Methodology Overview

This section describes the approach taken for the assessment of emissions associated with the operation of the installation.

For the purposes of this assessment, several assumptions have been made to ensure that the outputs of the dispersion modelling are reasonably precautionary. These assumptions include:

- The modelled emissions parameters for each BAT compliant generators considered represents the worst-case value, in terms of air quality impact, across the short-list of generator models being considered for the installation. For example:
    - The highest emissions concentration of each pollutant
    - The lowest emissions exit velocity
    - The lowest emissions temperature
- Each generator has been modelled to operate at 100% load for all testing, maintenance and emergency operations. Emission rates used in the modelling represent maximum rated output for each generator, and no partial-load adjustments have been applied.

Detailed dispersion modelling using the atmospheric dispersion model ADMS (V6) has been used to calculate the predicted PC at each receptor location. These concentrations have been compared with the relevant Environmental Standard for each pollutant species released.

2.2 Environmental Standards

The principal air quality legislation within the United Kingdom (UK) is the Air Quality Standards Regulations 2010[4], which transposes the requirements of the European Ambient Air Quality Directive 2008[5], updated 2015. The Regulations set air quality limits for a number of major air pollutants that have the potential to impact public health, such as NO_2, CO and particulates (PM_{10} and $PM_{2.5}$).

The Environmental Improvement Plan published in 2023[6] outlined several actions that are being taken to improve air quality, most notably by supporting local authorities, facilitating the rollout of Clean Air Zones, supporting the transition away from petrol and diesel cars, regulating domestic burners, and regulating agricultural emission. It also included interim targets (deadline 2028) for $PM_{2.5}$ to demonstrate the trajectory against the long-term legal targets (deadline 2040) set out in The Environmental Targets (Fine Particulate Matter) Regulations 2023.

The Environment Act 1995[7] requires the UK Government to produce a National Air Quality Strategy (NAQS)[8], last updated in 2023, containing air quality objectives and timescales to meet those objectives. These objectives apply to outdoor locations where people are regularly present and do not apply to occupational, indoor or in-vehicle exposure.

The NAQS also defines Critical Levels for the protection of vegetation and ecosystems for oxides of nitrogen for the protection of sensitive ecological receptors. The term 'Critical Levels' (CLe) refers to the concentrations of a pollutant in the atmosphere above which adverse effects on receptors, such as plants and/ or ecosystems may occur.

In addition to the above Critical Levels set in the legislation, there are non-legislative limits, called Critical Loads (CLo) that have been derived for different habitats covering the deposition of nitrogen and acidifying species; Critical Loads are defined as "a *quantitative estimate of exposure to one or more*

[4] H.M Government (2010), The Air Quality Standards Regulations 2010, Statutory Instrument No. 1001
[5] European Commission (2008), Directive 2008/50/EC of the European Parliament on ambient air quality and a cleaner air for Europe
[6] H.M Government (2023). Environmental Improvement Plan 2023. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1133967/environmental-improvement-plan-2023.pdf
[7] H.M Government (1995), The Environment Act 1995.
[8] Defra (2023), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2023.

pollutant below which significant harmful effects on specified elements of the environment do not occur according to present knowledge" (APIS). The habitat-specific Critical Loads for the relevant ecological receptors are presented in the tabulated results in Section 3.

Table 2-1 shows the current NAQS objectives, CLe and CLo values relevant to this assessment (here on in collectively referred to as the "air quality assessment levels (AQAL)").

Table 2-1: Environmental Standards Applicable to the Assessment

Pollutant	Averaging Period	Limit ($\mu g/m^3$ unless stated)	Number of Permitted Exceedances
For the Protection of Human Health			
Nitrogen Dioxide (NO_2)	Hourly mean	200	Not to be exceeded more than 18 times per year (i.e. 99.79th percentile of hourly results)
	Annua mean	40	None
Particulates (PM_{10})	Daily mean	50	Not to be exceeded more than 35 times per year (i.e. 90.4th percentile of daily results)
	Annual mean	40	None
Particulates ($PM_{2.5}$)	Annual mean	20	None
Carbon Monoxide (CO)	Rolling 8-hour mean	10,000	None
Total Hydrocarbon (HC)[1]	N/A[1]	N/A[1]	N/A[1]
For the Protection of Sensitive Habitats			
Oxides of Nitrogen (NO_x)	Daily maximum	75	None
	Annual mean	30	None
Nitrogen Deposition (Ndep)	Annual total	10 kgN/ha/yr	None
Acid Deposition	Annual total	Keq/ha/yr	None

[1] There is no air quality standard for total hydrocarbons. There are air quality standards for individual species of hydrocarbon, including an air quality objective value for benzene (C_6H_6) and an environmental assessment level toluene ($C_6H_5CH_3$).

2.3 Sensitive Receptors

The assessment has considered predicted ground level impacts at the worst-case identified human health and ecological receptors located in the vicinity of the installation. The identified human health and sensitive ecological receptors are shown in Table 2-2 and illustrated in Figure 1 of Appendix A.

Human Health sensitive receptors have been identified using online aerial photography and base mapping. They include the nearest sensitive land uses in each direction of the installation. Whether a land use is sensitive or not depends on whether members of the public are present at that location for a period of time comparable to the averaging periods of the AQALs. The human health sensitive receptors considered in this assessment are listed in Table 2-2.

Table 2-2: Identified Human Health Receptors in the Vicinity of the Site

Receptor Number	Receptor Description	Grid Reference (m)		Receptor Height (m)	Distance and Direction from Generator Emission Points
		X	Y	Z	
R01	Residential at Bathurst Walk	503258.5	179822.7	1.5	330m Southeast
R02	Residential at Bathurst Walk	503219.1	179774.9	1.5	325m Southeast
R03	Residential at Bathurst Walk	503460.3	179818.6	1.5	519m Southeast
R04	Residential by the Grand Union Canal Slough Arm	502506.1	180046.0	1.5	395m West
R05	Residential at Southwold Spur	502133.8	179679.8	1.5	807m West
R06	The Langley Heritage Primary School	501874.6	179329.2	1.5	1.19km Southwest
R07	Residential at Leacroft Road	502976.0	181034.6	1.5	957m North
R08	Residential at Mansion Lane	502424.4	180544.4	1.5	689m Northwest
R09	Residential at Parlaunt Road	502246.6	179078.0	1.5	1.09km Southwest
R10	Residential at Thorney Lane North	503938.1	180412.0	1.5	974m East
R11	Residential at North Park	503212.8	179245.7	1.5	780m South
R12	Residential at Syke Cluan	503357.6	179590.7	1.5	550m Southeast
R13	Residential at High Street	503247.7	181271.1	1.5	1.2km North
R14	Iver Village Nursery	503526.1	181218.6	1.5	1.24km North
R15	Residential at Thorney Lane North	503935.6	180547.4	1.5	1.03km East
R16	Residential by the Grand Union Canal Slough Arm	502570.0	180028.0	1.5	331m West
R17	Residential at James Walk	503255.0	179582.0	1.5	495m Southeast
R18	Residential at Addison Close	503391.0	180979.0	1.5	964m North
R19	Residential at Cherry Close	503697.0	180937.0	1.5	1.09km Northeast
R20	Residential at Barnes Way	503797.0	180791.0	1.5	1.05km Northeast
R21	Residential at Mansion Lane	502385.0	180319.0	1.5	585m Northwest
R22	Residential at Langley Park Road	502654.0	181036.0	1.5	1.01km North
R23	Residential at North Park	503015.0	179097.0	1.5	885m South
R24	Residential at Market Lane	502168.6	179737.6	1.5	755m West

Nature conservation receptors have been identified using the Air Pollutant Information System's (APIS) online mapping tool[9], Natural England's online Ancient Woodland mapping tool[10], and Buckinghamshire Council's Local Plan Proposals Maps[11]. These resources have been used to identify sensitive nature conservation habitats that meet the distance screening criteria given in Environment Agency guidance[3]. The criteria which apply are:

[9] UK Centre for Ecology and Hydrology (2025), Air Pollution Information System - APIS GIS map tool for Site Relevant Critical Loads & Search by Location for UK & Ireland.
[10] Natural England (2024), Natural England Open Data Publication - Ancient Woodland (England).
[11] Buckinghamshire Council (2025), The Local Plan for Buckinghamshire. https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-planning/buckinghamshire-local-plan/

- Within 10 km of the site:
  - Special Protected areas (SPAs)
  - Special Areas of Conservation (SACs)
  - Ramsar Sites (protected wetland)
- Within 2 km of the site:
  - Sites of Special Scientific Interest (SSSIs)
  - National Nature Reserves (NNR)
  - Local Nature Reserves (LNR)

Based on the screening criteria, five sensitive nature conservation sites of interest were identified which are described in Table 2-3 and shown on Figure 2 of Appendix A.

Table 2-3: Identified Nature Conservation Receptors in the Vicinity of the Site

Receptor Number	Receptor Description	Grid Reference (m)		Receptor Height (m)	Distance and Direction from Generator Emission Points
		X	Y	Z	
E1	Burnham Beeches, SAC and SSSI,	495625.2	184548.6	0	8.5km northwest
E2	Windsor Forest and Great Park, SAC and SSSI	496632.0	174939.2	0	7.9km southwest
E3	Southwest London Waterbodies, SPA and SSSI	501298.8	174125.3	0	6.0km south
E4	Ancient Woodland north of M4	503238.3	178377.4	0	1.5km south
E5	Ancient Woodland adjacent to Billet Lane	501650.3	181696.5	0	1.9km northwest

2.4 Background air quality

The total concentration of a pollutant at any location comprises contributions from explicit local emission sources, such as any roads and/or industrial stacks in the immediate vicinity of that location. It also includes contributions from more distant indeterminate sources that have been transported into the area of that location by the wind. This latter contribution is referred to as the background contribution. As the installation emissions produced are mixed into the ambient air, the assessment must also include this background contribution in order to estimate total pollutant concentrations (referred to from now on as the Predicted Environmental Concentration).

2.4.1 Defra Background Map Data

Defra has produced maps of background pollutant concentrations covering the whole of the UK for use by local authorities and consultants in the completion of Local Air Quality Management (LAQM) reports and air quality assessments[12]. The current Defra maps are based on projections from 2021 monitoring data and provide background pollutant concentrations for each 1-km grid square within the UK for all years between 2021 and 2040.

Background concentrations of NO_2, NO_x, PM_{10} and CO have been obtained from the Defra background pollutant database, in which pollutant concentrations are averaged over a 1km x 1km grid across the UK. Data for NO_2, NOx, and PM_{10} is available from 2021 baseline maps, while for CO data is only available from the 2001 maps. The background concentrations for the grid squares containing the installation and human health receptors are shown in Table 2-4.

[12] Defra (2024), Background Mapping data for local authorities. https://uk-air.defra.gov.uk/data/laqm-background-home

Background concentrations are assumed to be double the annual average value for the assessment against the daily critical level value, which is in line with guidance from the Environment Agency[3].

