Air Quality Permit Assessment

Colt Lon4 Data Centre, Hayes

March 2024

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EXECUTIVE SUMMARY

Phlorum Ltd has been commissioned by Black & White Engineering Ltd to undertake an air quality assessment (AQA) on behalf of Colt (the operator) to support the Environmental Permit application to operate the Colt Lon4 Data Centre located to the north of Beaconsfield Road, Hayes, UB4 0SL.

The Data Centre is located within the London Borough of Hillingdon's (LBH's) borough-wide Air Quality Management Area (AQMA). This assessment evaluates the impacts on local air quality of the data centre's standby generator (SBG) emissions during two operating scenarios:

- **Scenario 1:** Routine 'Testing and Maintenance' of the SBGs. In this scenario, all generators are expected to run independently for 8 hours per year, and cumulatively for 12 hours per year.
- **Scenario 2:** 72-hour 'Grid Failure'/ power outage emergency inclusive of the testing and maintenance run times above.

This report assesses the likely significant effects of the proposed development on the environment with respect to air quality. Air quality studies are concerned with the presence of airborne pollutants in the atmosphere. The main pollutants of concern for local air quality are oxides of nitrogen (NO_X) including nitrogen dioxide (NO_2), and particulate matter (PM_{10} and $PM_{2.5}$). Other pollutants are considered, where necessary.

The operator is committed to reducing SBG emissions as much as practically possible. To this end, the generators will be fitted with selective catalytic reduction (SCR) technology to achieve a NO_X emission concentration of 250 $mg.m^{-3}$ (5% O_2) and can operate using Hydrotreated Vegetable Oil (HVO).

The methodology applied to this assessment is considered to be highly conservative, with several assessment assumptions tending towards the 'worst-case'. Consequently, the outputs of the assessment are likely to present a worse case than would realistically be expected from the operation of the SBGs.

Long term impacts from the operation of the proposed SBGs were predicted to be **insignificant** for both scenarios at all relevant modelled receptor locations when assessed against all relevant long-term UK Air Quality Standards. Short term impacts were also found to be **insignificant** for scenario 1, which assesses 'business as usual' maintenance and testing operations. An exceedance of the 24-hour NO_X critical level for ecological impacts was considered possible if prolonged 72-hour grid failure events occurred consistently for several years, at the nearby Yeading Brook and London Canals local wildlife sites.

Prolonged 72-hour grid failure events are considered to be extremely rare events and therefore do not reflect the likely impacts from the installation. To address and mitigate the risks associated with a prolonged grid failure, an Air Quality Management Plan will be implemented.

1. INTRODUCTION

Background

1.1 Phlorum Ltd has been commissioned by Black & White Engineering Ltd to undertake an air quality assessment (AQA) on behalf of Colt (the operator) to support the Environmental Permit application to operate the Colt Lon4 Data Centre Emergency Back-up Generation Facility. The Data Centre is located to the north of Beaconsfield Road, Hayes, UB4 0SL ("the site"). The National Grid Reference for the centre of the site is 511518, 180182. A site location plan is included in Figure 1.

1.2 The site is located in the administrative boundary of the London Borough of Hillingdon (LBH). LBH has declared one Air Quality Management Area (AQMA) that covers the southern two thirds of the Borough. This AQMA was declared in 2003 due to exceedances of the UK Air Quality Standard (AQS) for annual mean concentrations of nitrogen dioxide (NO_2). The proposed development is also located in close proximity to an Air Quality Focus Area (AQFA), which is an area of known poor air quality and high human exposure. The nearest AQFA has been declared on the A4020 to the north of the application site and there is another situated on the A3005 to the east of the site, centred on South Road.

1.3 Land-use in the vicinity of the site is primarily industrial and commercial; however, residential land-use can be found in close proximity to the east, and there are two education facilities located nearby (Guru Nanak Sikh Academy and Blair Peach Primary School).

1.4 The key sources of air emissions associated with this application are the 44 No. SBGs (27 No. 2.6MW *MTU 20V4000 G94F* generators and 17 No. 2.4MW *MTU 20V4000 G74F* generators), required to meet the electrical demand for the data centre in the event of an emergency power outage. The generators will be fitted with selective catalytic reduction (SCR) technology to achieve a NO_X emission concentration of $250mg.m^{-3}$ (5% O_2) and can operate using Hydrotreated Vegetable Oil (HVO).