Table 2-4: Defra Background Maps Data (2024)

Receptor Number	Grid reference X	Grid reference Y	Background duration	NO_2 (μg/m^3)	PM_{10} (μg/m^3)	$PM_{2.5}$ (μg/m^3)	CO (μg/m^3)
R01,R02, R03, R17,R12, R11,R23	503500	179500	Long Term	13.2	13.2	7.8	447
			Short Term	26.4	26.4	n/a	894
R05, R06, R09, R24	502500	179500	Long Term	12.4	13.0	7.7	447
			Short Term	24.8	26.0	n/a	894
R04, R16, R21, R08	502500	180500	Long Term	11.7	12.9	7.6	433
			Short Term	23.4	25.8	n/a	866
R22, R07	502500	181500	Long Term	11.4	12.2	7.5	407
			Short Term	22.8	24.4	n/a	814
R13, R14	503500	181500	Long Term	12.3	12.6	7.8	414
			Short Term	24.6	25.4	n/a	828
R10, R15, R18, R19, R20	503500	180500	Long Term	12.6	12.9	7.7	438
			Short Term	25.2	25.8	n/a	876

This value corresponds with the urban background diffusion tube concentration measured by Buckinghamshire Council (see Table 3-1). For this assessment, the maximum background concentration from the Defra maps has been used as a conservative representation of background concentrations at receptor locations.

2.4.2 APIS Background Map Data

Background NO_X concentrations, Ndep rates and Adep rates at the habitat sites identified for the assessment have been obtained from the Air Pollution Information Service (APIS) website[9], and are detailed in Table 2-5.

Table 2-5: APIS Background Maps Data (3-year average (2020-2022))

Receptor Number	Grid Reference X	Grid Reference Y	Background duration	Annual Mean NOx Concentrations (μg/m^3)	NDep (kg N/Ha/Yr)	ADep (Keq S/Ha/Yr) N	ADep (Keq S/Ha/Yr) S
E1	494500	185500	Long Term	15.5	24.1	1.71	0.21
			Short Term	31.0	n/a		
E2	495500	174500	Long Term	16.4	22.3	1.59	0.19
			Short Term	32.8	n/a		
E3	501500	174500	Long Term	22.7	Not Sensitive		
			Short Term	45.4	n/a		
E4	503500	178500	Long Term	26.3	24.6	1.76	0.24
			Short Term	52.6	n/a		
E5	501500	181500	Long Term	19.0	24.8	1.74	0.21
			Short Term	38.0	n/a		

2.5 ADMS Model inputs

2.5.1 General Model Inputs

The general model inputs used in the assessment are summarised in Table 2-6. Modelled stack locations are provided in Table 2-7 and shown on Figure 3 of Appendix A. More detail is then provided on key relevant model inputs.

It is noted that the dispersion model in based on emissions data and site layout information provided by Amazon Data Services UK Limited.

Table 2-6: ADMS Model Inputs

Variables	ADMS model inputs
Sources	Emission point locations associated with the data centre generators are presented in Table 2-7
Pollutants modelled	NO_X, CO, HC, PM ($_{10}$ and $_{2.5}$)
Surface Roughness at source	0.5m
Minimum Monin-Obukhov length for stable conditions	5m
Meteorological data	Hourly sequential data from Heathrow airport for 5 years (2019-2023). Impacts reported at each receptor are the maximum impact across this 5-year period
Receptors	Designated human health and nature conservation receptors
Additional input files	Building data for downwash and Terrain data
Model output	PC to long-term (annual mean) and short-term concentrations of the pollutants modelled, plus conversion of those compounds to NO_2, Nitrogen deposition and acid deposition. PC and PEC reported are for the worst meteorological year for each pollutant and averaging period at each receptor.
NO_X to NO_2 conversion	Precautionarily assumed that 100% of long-term NO_X is converted to NO_2 and 50% of short-term NO_X is converted to NO_2.
Ambient background contributions	Sourced from published Defra data and APIS data, in line with Environment Agency guidance.

Table 2-7: Stack Locations

Stack	X	Y	Stack	X	Y
DC-A					
DC-A_House	502964.9	179986.8	DC-A_Gen8	502928.6	179976.9
DC-A_Gen1	502964.0	179986.7	DC-A_Gen9	502914.7	179973.1
DC-A_Gen2	502963.1	179986.3	DC-A_Gen10	502913.6	179972.8
DC-A_Gen3	502954.9	179984.1	DC-A_Gen11	502904.6	179970.4
DC-A_Gen4	502954.0	179983.8	DC-A_Gen12	502903.6	179970.0
DC-A_Gen5	502939.4	179979.9	DC-A_Gen13	502889.7	179966.3
DC-A_Gen6	502938.5	179979.6	DC-A_Gen14	502888.8	179966.0

Stack	X	Y	Stack	X	Y
DC-A_Gen7	502929.6	180052.1			
DC-B					
DC-B_House	502902.9	180041.5	DC-B_Gen12	502963.6	180058.7
DC-B_Gen1	502903.7	180041.7	DC-B_Gen13	503028.1	180077.1
DC-B_Gen2	502904.7	180041.9	DC-B_Gen14	503026.3	180076.8
DC-B_Gen3	502913.5	180044.1	DC-B_Gen15	503014.3	180073.1
DC-B_Gen4	502915.3	180044.5	DC-B_Gen16	503012.4	180072.3
DC-B_Gen5	502929.1	180048.8	DC-B_Gen17	503001.8	180069.3
DC-B_Gen6	502927.5	180048.3	DC-B_Gen18	503000.2	180068.7
DC-B_Gen7	502940.9	180052.1	DC-B_Gen19	502990.1	180066.0
DC-B_Gen8	502941.9	180052.5	DC-B_Gen20	502988.0	180065.3
DC-B_Gen9	502954.0	180055.8	DC-B_Gen21	502977.0	180062.2
DC-B_Gen10	502952.7	180055.4	DC-B_Gen22	502975.0	180061.7
DC-B_Gen11	502964.9	180059.2			

2.5.2 Modelling Approach

The nature of data centre emergency generator operations makes them a difficult source to model accurately, particularly for short-term pollutant impacts. The approach to modelling the generator emissions for testing and maintenance, and emergency operation scenarios is set out below.

2.5.2.1 Testing and Maintenance

Long-term impacts associated with testing and maintenance have been quantified by modelling all generators operating in unison at 100% load throughout the year. The model output has then been factored to account for the anticipated hours of operation anticipated over the year. This calculation is summarised as follows:

Long-Term PC = Modelled PC X ((13+8+10)/8760)

where 13 is the number of hours per year per generator for biweekly testing
8 is the number of hours per year per generator for biannual load testing
10 is the number of hours per year per generator for general maintenance
8760 is the number of hours in a standard year

Short-term impacts associated with testing and maintenance have been modelled assuming that the operation of each generator in isolation for this scenario could occur on any hour of the year. This assumes that the operation of each generator in isolation will coincide with the worst meteorological conditions over the course of the year at each receptor. This is an inherently precautionary approach. For example, the hourly mean AQAL for NO_2 is exceeded when a receptor experiences hourly mean concentrations of 200 µg/m^3 or more on a minimum of 19 hours in a calendar year. Given that there are only 31 hours of operation per generator per year, or 1,116 hours of operation aggregated across the installation per year, the likelihood of operations coinciding with the 19 worst meteorological hours in a year at each receptor is very low.

2.5.2.2 Emergency Operation

Long-term impacts associated with emergency operation have been quantified by modelling all generators operating in unison at 100% load throughout the year. The model output has then been factored to account for the anticipated hours of operation anticipated over the year. This calculation is summarised as follows:

Long-Term PC = Modelled PC X ((13+8+10+72)/8760)

where 13 is the number of hours per year per generator for biweekly testing
8 is the number of hours per year per generator for biannual load testing
10 is the number of hours per year per generator for general maintenance
72 is the number of hours per year per generator assumed for emergency operation
8760 is the number of hours in a standard year

It is not possible to foresee the number of hours of emergency operation that will be required each year. 72-hours of emergency operation is commonly used in the assessment of air quality impacts associated with emergency generator operation, as a precautionary estimate of emergency operation per year. The use of 72-hours of emergency operation in this assessment is not intended to represent a limit on emergency operation per year.

The assessment of short-term impacts associated with emergency operation focuses on hourly mean NO_2. All generators have been modelled operating simultaneously and at full load. Model outputs provided the hourly mean NO_2 PC for every hour of the five years of meteorological data used in the assessment. With the addition of a representative background contribution to the PC, each year of hourly PEC data was then analysed using hypergeometric distribution, following EA guidance[13]. The hypergeometric distribution calculation quantifies the probability of the hourly mean NO_2 AQAL being exceeded, based on the number of hours where concentrations are in excess of 200 µg/m^3, the number of allowable hourly exceedances, and the number of hours of emergency operation.

$$\text{Probability of an exceedance} = \left[\sum_{i=0}^{N-19} \frac{\binom{K}{i}\binom{M-K}{N-i}}{\binom{M}{N}} \right] X\ 2.5$$

where P is cumulative hypergeometric probability of an exceedance
i is the index of summation
K is the number of non-exceedance hours
M is the number of hours in the operating envelope
N is the number of operational hours
Probability is multiplied by 2.5 assuming continuous operations could occur for more than 1-hour

The results of this analysis present the probability of an exceedance of the AQO assuming 72 hours of emergency operation per year, and the number of emergency hours that could occur before the probability of an exceedance is ≥5%.

2.5.3 Emissions Data

The emissions data used to inform the dispersion modelling assessment is provided in Table 2-8. At time of writing, the type of generator to be used at the installation was not fixed but the generators selected will use diesel or equivalent substitute as a fuel. The data provided in Table 2-8 is therefore an amalgamation of emissions parameters across a number of generator types shortlisted for the installation by the operator. All generator types from which data has been sourced are diesel-fired and BAT compliant. In line with the EA FAQ Guidance for Data Centres, should the generators be fuelled with Hydrotreated Vegetable Oil (HVO), their emission parameters are likely to be less than reported here. The data selected for each emissions parameter is the most precautionary value, with regards to air quality impacts, across the range of generator types short-listed. Thus, providing a reasonably precautionary estimate of generator emissions.

[13] Environment Agency (2019), Specified generators: dispersion modelling assessment – Guidance on how to do detailed air quality modelling for specified generators. https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

Table 2-8: Generator Emission Parameters (100% Load)

Emission Source	Stack Height (m)	Stack Diameter (m)	Mass Flow (kg/s)	Temp (°C)	Substance	Conc. (mg/Nm^3)[1]	Release Rate (g/s)
Emergency Generators[2]	25	0.6	4.903	434	NOx	2678.8	6.793
					CO	606.6	1.456
					PM_{10} and $PM_{2.5}$	32.1	0.095
					HC	65.3	0.187
House Generators[3]	25	0.6	1.410	444	NOx	2051.1	2.436
					CO	572.2	0.680
					PM_{10} and $PM_{2.5}$	43.4	0.052
					HC	96.4	0.114

[1] Dry, 0°C, 5% O_2.
[2] Generators used to inform this data are: CAT (3516E); CAT (175-20); Cummins (QSK95-G5).
[3] Generators used to inform this data are: CAT (3512B); MTU (20V4000G94F).

2.5.4 Meteorology

The dispersion of emissions from point sources is largely dependent on atmospheric stability and turbulent mixing in the atmosphere, which in turn are dependent on wind speed and direction, ambient temperature, and cloud cover.

The dispersion modelling assessment is informed by 5-years of hourly sequential meteorological data from Heathrow Airport. It is important to use meteorological data that is as representative as possible for the installation that is modelled. At ~5km from the installation, the meteorological monitoring station at Heathrow Airport is considered the most representative source of meteorological data available. The wind-roses for the 5-years of Heathrow meteorological data are shown in Figure 3 of Appendix A.

2.5.5 Building Effects

The presence of buildings in the vicinity of an emissions source can have a significant effect on the dispersion of emissions from that source, affecting the flow pattern of the wind field, which can in turn bring a plume to ground more rapidly. The wind field can become entrained into the wake of buildings, which causes the wind to be directed to ground level more rapidly than in the absence of a building. If an emission is entrained into this deviated wind field, this can give rise to elevated ground-level concentrations. Building effects are typically considered where:

- The stack height is less than 2.5 times the height of a building; and
- The distance of a building from the stack is less than 5L, where L is the lesser dimension of the building height and maximum projected width.

The buildings present at the installation that are considered to be of sufficient height and massing to potentially impact on the dispersion of emissions from the generator stacks have been included in the model. The building parameters used in the model are shown in Table 2-9, and a visualisation of the buildings is shown in Figure 3 of Appendix A.

Table 2-9: Modelled Building Parameters

Building ID	Location (x, y)	Height (m)	Length/ diameter (m)	Width (m)	Angle[1]
DC-A	502948, 180091	19.8	155.0	67.7	253.5
DC-B	502944, 179945	19.8	103.7	69.0	344.3

Building ID	Location (x, y)	Height (m)	Length/ diameter (m)	Width (m)	Angle[1]
MV Building 1	502872, 180021	6.8	15.2	11.9	254.8
Client Control Building	502831, 179949	4.12	26.6	11.1	339.5
MV Building 2	502995, 180007	6.8	15.2	13.0	343.5
Sprinkler Pump House	503027, 180026	4.6	10.4	8.2	342.5
Lift House	502977, 179977	25.0	5.0	4.6	253.8

[1] Angle of building length to vertical north.

2.5.6 Terrain Effects

Local terrain can also influence the dispersion of emissions from modelled sources. The terrain data used to inform the assessment has been sourced from Lake Environmental Software[14] and is visualised in Figure 5 of Appendix A.

2.5.7 Surface Roughness

Surface roughness describes the degree of ground turbulence caused by the passage of winds across surface structures. Ground turbulence is greater in urban areas than in rural areas, for example, due to the presence of tall buildings.

The installation is situated in an industrial area, surrounded by buildings to the north, west and south, with open areas to the east. A surface roughness of 0.5 m, corresponding to parkland and open suburbia, has been selected to represent the local terrain.

2.6 Pollutant Conversion Rates

2.7 NO_X to NO_2 Conversion

Emissions of nitrogen oxides from combustion sources are typically dominated by nitric oxide (NO), in the ratio of nitric oxide to nitrogen dioxide (NO_2) of 9:1. However, it is NO_2 that has a specified Environmental Standard due to its potential impact on human health. In the ambient air, NO is oxidised to NO_2 by the ozone present, and the rate of oxidation is dependent on the relative concentrations of NO and ozone in the ambient air.

In order to assess the impact of the NO_2 emissions on local receptors, the following NO_X to NO_2 conversion rates have been used to inform the dispersion modelling assessment, as suggested by Environment Agency guidance[3]:

- Assumption that 100% of NOx present as NO_2 at ground level, plus the long-term background NO_2 concentration, in the calculation of long-term annual mean calculations; and
- Assumption that 50% of NOx present as NO_2 at ground level, plus double the long-term background NO_2 concentration, in the calculation of short-term hourly concentrations.

2.8 NO_2 to Nitrogen Deposition

Annual mean NO_2 concentrations are converted to nitrogen deposition (Ndep) using the following factors as set out in Environment Agency guidance[15]:

- Deposition flux for NO_2 (as µg/m²/s) is calculated by applying deposition velocity factors of:
    - o 0.0015 m/s to the annual mean NO_2 contribution (as µg/m³) at habitats with short vegetation (non-woodland); and

[14] http://www.webgis.com/srtm3.html
[15] Environment Agency (2014), AQTAG06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air.

  - 0.003 m/s to annual mean NO_2 (as µg/m^3) contribution at habitats with tall vegetation (woodland).

- A nitrogen deposition rate (as kgN/ha/yr) is then calculated by applying a unit conversion factor of:
  - 95.9 to the calculated deposition flux for NO_2 (as µg/m^2/s).

2.9 NO_2 to Acid Deposition

Annual mean NO_2 are converted to acid deposition (Adep) using the following factors as set out Environment Agency guidance[15]:

- Deposition flux for NO_2 (as µg/m^2/s) is calculated by applying deposition velocity factors of:
  - 0.0015 m/s to the annual mean NO_2 contribution (as µg/m^3) at habitats with short vegetation (non-woodland); and
  - 0.003 m/s to annual mean NO_2 (as µg/m^3) contribution at habitats with tall vegetation (woodland).
- An acid deposition rate (as keq/ha/yr) is calculated by applying a unit correction factor of:
  - 6.84 to the calculated deposition flux for NO_2 (as µg/m^2/s).

Once calculated PC contributions are input into the Acidity Critical Loads Function tool made available on the APIS. The tool is designed for the input of NO_2 and SO_2 derived acid deposition contributions.

2.10 Environment Agency Screening Criteria

2.10.1 Human Health Criteria

The Environment Agency's Risk Assessment guidance[3] provides staged screening criteria to inform the level of detail that air quality assessment is required to cover. In the first stage, the guidance advises that if both of the following criteria are met in respect of the predicted PC of any substance, the impact of an installation is screened out as insignificant and no further assessment is required:

- PC <1% of the long-term environmental standard; and
- PC <10% of the short-term environmental standard.

If one or both of these first screening criteria are not met, then further assessment is required to determine the impact of the PEC. In the second stage of screening if both of the following criteria are met no further assessment is required.

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration.
- The long-term PEC is less than 70% of the long-term environmental standards.

The EA's screening criteria have been applied to the outputs of the dispersion modelling assessment. Where the PC or the PEC is predicted to be lower than the relevant criteria, it is considered that the emissions from the Installation will be insignificant and not cause a new exceedance of an AQAL or markedly worsen an existing exceedance of an AQAL.

The guidance indicates that where an AQAL is likely to be breached as a result of contributions from an installation, or where an installation's releases contribute to high a proportion of the AQAL, such releases are likely to be considered significant at identified sensitive receptors.

2.10.1.1 Emergency Operation

In addition to the screening criteria set out in the Environment Agency's Air Emissions Risk Assessment guidance, they have separate guidance on Specified Generators[2]. This guidance provides a means by which the impact of emergency operation on short-term NO_2 concentrations can be determined, based on probability of an exceedance occurring. Where the calculated probability is:

- 1% or less – exceedances are highly unlikely
- less than 5% – exceedances are unlikely if the generator plant operational lifetime is no more than 20 years
- more than or equal to 5% – there's potential for exceedances and the regulator will consider if acceptable on a case-by-case basis

2.10.2 Nature Conservation Criteria

The Environment Agency's Risk Assessment guidance[3] also provides screening criteria for protected nature conservation sites, to identify when the impact on such receptors can be considered insignificant. The following criteria is used to demonstrate when the impact on habitats defined as SPAs, SACs, Ramsar's, and SSSIs can be screened out as insignificant and do not require further assessment:

- The short-term PC is less than 10% of the short-term environmental standard for protected conservation areas.
- The long-term PC is less than 1% of the long-term environmental standard for protected conservation areas.
- If your long-term PC is greater than 1% and your PEC is less than 70% of the long-term environmental standard.

The following criteria is used to demonstrate when the impact on habitats defined as local nature sites, such as ancient woodland, Local Wildlife Sites, and Local Nature Reserves:

- The short-term PC is less than 100% of the short-term environmental standard for protected conservation areas.
- The long-term PC is less than 100% of the long-term environmental standard for protected conservation areas.

If these conditions are not met for their respective sites, further assessment and more detailed justification needs to be provided to demonstrate that Installation emissions will be insignificant and not cause or markedly worsen an air quality compliance issue.

3. Baseline Air Quality

This section reports on existing baseline air quality in the vicinity of the Installation site. The background pollutant data reported in Section 2.4 is one source of information that can be considered to represent baseline conditions at locations.

A second source of baseline air quality data, which is described below, is that gathered by Local Authorities under their Local Air Quality Management responsibilities.

3.1 Local Air Quality Management

The Installation site is situated in the local authority areas of Buckinghamshire Council and Slough Borough Council.

Buckinghamshire Council has declared nine Air Quality Management Areas (AQMA) for annual NO_2 concentrations. However, four of them are now in the process to be revoked as recently measured NO_2 concentration are comfortably below the annual mean objective of 40µg/m^3. The site is located within the live South Bucks District Council Air Quality Management Area No.2 (Iver Parish). Slough Council has declared four AQMAs for annual NO_2 concentrations with one of those currently in the process of being revoked.

3.1.1.1 Local Monitoring data

Under the requirements of Part IV of the Environment Act, Buckinghamshire and Slough Councils have a duty to undertake the periodic review and assessment of local air quality within their administrative areas. The 2024 Air Quality Annual Status Reports[16,17] have been reviewed to obtain details of the monitoring carried out near the Installation which may be relevant to the assessment.

The Buckinghamshire Council operate two automatic monitoring sites, CM1 suburban monitoring site located at about 30km Northwest of the Installation, and CM2 Roadside monitoring site located at about 20km Northwest of the Installation. As these automatic monitoring sites are well distant from the Installation, it is not considered appropriate to refer to the monitoring data from those locations in this assessment.

Slough Council operate 12 automatic monitoring sites, the nearest of which that measure NO_2 concentrations is approximately 1.5 km to the west of the Installation site. At this monitoring site in 2023, the annual mean NO_2 measurement was 20.5 µg/m^3. The nearest automatic monitoring site that measures PM_{10} concentrations is approximately 2.5 km to the southwest of the Installation site. At this monitoring site in 2023, the annual mean PM_{10} measurement was 20.4 µg/m^3. The nearest automatic monitoring site that measures $PM_{2.5}$ concentrations is approximately 2.5 km to the southeast of the Installation site. At this monitoring site in 2023, the annual mean $PM_{2.5}$ measurement was 5.9 µg/m^3.

In addition, both councils have a network of passive NO_2 diffusion tube monitoring. There are seven Buckinghamshire diffusion tube sites located in the vicinity of the Installation and two Slough diffusion tube sites. These are shown in Table 3-1 and in Figure 1 of Appendix A.

Table 3-1: Local Authority Monitoring Data (µg/m^3)

Diffusion tube ID	X	Y	Distance from Site (m)	2019	2020	2021	2022	2023
Buckinghamshire Council								
SB38	503619	180518	648	28.0	18.0	21.2	15.6	16.7
SB22	503927	179701	874	37.2	25.4	28.1	21.1	23.3
SB2	504124	180868	1,263	27.7	17.4	18.3	11.7	15.9
SB30 & 31	503925	181128	1,275	43.6	26.4	32.6	23.2	27.4
SB28 & 29	503899	181200	1,313	36.8	25.7	30.2	24.3	25.5

16 Buckinghamshire Council (2024), Local Air Quality Management – Air Quality Annual Status Report. Council
17 Slough Borough Council (2024), Local Air Quality Management – Air Quality Annual Status Report. Council

Diffusion tube ID	X	Y	Distance from Site (m)	2019	2020	2021	2022	2023
SB49	503759	181200	1,227	-	-	-	-	23.7
SB24	503050	181176	985	29.5	19.8	21.7	15.9	18.2
Slough Borough Council								
SLO 55	501891	178954	1,130	29.5	21.3	20.1	21.0	18.7
SLO 56	502241	178679	1,300	35.7	26.3	23.3	24.1	20.9

The local authority monitoring results show that since 2019, there has been a large improvement in annual mean NO_2 concentrations across the area. The Covid-19 pandemic and the resultant impact on traffic flows contributed to this decrease and concentrations have not returned and do not look like returning to pre-pandemic conditions.

3.2 Local Emissions Sources

Local to the Site, the nearest notable sources of emissions to air include the M25 Motorway, ~1km to the east, and Heathrow Airport, ~4km to the southeast. There are also a number of permitted facilities, including existing data centres at Prologis Park, ~4km to the east and more distant, existing data centres at the Slough Trading Estate, ~7km to the west.

The contribution of these emissions sources to the pollutant concentrations reported in this assessment are accounted for in the baseline data described above and background data given in Section 2.4.

Given the distance of the existing data centre sources to the Site and to the worst-affected receptors impacted by the Site, the risk of cumulative impacts on short-term AQALs is considered to be limited and would not alter the conclusions of this assessment.

4. Dispersion Model Results

This section presents the results of the dispersion modelling assessment. The results presented represent a precautionary assessment of emissions associated with the operation of the emergency generators at the installation. Emissions have been modelled using several precautionary assumptions, with generators assumed to always run at 100% load when in operation, and with testing and maintenance operations coinciding with the with the worst meteorological conditions at each receptor. The emissions data parameters modelled are also based on the worst-case values across the shortlist of generator plant options being considered for the installation.

This assessment has quantified the Process Contribution (PC) and Predicted Environmental Concentration (PEC) for each pollutant based on the operational scenarios described in Section 1.2. For clarity, the following definitions apply in the interpretation of subsequent paragraphs and tables:

- PC represents the Process Contribution from modelled emissions from the backup generators;
- AC represents the Ambient (background) Concentration obtained from Defra and APIS mapping;
- PEC represents the Predicted Environmental Concentration, the total pollutant concentration calculated as PEC = PC + AC;
- PC/AQS represents the Process Contribution as a percentage of the relevant AQAL; and
- PEC/AQS represents the Predicted Environmental Concentration as a percentage of the relevant AQAL.

4.1 Testing and Maintenance

This section presents the magnitude of impacts at representative human health and nature conservation receptors in terms of the PCs and PECs associated with generator emissions during the testing and maintenance scenario. Testing and maintenance consists of routine biweekly functional testing, biannual load testing, and general maintenance, as described in Section 1.2.

4.1.1 Human Health Impacts

The results of the dispersion modelling for this scenario are presented in Table 4-1 to Table 4-5 for human health sensitive receptors. The results are then described in subsequent sections below Table 4-5 for human health receptors.

Table 4-1: Predicted NO_2 Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/ AQS (%)	AC (µg/m³)	PEC (µg/m³)	PEC/ AQS (%)	Insignificant (Yes / No)
R01	1-hour	200	44.9	22.4	35.6	80.5	40.2	No
	Annual	40	0.4	0.9	17.8	18.2	45.4	Yes
R02	1-hour	200	40.6	20.3	35.6	76.2	38.1	No
	Annual	40	0.3	0.8	17.8	18.1	45.3	Yes
R03	1-hour	200	31.0	15.5	35.6	66.6	33.3	Yes
	Annual	40	0.3	0.7	17.8	18.1	45.2	Yes
R04	1-hour	200	47.1	23.6	35.6	82.7	41.4	No
	Annual	40	0.3	0.8	17.8	18.1	45.3	Yes
R05	1-hour	200	14.5	7.2	35.6	50.1	25.0	Yes
	Annual	40	0.1	0.3	17.8	17.9	44.8	Yes
R06	1-hour	200	13.6	6.8	35.6	49.2	24.6	Yes
	Annual	40	0.1	0.2	17.8	17.9	44.7	Yes
R07	1-hour	200	18.3	9.2	35.6	53.9	27.0	Yes
	Annual	40	0.2	0.5	17.8	18.0	45.0	Yes

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/ AQS (%)	AC (µg/m³)	PEC (µg/m³)	PEC/ AQS (%)	Insignificant (Yes / No)
R08	1-hour	200	24.1	12.1	35.6	59.7	29.9	Yes
	Annual	40	0.2	0.4	17.8	18.0	44.9	Yes
R09	1-hour	200	20.4	10.2	35.6	56.0	28.0	Yes
	Annual	40	0.1	0.4	17.8	17.9	44.9	Yes
R10	1-hour	200	14.5	7.2	35.6	50.1	25.0	Yes
	Annual	40	0.3	0.6	17.8	18.1	45.1	Yes
R11	1-hour	200	17.1	8.5	35.6	52.7	26.3	Yes
	Annual	40	0.1	0.2	17.8	17.9	44.7	Yes
R12	1-hour	200	23.4	11.7	35.6	59.0	29.5	Yes
	Annual	40	0.2	0.4	17.8	18.0	44.9	Yes
R13	1-hour	200	16.1	8.1	35.6	51.7	25.9	Yes
	Annual	40	0.2	0.4	17.8	18.0	44.9	Yes
R14	1-hour	200	16.2	8.1	35.6	51.8	25.9	Yes
	Annual	40	0.2	0.5	17.8	18.0	45.0	Yes
R15	1-hour	200	14.2	7.1	35.6	49.8	24.9	Yes
	Annual	40	0.2	0.6	17.8	18.0	45.1	Yes
R16	1-hour	200	54.7	27.4	35.6	90.3	45.2	No
	Annual	40	0.4	0.9	17.8	18.2	45.4	Yes
R17	1-hour	200	26.3	13.1	35.6	61.9	30.9	Yes
	Annual	40	0.2	0.4	17.8	18.0	44.9	Yes
R18	1-hour	200	19.1	9.6	35.6	54.7	27.4	Yes
	Annual	40	0.3	0.7	17.8	18.1	45.2	Yes
R19	1-hour	200	18.8	9.4	35.6	54.4	27.2	Yes
	Annual	40	0.2	0.6	17.8	18.0	45.1	Yes
R20	1-hour	200	17.3	8.7	35.6	52.9	26.5	Yes
	Annual	40	0.2	0.6	17.8	18.0	45.1	Yes
R21	1-hour	200	30.5	15.3	35.6	66.1	33.1	Yes
	Annual	40	0.2	0.4	17.8	18.0	44.9	Yes
R22	1-hour	200	16.2	8.1	35.6	51.8	25.9	Yes
	Annual	40	0.1	0.4	17.8	17.9	44.9	Yes
R23	1-hour	200	13.6	6.8	35.6	49.2	24.6	Yes
	Annual	40	0.1	0.2	17.8	17.9	44.7	Yes
R24	1-hour	200	17.0	8.5	35.6	52.6	26.3	Yes
	Annual	40	0.1	0.3	17.8	17.9	44.8	Yes

Table 4-2 Predicted PM_{10} Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/ AQS (%)	AC (µg/m³)	PEC (µg/m³)	PEC/ AQS (%)	Insignificant (Yes / No)
R01	24-hour	50	0.2	0.4	26.4	26.6	53.2	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R02	24-hour	50	0.2	0.3	26.4	26.6	53.1	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R03	24-hour	50	0.1	0.3	26.4	26.5	53.1	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R04	24-hour	50	0.2	0.3	26.4	26.6	53.1	Yes

Receptor	Averaging period	AQS (μg/m^3)	PC (μg/m^3)	PC/ AQS (%)	AC (μg/m^3)	PEC (μg/m^3)	PEC/ AQS (%)	Insignificant (Yes / No)
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R05	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R06	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R07	24-hour	50	0.1	0.2	26.4	26.5	53.0	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R08	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R09	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R10	24-hour	50	0.1	0.2	26.4	26.5	53.0	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R11	24-hour	50	<0.1	0.1	26.4	26.4	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R12	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R13	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R14	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R15	24-hour	50	0.1	0.2	26.4	26.5	53.0	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R16	24-hour	50	0.2	0.4	26.4	26.6	53.2	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R17	24-hour	50	0.1	0.2	26.4	26.5	53.0	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R18	24-hour	50	0.1	0.2	26.4	26.5	53.0	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R19	24-hour	50	0.1	0.2	26.4	26.5	53.0	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R20	24-hour	50	0.1	0.2	26.4	26.5	53.0	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R21	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R22	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R23	24-hour	50	<0.1	0.1	26.4	26.4	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R24	24-hour	50	0.1	0.1	26.4	26.5	52.9	Yes
	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes

Table 4-3 Predicted $PM_{2.5}$ Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (μg/m^3)	PC (μg/m^3)	PC/AQS (%)	AC (μg/m^3)	PEC (μg/m^3)	PEC/AQS (%)	Insignificant (Yes / No)

R01	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R02	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R03	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R04	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R05	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R06	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R07	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R08	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R09	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R10	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R11	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R12	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R13	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R14	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R15	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R16	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R17	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R18	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R19	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R20	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R21	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R22	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R23	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R24	8-hour	20	<0.1	<0.1	7.8	7.8	39.0	Yes

Table 4-4 Predicted CO Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m^3)	PC (µg/m^3)	PC/AQS (%)	AC (µg/m^3)	PEC (µg/m^3)	PEC/AQS (%)	Insignificant (Yes / No)
R01	8-hour	10,000	16.5	0.2	894.0	910.5	9.1	Yes
R02	8-hour	10,000	16.0	0.2	894.0	910.0	9.1	Yes
R03	8-hour	10,000	10.4	0.1	894.0	904.4	9.0	Yes
R04	8-hour	10,000	14.5	0.1	894.0	908.5	9.1	Yes
R05	8-hour	10,000	5.5	0.1	894.0	899.5	9.0	Yes
R06	8-hour	10,000	3.9	<0.1	894.0	897.9	9.0	Yes
R07	8-hour	10,000	4.8	<0.1	894.0	898.8	9.0	Yes
R08	8-hour	10,000	7.3	0.1	894.0	901.3	9.0	Yes
R09	8-hour	10,000	5.6	0.1	894.0	899.6	9.0	Yes
R10	8-hour	10,000	3.9	<0.1	894.0	897.9	9.0	Yes
R11	8-hour	10,000	5.3	0.1	894.0	899.3	9.0	Yes
R12	8-hour	10,000	9.6	0.1	894.0	903.6	9.0	Yes
R13	8-hour	10,000	4.0	<0.1	894.0	898.0	9.0	Yes
R14	8-hour	10,000	4.3	<0.1	894.0	898.3	9.0	Yes
R15	8-hour	10,000	3.7	<0.1	894.0	897.7	9.0	Yes
R16	8-hour	10,000	17.8	0.2	894.0	911.8	9.1	Yes
R17	8-hour	10,000	9.4	0.1	894.0	903.4	9.0	Yes
R18	8-hour	10,000	5.6	0.1	894.0	899.6	9.0	Yes

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/AQS (%)	AC (µg/m³)	PEC (µg/m³)	PEC/AQS (%)	Insignificant (Yes / No)
R19	8-hour	10,000	5.9	0.1	894.0	899.9	9.0	Yes
R20	8-hour	10,000	4.2	<0.1	894.0	898.2	9.0	Yes
R21	8-hour	10,000	10.4	0.1	894.0	904.4	9.0	Yes
R22	8-hour	10,000	4.9	<0.1	894.0	898.9	9.0	Yes
R23	8-hour	10,000	5.3	0.1	894.0	899.3	9.0	Yes
R24	8-hour	10,000	6.0	0.1	894.0	900.0	9.0	Yes

Table 4-5 Predicted HC Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)
R01	Annual mean	N/A	<0.1
R02	Annual mean	N/A	<0.1
R03	Annual mean	N/A	<0.1
R04	Annual mean	N/A	<0.1
R05	Annual mean	N/A	<0.1
R06	Annual mean	N/A	<0.1
R07	Annual mean	N/A	<0.1
R08	Annual mean	N/A	<0.1
R09	Annual mean	N/A	<0.1
R10	Annual mean	N/A	<0.1
R11	Annual mean	N/A	<0.1
R12	Annual mean	N/A	<0.1
R13	Annual mean	N/A	<0.1
R14	Annual mean	N/A	<0.1
R15	Annual mean	N/A	<0.1
R16	Annual mean	N/A	<0.1
R17	Annual mean	N/A	<0.1
R18	Annual mean	N/A	<0.1
R19	Annual mean	N/A	<0.1
R20	Annual mean	N/A	<0.1
R21	Annual mean	N/A	<0.1
R22	Annual mean	N/A	<0.1
R23	Annual mean	N/A	<0.1
R24	Annual mean	N/A	<0.1

4.1.1.1 Annual Mean NO_2

The maximum annual mean NO_2 PC modelled over the 5-year meteorological dataset at a location of relevant exposure is 0.4 µg/m³ to one decimal place and occurs at receptors R01, R02, R04 and R16. This accounts for less than 1% of the long-term AQAL for this pollutant if reported to two decimal places (0.38 µg/m³). With the addition of the AC, the max PEC at these receptors is 18.2 µg/m³, which accounts for 45% of the long-term AQAL. Both the PC and PEC are below the respective Environment Agency screening levels (1% and 70% of AQAL) and the impact of the Installation on annual mean NO_2 can therefore be screened out as insignificant.

4.1.1.2 Hourly Mean NO_2

The maximum hourly mean NO_2 PC (as the 99.8th Percentile of 1-hour concentrations over the course of a year) is predicted to be 54.7 µg/m³. This occurs at receptor R16 and accounts for around 27% of the AQAL for this pollutant. This exceeds both stages of Environment Agency criteria for screening short-term impacts. The PC is greater than 10% of the AQAL at several locations, which exceeds the first screening stage, and the PC is greater than 32.9 µg/m³ (derived as 20% of the Air Quality Standard minus twice the long-term background concentration (screening criteria = 0.2 x (200 – (17.8 x 2))) at four locations, which exceeds the second screening stage.

An exceedance of the screening criteria does not necessarily mean that the impact of the operational Installation will be significant. Instead, it means that the impact of the Installation needs to be considered in more detail.

With the addition of the AC, the max PEC at receptor R16 is 90.3 µg/m³, which accounts for 45% of the AQS. This means that with the Installation in operation, there remains a headroom of 55% of the AQAL, indicating no risk of an exceedance of that AQAL in this scenario. In addition, the modelling of short-term impacts from testing and maintenance is inherently precautionary. The hourly NO_2 PC reported at receptor R16 is the 19th highest hourly concentration during the worst of the five meteorological years considered, assuming each generator could operate in isolation on any hour of the year. The dispersion model therefore predicts the 19th worst hourly concentration of the pollutant, assuming that testing and maintenance of the emergency generator closest to that receptor is operational on each of the hours that cause the 19 highest concentrations in that calendar year. Given that each generator will only be tested for 26 hours per year (936 hours per year aggregated across all generators at the Installation), it is highly unlikely that the testing of the closest generator to that receptor will occur on those hours, and it is highly likely that the actual hourly NO_2 impact of testing and maintenance will be lower than that reported here.

In light of the inherently precautionary assessment and the amount of headroom remaining before there is an exceedance of the AQAL, it is considered that the impact of the Installation on hourly mean NO_2 can be screened out as insignificant.

4.1.1.3 Annual Mean PM_{10}

The annual mean PM_{10} PC is predicted to be less than 0.1 µg/m³ at all receptors considered in this assessment. This equates to less than 0.1% of the AQAL for this pollutant. With the addition of AC, the PEC is 13.2 µg/m³, which equates to 33% of the AQAL. Both the PC and PEC are below the respective Environment Agency screening levels (1% and 70% of AQAL) and the impact of the Installation on annual mean PM_{10} can therefore be screened out as insignificant.

4.1.1.4 Daily Mean PM_{10}

The maximum predicted daily mean PM_{10} PC (as the 90.41st Percentile of 24-hour concentrations over the course of a year) is 0.2 µg/m³ and occurs at receptors R01, R02, R04 and R16. This PC accounts for up to 0.4% of the AQAL for this pollutant. The PC is less than Environment Agency screening criteria of 10% of the EAL. It is also less than 4.7 µg/m³, which is the second stage screening criteria (derived as 20% of the Air Quality Standard minus twice the long-term background concentration (screening criteria = 0.2 x (50 – (13.2 x 2))).

With the addition of the AC, the maximum PEC predicted is 26.6 µg/m³, which accounts for 53% of the AQAL. The PC are below the respective Environment Agency screening levels for short-term impacts and therefore the impact of the Installation on daily mean PM_{10} can be screened out as insignificant

4.1.1.5 Annual Mean $PM_{2.5}$

The annual mean $PM_{2.5}$ PC is predicted to be less than 0.1 µg/m³ at all receptors considered in this assessment. This equates to less than 0.1% of the AQAL for this pollutant. With the addition of AC, the PEC is 7.8 µg/m³, which equates to 39% of the AQAL. Both the PC and PEC are below the respective Environment Agency screening levels (1% and 70% of AQAL) and the impact of the Installation on annual mean $PM_{2.5}$ can therefore be screened out as insignificant.

4.1.1.6 Rolling 8-hour Maximum CO

The highest 8-hour maximum CO PC (as the 100th Percentile of rolling 8-hour concentrations over the course of a year) is 17.8 µg/m³ and occurs at receptor R16. This represents 0.2% of the AQAL for this pollutant. This is well below the Environment Agency's 10% screening threshold for short-term impacts. With the addition of the AC, the PEC at this location is 811.8 µg/m³, which equates to 9% of the AQAL Given that the screening criteria is comfortably met, the impact of the Installation on 8-hour maximum CO is screened out as insignificant.

4.1.1.7 Annual Mean HC

Annual mean total HC emissions have been modelled and the highest PC reported in 0.01 µg/m³. There is no AQAL for total HC against which this PC can be directly compared. Neither is there an AC reported that is representative of total HC. It is sometimes necessary to assume that all HC emissions released are as benzene, because benzene has an AQAL (3 µg/m³) set out within the UK Air Quality Strategy. To assume in this instance that total HC emissions released are benzene would be highly precautionary, given the limited proportion of this compound in typical diesel fuel. However, it is worth noting that even with the highly precautionary assumption, the highest total HC PC reported would account for less than 1% of the AQAL for annual mean benzene. Such an impact would be screened as insignificant.

4.1.2 Nature Conservation Impacts

The results of the dispersion modelling for this scenario are presented in Table 4-6 to Table 4-8 for nature conservation receptors. The results are then described in subsequent sections below Table 4-8 for nature conservation receptors.

Table 4-6: Predicted NOx Results for Nature Conservation Receptors

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/AQS (%)	AC (µg/m³)	PEC (µg/m³)	PEC/ AQS (%)	Insignificant (Yes / No)
E1	24-hour	75	1.1	1.5	31.0	32.1	42.8	Yes
	Annual	30	<0.1	<0.1	15.8	15.8	52.7	Yes
E2	24-hour	75	1.7	2.2	32.8	34.5	46.0	Yes
	Annual	30	<0.1	<0.1	16.4	16.4	54.7	Yes
E3	24-hour	75	2.4	3.2	45.4	47.8	63.7	Yes
	Annual	30	<0.1	0.1	22.7	22.7	75.7	Yes
E4	24-hour	75	7.4	9.8	52.6	60.0	79.9	Yes
	Annual	30	<0.1	0.1	26.3	26.3	87.8	Yes
E5	24-hour	75	5.1	6.7	38.0	43.1	57.4	Yes
	Annual	30	<0.1	0.1	19.0	19.0	63.5	Yes

Table 4-7: Predicted Nitrogen Deposition

Receptor	Averaging period	CL[1] (kgN/ha/yr)	PC (kgN/ha/yr)	PC/CL (%)	AC (kgN/ha/yr)	PEC (kgN/ha/yr)	PEC/CL (%)	Insignificant (Yes / No)
E1	Annual	10	0.002	<0.1	24.1	24.1	241	Yes
E2	Annual	10	0.005	<0.1	22.3	22.3	223	Yes
E3	Annual	Not Sensitive	n/a	n/a	n/a	n/a	n/a	n/a
E4	Annual	10	0.011	0.1	24.6	24.6	246	Yes
E5	Annual	10	0.013	0.1	24.8	24.8	248	Yes

[1] Lower Critical Load

Table 4-8: Predicted Acid Deposition

Receptor	Averaging period	CL (keq/ha/yr) Note 1	AC % of Critical Load	PC (keq /ha/yr)	PC% Critical Load	Insignificant (Yes / No)
E1	Annual	MinCLMinN 0.142 MinCLMaxN 2.056 MinCLMaxS 1.699	93.4%	0.0002	<0.1%	Yes
E2	Annual	MinCLMinN 0.142 MinCLMaxN 1.044 MinCLMaxS 0.759	170.5%	0.0003	<0.1%	Yes
E3	Annual	Not sensitive	N/A	N/A	N/A	Yes
E4	Annual	MinCLMinN 0.357 MinCLMaxN 3.204 MinCLMaxS 2.847	62.4%	0.0008	<0.1%	Yes

Receptor	Averaging period	CL (keq/ha/yr) Note 1	AC % of Critical Load	PC (keq /ha/yr)	PC% Critical Load	Insignificant (Yes / No)
E5	Annual	MinCLMinN 0.357 MinCLMaxN 3.204 MinCLMaxS 2.847	60.9%	0.0010	<0.1%	Yes

4.1.2.1 Annual Mean NO_X
The annual mean NO_X PC at all receptors modelled is less than 0.1 µg/m^3, which equates to less than 1% of the AQAL for this pollutant. With the addition of the AC, the max PEC is 26.3 µg/m^3, which accounts for 88% of the long-term AQAL. As the PC at all receptors is less than 1% of the AQAL Environment Agency screening criteria, the impact of the Installation on annual mean NO_X can be screened out as insignificant.

4.1.2.2 Daily Maximum NO_X
The highest daily maximum NO_X PC at the SAC/SPA/SSSI nature conservation receptors (E01, E02, and E03) is 2.4 µg/m^3, which accounts for 3.2% of the AQAL. The PC at these receptors is less than the 10% of the AQAL screening criteria for short-term impacts on designations of this kind. The highest daily maximum NO_X PC at the ancient woodland nature conservation receptors (E04 and E05) is 7.4, which accounts for 9.8% of the AQAL. The PC at these receptors is less than the 100% of the AQAL screening criteria for short-term impacts on designations of this kind. Given that the Environment Agency Screening Criteria is not exceeded at any nature conservation receptors considered in the assessment, the impact of the Installation on daily maximum NO_X can be screened out as insignificant.

4.1.2.3 Annual Nitrogen Deposition Rate
The highest annual Ndep rate PC at the sensitive SAC/SPA/SSSI nature conservation receptors (E01 and E02) is 0.005 kgN/ha/yr, which accounts for less than 0.1% of the AQAL. The PC at these receptors is less than the 1% of the AQAL screening criteria for long-term impacts on designations of this kind. The highest annual Ndep rate PC at the ancient woodlands nature conservation receptors (E04 and E05) is 0.013 kgN/ha/yr, which accounts for 0.1% of the AQAL. The PC at these receptors is less than the 100% of the AQAL screening criteria for long-term impacts on designations of this kind. Given that the Environment Agency Screening Criteria is not exceeded at any nature conservation receptors considered in the assessment, the impact of the Installation on annual Ndep rates can be screened out as insignificant.

4.1.2.4 Annual Acid Deposition Rate
The highest annual Adep rate PC at the sensitive SAC/SPA/SSSI nature conservation receptors (E01 and E02) is 0.0003 keq/ha/yr, which accounts for less than 0.1% of the AQAL. The PC at these receptors is less than the 1% of the AQAL screening criteria for long-term impacts on designations of this kind. The highest annual Adep rate PC at the ancient woodlands nature conservation receptors (E04 and E05) is 0.0010 keq/ha/yr, which accounts for less than 0.1% of the AQAL. The PC at these receptors is less than the 100% of the AQAL screening criteria for long-term impacts on designations of this kind. Given that the Environment Agency Screening Criteria is not exceeded at any nature conservation receptors considered in the assessment, the impact of the Installation on annual Adep rates can be screened out as insignificant.

4.2 Emergency
This section presents the magnitude of impacts at representative human health and Nature conservation receptors in terms of the Process Contributions (PCs) and Predicted Environmental Concentrations (PECs) associated with emissions from the emergency generator operation scenario. Emergency operation consists of up 72 hours of generator operation per year. This is to provide a reasonably precautionary estimate of emergency operation, but is not intended to represent a limit on hours of emergency operation.

4.2.1 Human Health Impacts
The results of the dispersion model are presented in Table 4-9 to Table 4-13 for human health sensitive receptors. The results are then described in subsequent sections below Table 4-13 for human health receptors.

Table 4-9: Predicted Probability of Short-Term NO_2 Exceedance at Human Health Receptors

Receptor	Averaging period	AQS (µg/m³)	Hours in year	No of PEC Hours >200 µg/m	No of operational hours	Probability of ≥19 Exceedances (%)	Hours of operation where probability is <5%
R01	1-hour	200	8760	675	72	0.00%	149
R02	1-hour	200	8760	553	72	0.00%	181
R03	1-hour	200	8760	632	72	0.00%	158
R04	1-hour	200	8760	554	72	0.00%	180
R05	1-hour	200	8760	419	72	0.00%	238
R06	1-hour	200	8760	235	72	0.00%	425
R07	1-hour	200	8760	578	72	0.00%	173
R08	1-hour	200	8760	392	72	0.00%	254
R09	1-hour	200	8760	403	72	0.00%	247
R10	1-hour	200	8760	743	72	0.00%	135
R11	1-hour	200	8760	264	72	0.00%	378
R12	1-hour	200	8760	387	72	0.00%	258
R13	1-hour	200	8760	446	72	0.00%	224
R14	1-hour	200	8760	488	72	0.00%	205
R15	1-hour	200	8760	584	72	0.00%	171
R16	1-hour	200	8760	593	72	0.00%	169
R17	1-hour	200	8760	396	72	0.00%	252
R18	1-hour	200	8760	853	72	0.01%	118
R19	1-hour	200	8760	560	72	0.00%	179
R20	1-hour	200	8760	627	72	0.00%	160
R21	1-hour	200	8760	344	72	0.00%	290
R22	1-hour	200	8760	400	72	0.00%	249
R23	1-hour	200	8760	235	72	0.00%	425
R24	1-hour	200	8760	379	72	0.00%	263

Table 4-10 Predicted Long-Term NO_2 Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/AQS (%)	AC (µg/m³)	PEC (µg/m³)	PEC/AQS (%)	Insignificant (Yes / No)
R01	Annual	40	1.2	3.1	17.8	19.0	47.6	Yes
R02	Annual	40	1.1	2.7	17.8	18.9	47.2	Yes
R03	Annual	40	1.0	2.4	17.8	18.8	46.9	Yes
R04	Annual	40	1.0	2.5	17.8	18.8	47.0	Yes
R05	Annual	40	0.4	1.0	17.8	18.2	45.5	Yes
R06	Annual	40	0.3	0.8	17.8	18.1	45.3	Yes
R07	Annual	40	0.7	1.7	17.8	18.5	46.2	Yes
R08	Annual	40	0.5	1.3	17.8	18.3	45.8	Yes
R09	Annual	40	0.5	1.2	17.8	18.3	45.7	Yes
R10	Annual	40	0.9	2.1	17.8	18.7	46.6	Yes
R11	Annual	40	0.3	0.7	17.8	18.1	45.2	Yes
R12	Annual	40	0.5	1.3	17.8	18.3	45.8	Yes
R13	Annual	40	0.6	1.5	17.8	18.4	46.0	Yes

R14	Annual	40	0.7	1.6	17.8	18.5	46.1	Yes
R15	Annual	40	0.7	1.9	17.8	18.5	46.4	Yes
R16	Annual	40	1.2	3.0	17.8	19.0	47.5	Yes
R17	Annual	40	0.6	1.4	17.8	18.4	45.9	Yes
R18	Annual	40	0.9	2.3	17.8	18.7	46.8	Yes
R19	Annual	40	0.8	2.0	17.8	18.6	46.5	Yes
R20	Annual	40	0.8	1.9	17.8	18.6	46.4	Yes
R21	Annual	40	0.5	1.3	17.8	18.3	45.8	Yes
R22	Annual	40	0.5	1.2	17.8	18.3	45.7	Yes
R23	Annual	40	0.3	0.7	17.8	18.1	45.2	Yes
R24	Annual	40	0.4	1.0	17.8	18.2	45.5	Yes

Table 4-11 Predicted PM_{10} Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m^3)	PC (µg/m^3)	PC/ AQS (%)	AC (µg/m^3)	PEC (µg/m^3)	PEC/ AQS (%)	Insignificant (Yes / No)
R01	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R02	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R03	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R04	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R05	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R06	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R07	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R08	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R09	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R10	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R11	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R12	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R13	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R14	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R15	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R16	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R17	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R18	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R19	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R20	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R21	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R22	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R23	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes
R24	Annual	40	<0.1	<0.1	13.2	13.2	33.0	Yes

Table 4-12 Predicted $PM_{2.5}$ Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m^3)	PC (µg/m^3)	PC/ AQS (%)	AC (µg/m^3)	PEC (µg/m^3)	PEC/ AQS (%)	Insignificant (Yes / No)
R01	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R02	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R03	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R04	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R05	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/ AQS (%)	AC (µg/m³)	PEC (µg/m³)	PEC/ AQS (%)	Insignificant (Yes / No)
R06	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R07	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R08	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R09	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R10	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R11	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R12	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R13	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R14	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R15	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R16	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R17	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R18	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R19	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R20	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R21	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R22	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R23	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes
R24	Annual	20	<0.1	<0.1	7.8	7.8	39.0	Yes

Table 4-13 Predicted HC Concentrations at Human Health Receptors

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)
R01	Annual mean	N/A	<0.1
R02	Annual mean	N/A	<0.1
R03	Annual mean	N/A	<0.1
R04	Annual mean	N/A	<0.1
R05	Annual mean	N/A	<0.1
R06	Annual mean	N/A	<0.1
R07	Annual mean	N/A	<0.1
R08	Annual mean	N/A	<0.1
R09	Annual mean	N/A	<0.1
R10	Annual mean	N/A	<0.1
R11	Annual mean	N/A	<0.1
R12	Annual mean	N/A	<0.1
R13	Annual mean	N/A	<0.1
R14	Annual mean	N/A	<0.1
R15	Annual mean	N/A	<0.1
R16	Annual mean	N/A	<0.1
R17	Annual mean	N/A	<0.1
R18	Annual mean	N/A	<0.1
R19	Annual mean	N/A	<0.1
R20	Annual mean	N/A	<0.1
R21	Annual mean	N/A	<0.1
R22	Annual mean	N/A	<0.1
R23	Annual mean	N/A	<0.1

Receptor	Averaging period	AQS ($\mu g/m^3$)	PC ($\mu g/m^3$)
R24	Annual mean	N/A	<0.1

4.2.1.1 Hourly Mean NO_2

There inherent difficulties associated with predicting short-term impacts from emergency operation, i.e.:

- The unknowns associated with the frequency and duration of potential power outages; and
- The assumption that all generators could operate in unison on any hour of the year and thus coinciding with the worst meteorological hours of the year at each receptor, being unreasonably precautionary.

For this reason, the Environment Agency recommend an alternative method of assessment for determining the impact of short-term emissions from emergency generators. This alternative assessment method has been utilised for the dispersion modelling reported here. Models have been run that assume all generators associated with the Installation are running at 100% load at the same time on every hour of the year. The model then provides an output giving hourly NO_2 concentrations at each receptor for every hour of the year. From this output, the number of hours in which the hourly NO_2 PEC is 200µg/m³ or more are counted for each receptor. The number of hours counted is then input into the hypergeometric distribution calculation along with the number of hours in the year, the number of hours of anticipated emergency operation in a year, and the number of allowable hours in a year before an exceedance occurs of the AQAL.

Assuming 72 hours of emergency operation in a year with the potential for operations to have a duration of more than an hour, the hypergeometric distribution analysis calculates the probability of an exceedance being <1% at all receptors modelled. The highest probability of 0.01% is calculated for receptor R18, where 118 hours of emergency operation can occur before the probability of an exceedance is 5% or more. A calculated probability of less than 1% can be screened as insignificant.

4.2.1.2 Annual Mean NO_2

The maximum annual mean NO_2 PC modelled over the 5-year meteorological dataset at a location of relevant exposure is 1.2 µg/m³ and occurs at receptors R01 and R16. This accounts for 3.% of the long-term AQAL for this pollutant. With the addition of the AC, the max PEC at these receptors is 19.0 µg/m³, which accounts for 48% of the long-term AQAL. Whilst the PC is greater than 1% of the AQAL, the PEC remains less than 70% of the AQAL and therefore less than the Environment Agency screening level. The impact of the Installation on annual mean NO_2 can therefore be screened out as insignificant.

4.2.1.3 Annual Mean PM_{10}

The annual mean PM_{10} PC is predicted to be less than 0.1 µg/m³ at all receptors considered in this assessment. This equates to less than 0.1% of the AQAL for this pollutant. With the addition of AC, the PEC is 13.2 µg/m³, which equates to 33% of the AQAL. Both the PC and PEC are below the respective Environment Agency screening levels (1% and 70% of AQAL) and the impact of the Installation on annual mean PM_{10} can therefore be screened out as insignificant.

4.2.1.4 Daily Mean PM_{10}

Daily mean PM_{10} PC for the emergency operation scenario has not been quantified in this assessment. Emergency operation, should it occur, will likely do so sporadically for periods of minutes at a time, rather than for a period of hours or days. As such, it is very unlikely that daily mean PM_{10} AQAL would be impacted to the extent that there is any risk to compliance. The statistical analysis of hourly mean NO_2 impacts has demonstrated that the short-term impact of emergency operation will be insignificance if emergency operation is to occur for 72 hours per year or less.

4.2.1.5 Annual Mean $PM_{2.5}$

The annual mean $PM_{2.5}$ PC is predicted to be less than 0.1 µg/m³ at all receptors considered in this assessment. This equates to less than 0.1% of the AQAL for this pollutant. With the addition of AC, the PEC is 7.8 µg/m³, which equates to 39% of the AQAL. Both the PC and PEC are below the respective Environment Agency screening levels (1% and 70% of AQAL) and the impact of the Installation on annual mean $PM_{2.5}$ can therefore be screened out as insignificant.

4.2.1.6 Rolling 8-hour Maximum CO

8-hour CO PC for the emergency operation scenario has not been quantified in this assessment. Emergency operation, should it occur, will likely do so sporadically for periods of minutes at a time, rather than for any extended period of hours. As such, it is very unlikely that 8-hour CO AQAL would be impacted to the extent that there is any risk to compliance. The statistical analysis of hourly mean NO_2 impacts, considered the most sensitive EAL to short-term impacts from emergency operation, has demonstrated that the short-term impact of emergency operation will be insignificant if emergency operation is to occur for 72 hours per year or less. This suggests that impacts over a longer averaging period will likely be insignificant also.

4.2.1.7 Annual Mean HC

Annual mean total HC emissions have been modelled and the highest PC reported in 0.03 µg/m³. There is no AQAL for total HC against which this PC can be directly compared. Neither is there an AC reported that is representative of total HC. It is sometimes necessary to assume that all HC emissions released are as benzene, because benzene has an AQAL (3 µg/m³) set out within the UK Air Quality Strategy. To assume in this instance that total HC emissions released are benzene would be highly precautionary, given the limited proportion of this compound present in typical diesel fuel. However, it is worth noting that even with the highly precautionary assumption, the highest total HC PC reported would account for around 1% of the AQAL for annual mean benzene. Such an impact would be screened as insignificant given the low benzene AC levels typical in most areas of the UK.

4.2.2 Ecological Impacts

The process contributions (PCs) have been compared with the appropriate Critical Levels to identify whether the contribution could result in the Critical Levels being exceeded at ecological receptors, or where there is a significant risk of the Critical Levels being exceeded. Table 4-14 shows the predicted NO_x levels for each ecological receptor.

Table 4-14: Predicted NOx Results for Ecological Receptors

Receptor	Averaging period	AQS (µg/m³)	PC (µg/m³)	PC/ AQAL (%)	AC (µg/m³)	PEC (µg/m³)	PEC/ AQAL (%)	Insignificant (yes/No)
E1	Annual	30	0.02	0.1	15.8	15.8	52.7	Yes
E2	Annual	30	0.05	0.2	16.4	16.5	54.8	Yes
E3	Annual	30	0.08	0.3	22.7	22.8	75.9	Yes
E4	Annual	30	0.13	0.4	26.3	26.4	88.1	Yes
E5	Annual	30	0.15	0.5	19.0	19.2	63.8	Yes

Table 4-15: Predicted Nitrogen Deposition

Receptor	Averaging period	CL[1] (kgN/ha/yr)	PC (kgN/ha/yr)	PC/CL (%)	AC (kgN/ha/yr)	PEC (kgN/ha/yr)	PEC/CL (%)	Insignificant (yes/No)
E1	Annual	10	0.01	0.1	24.1	24.1	241	Yes
E2	Annual	10	0.02	0.2	22.3	22.3	223	Yes
E3	Annual	Not Sensitive	n/a	n/a	n/a	n/a	n/a	n/a
E4	Annual	10	0.04	0.4	24.6	24.6	246	Yes
E5	Annual	10	0.04	0.4	24.8	24.8	248	Yes

[1] Lower Critical Load

Table 4-16: Predicted Acid Deposition

Receptor	Averaging period	CL (keq/ha/yr) Note 1	AC % of Critical Load	PC (keq N/ha/yr)	PC% Critical Load
E1	Annual	MinCLMinN 0.142 MinCLMaxN 2.056 MinCLMaxS 1.699	93.4%	0.0005	<0.1%
E3	Annual	MinCLMinN 0.142 MinCLMaxN 1.044 MinCLMaxS 0.759	170.5%	0.0011	<0.1%

Receptor	Averaging period	CL (keq/ha/yr) Note 1	AC % of Critical Load	PC (keq N/ha/yr)	PC% Critical Load
E7	Annual	Not sensitive	N/A	N/A	N/A
E4	Annual	MinCLMinN 0.357 MinCLMaxN 3.204 MinCLMaxS 2.847	62.4%	0.0026	<0.1%
E5	Annual	MinCLMinN 0.357 MinCLMaxN 3.204 MinCLMaxS 2.847	60.9%	0.0032	<0.1%

4.2.2.1 Annual Mean NO_X

The annual mean NO_X PC peaks at 0.15 µg/m^3, which equates to less than 1% of the AQAL for this pollutant. With the addition of the AC, the max PEC is 26.4 µg/m^3, which accounts for 88% of the long-term AQAL. As the PC at all receptors is less than 1% of the AQAL Environment Agency screening criteria, the impact of the Installation on annual mean NO_X can be screened out as insignificant.

4.2.2.2 Daily Maximum NO_X

Daily mean NOx PC for the emergency operation scenario has not been quantified in this assessment. Emergency operation, should it occur, will likely do so sporadically for periods of minutes at a time, rather than for a period of hours or days. As such, it is very unlikely that daily mean NO_X AQAL would be impacted to the extent that there is any risk to compliance. The statistical analysis of hourly mean NO_2 impacts has demonstrated that the short-term impact of emergency operation will be insignificant if emergency operation is to occur for 72 hours per year or less. This suggests that NOx impacts over a longer averaging period would likely be insignificant also.

4.2.2.3 Annual Nitrogen Deposition Rate

The highest annual Ndep rate PC at the sensitive SAC/SPA/SSSI nature conservation receptors (E01 and E02) is 0.016 kgN/ha/yr, which accounts for 0.2% of the AQAL. The PC at these receptors is less than the 1% of the AQAL screening criteria for long-term impacts on designations of this kind. The highest annual Ndep rate PC at the ancient woodlands nature conservation receptors (E04 and E05) is 0.044 kgN/ha/yr, which accounts for 0.4% of the AQAL. The PC at these receptors is less than the 100% of the AQAL screening criteria for long-term impacts on designations of this kind. Given that the Environment Agency Screening Criteria is not exceeded at any nature conservation receptors considered in the assessment, the impact of the Installation on annual Ndep rates can be screened out as insignificant.

4.2.2.4 Annual Acid Deposition Rate

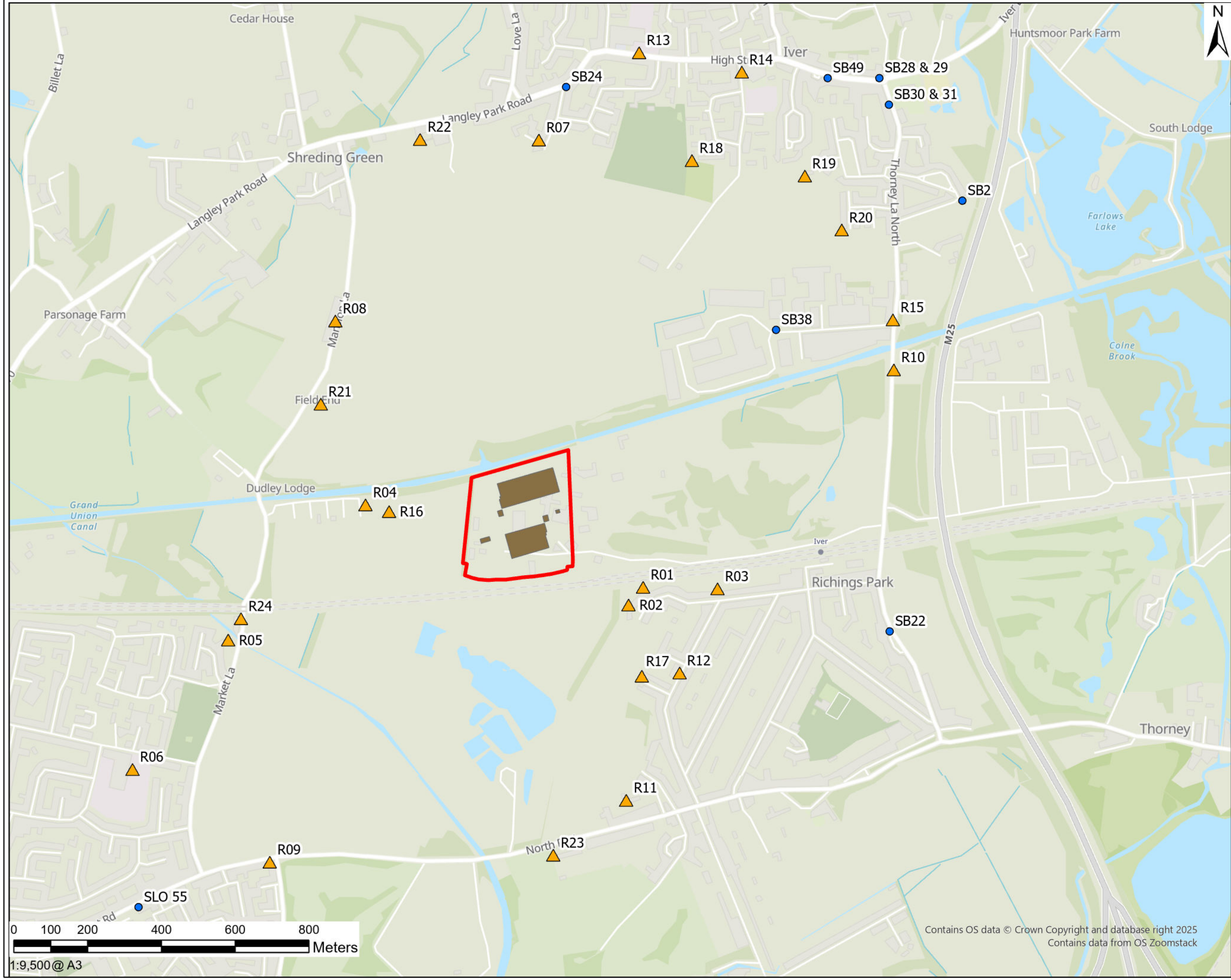
The highest annual Adep rate PC at the sensitive SAC/SPA/SSSI nature conservation receptors (E01 and E02) is 0.0011 keq/ha/yr, which accounts for less than 0.1% of the AQAL. The PC at these receptors is less than the 1% of the AQAL screening criteria for long-term impacts on designations of this kind. The highest annual Adep rate PC at the ancient woodlands nature conservation receptors (E04 and E05) is 0.0032 keq/ha/yr, which accounts for less than 0.1% of the AQAL. The PC at these receptors is less than the 100% of the AQAL screening criteria for long-term impacts on designations of this kind. Given that the Environment Agency Screening Criteria is not exceeded at any nature conservation receptors considered in the assessment, the impact of the Installation on annual Adep rates can be screened out as insignificant.

5. Summary

An air quality assessment has been undertaken, using dispersion modelling software, to predict the impact of the Installation on air quality. The assessment has considered the impact of emissions from the Installation's emergency generators during testing and maintenance, and during emergency operation (i.e. a power outage of the primary power source).

The assessment has identified that the operation of the installation under testing and maintenance, and under emergency operation would not cause an air quality compliance issue with impacts screened out as insignificant. Hypergeometric distribution analysis of the hourly mean NO_2 impact during an emergency identified the probability of an exceedance occurring of less than 1% with up to 72 hours of emergency operation in a year.

Appendix A – Figures



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LEGEND

- Diffusion Tubes
- Site Boundary
- Human Health Receptors
- Modelled Buildings

NOTES

Copyright statements and source of data: ESRI, Intermap, NASA, NGA, USGS, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies

ISSUE PURPOSE

FINAL

PROJECT NUMBER

60753542

SHEET TITLE

Human Health Receptors & NO2 Diffusion Tubes

SHEET NUMBER

Figure 1

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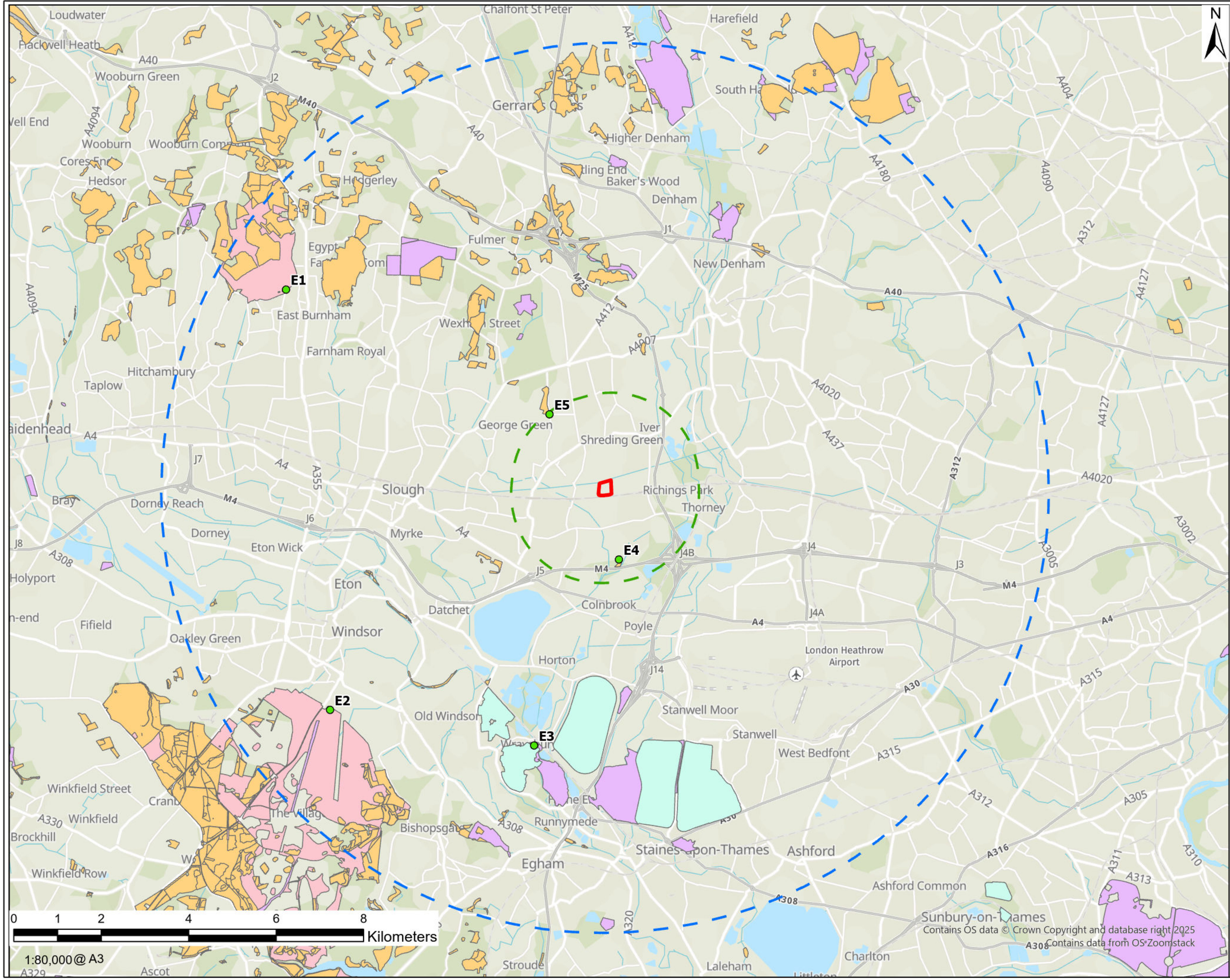

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LEGEND

- Site Boundary
- 2Km Site Boundary Buffer
- 10Km Site Boundary Buffer
- Ancient Woodlands
- Special Protection Areas (SPA)
- Special Areas of Conservation (SAC)
- Sites of Special Scientific Interest (SSSI)
- Sensitive Ecological Receptors

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SHEET TITLE

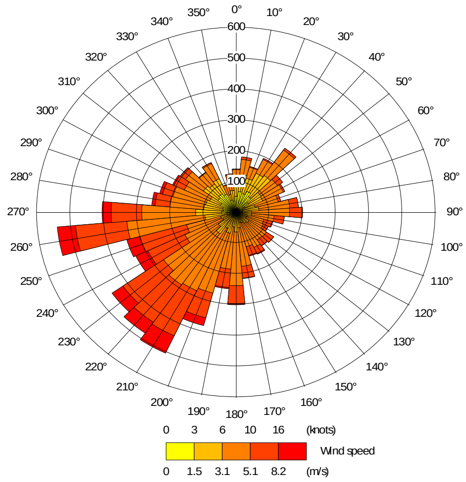
Ecological Receptors

SHEET NUMBER

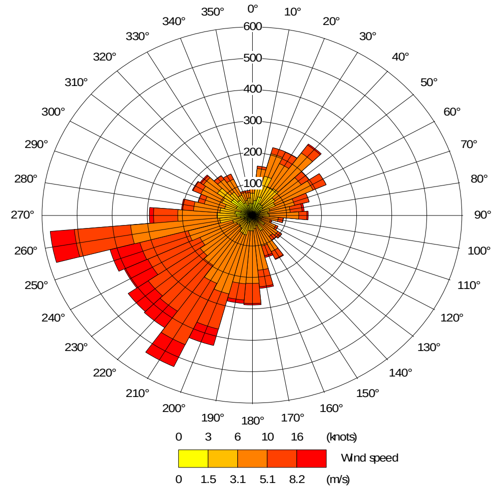
Figure 2

Figure 3: Wind roses for Heathrow Meteorological Station (2019 – 2023)

2019



2020



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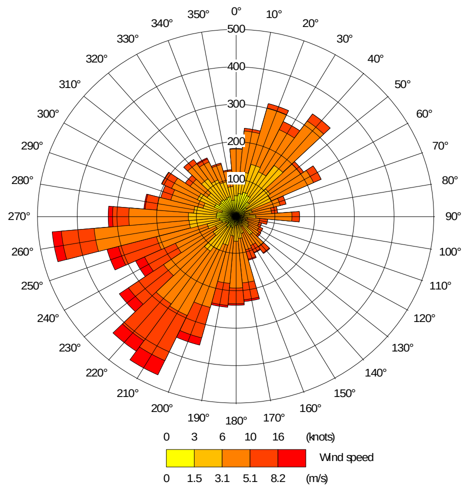

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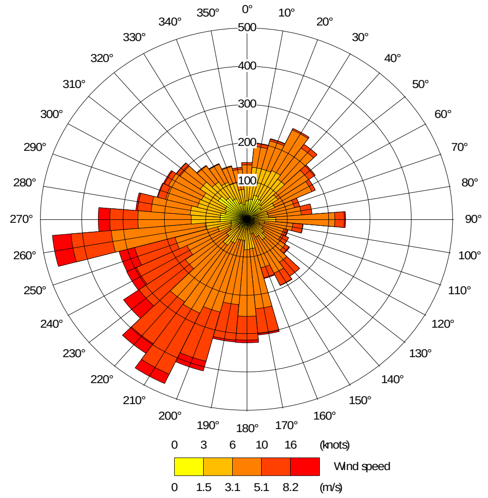

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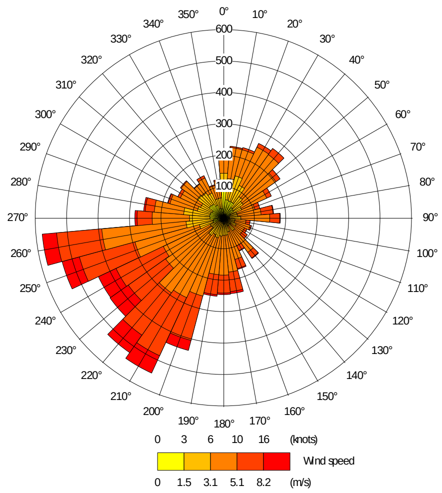

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LEGEND

- Site Boundary
- Building 2 Generator Stacks
- Building 1 Generator Stacks
- Modelled Buildings

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Modelled Buildings

SHEET NUMBER

Figure 4

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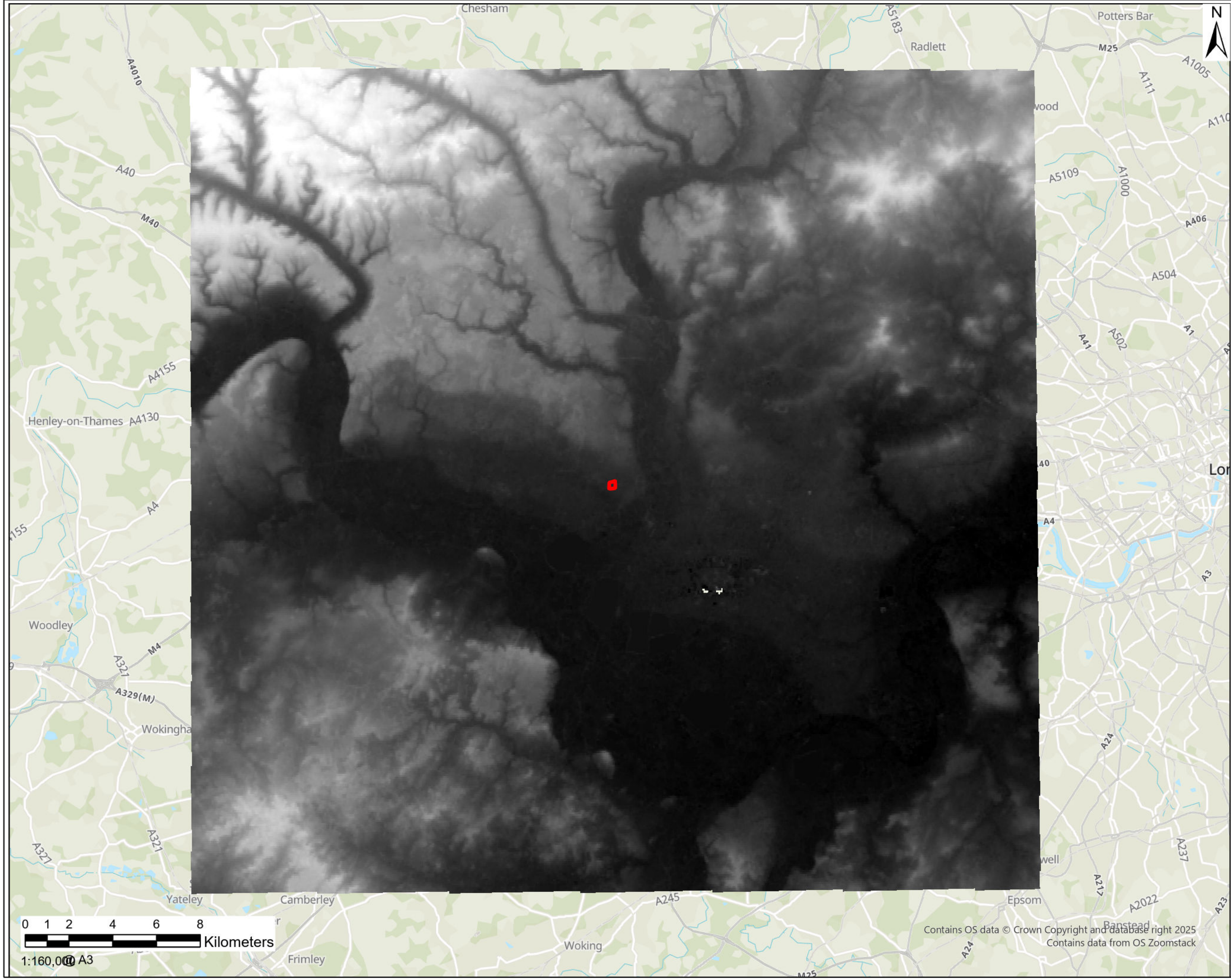

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LEGEND

Site Boundary

Modelled Terrain

Value

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Modelled Terrain

SHEET NUMBER

Figure 5

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