Scope of Report

1.5 This assessment evaluates the likely local air quality impacts from the 44 No. SBGs at Lon4 during their routine testing and maintenance regime, and during unplanned emergency use.

1.6 Unplanned emergency use is to be assessed despite the understanding that the probability of a major grid failure occurring during the development's operational lifetime is very low, due to the site benefitting from a highly reliable direct connection to the national grid (average 99.999966% availability). This equates to 0.000033% of the time where the grid is unreliable, and this is equivalent to a period of circa 17.67 seconds in a year.

1.7 As such, the principal emissions associated with the use of the SBGs occur during routine testing and maintenance. It is understood that each of the generators will undergo testing and maintenance for up to 20 hours per year, running independently for 2 hours per quarter (8 hours) and cumulatively for 1 hour per month (12 hours).

2. POLICY CONTEXT

The UK Air Quality Strategy

2.1 The UK Air Quality Strategy (UKAQS)[1] sets "air quality standard" (AQS) concentrations for a number of key pollutants that are to be achieved at sensitive receptor locations across the UK by corresponding "air quality objective" (AQO) dates. The sensitive locations at which the standards and objectives apply are those where the population are reasonably expected to be exposed to said pollutants over a particular averaging period.

2.2 For those objectives to which an annual mean standard applies, the most common sensitive receptor locations used to compare concentrations against the standards are areas of residential housing. It is reasonable to expect that people living in their homes could be exposed to pollutants over such a period of time.

2.3 Schools and children's playgrounds are also often used as sensitive locations for comparison with annual mean objectives due to the increased sensitivity of young people to the effects of pollution (regardless of whether or not their exposure to the pollution could be over an annual period). For shorter averaging periods of between 15 minutes, 1 hour or 1 day, the sensitive receptor location can be anywhere where the public could be exposed to the pollutant over these shorter periods of time.

2.4 The objectives adopted in the UK are based on the Air Quality (England) Regulations 2000[2], as amended, for the purpose of Local Air Quality Management (LAQM). These Air Quality Regulations have been adopted into UK law from limit values required by European Union Daughter Directives on air quality. The UKAQS for $PM_{2.5}$ was amended as part of The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[3].

2.5 The Environment Agency also provides further environmental assessment levels (EALs) for additional pollutants[4], which are not included in the UKAQS.

2.6 A summary of the AQSs and EALs relevant to this assessment are included in Table 2.1, below.

1 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) July 2007.
2 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043.
3 The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020
4 Environment Agency & Defra (2022) https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions

Table 2.1 UK Air Quality Standards and EALs

Pollutant	Averaging Period	Air quality standard/EAL ($\mu g.m^{-3}$)	Air quality objective, where applicable
Nitrogen dioxide (NO_2)	1 hour	200	Not to be exceeded more than 18 times a year
	Annual	40	40 $\mu g.m^{-3}$
Particulate Matter (PM_{10})	24 hour	50	Not to be exceeded more than 35 times a year
	Annual	40	40 $\mu g.m^{-3}$
Particulate Matter ($PM_{2.5}$)	Annual	20	20 $\mu g.m^{-3}$
Sulphur Dioxide	15-minute	266	Not to be exceeded more than 35 times per calendar year
	1 hour	350	Not to be exceeded more than 24 times per calendar year
	24-hour	125	Not to be exceeded more than 3 times per calendar year
Carbon Monoxide	Maximum daily running 8-hour mean	10,000	-
	Maximum 1-hour	30,000	-
Benzene	Maximum 1 hour	195	-
	Annual	5	-
Nitrogen Monoxide (NO)	Maximum 1 hour	4,400	-
	Annual	310	-

Other Human Standards

Acute Exposure Guideline Levels

2.7 The EA also request that air quality assessments give due consideration to the United States Environmental Protection Agency's (EPA's) Acute Exposure Guideline Levels (AEGLs)[5], which represent guideline concentrations at which certain toxicological health effects are considered likely to occur.

2.8 Within this assessment, the primary pollutant of concern is NO_2. The EPA highlight that non-disabling adverse impacts are likely to occur when NO_2 concentrations reach 940 $\mu g.m^{-3}$. As such, this is the concentration used as an additional significance threshold within this assessment.

Ecological Standards

2.9 There are two categories of pollutants that are typically the subject of assessments for ecological designated sites. These are pollutants that have an effect on vegetation/habitats in (1) a gaseous form, assessed against critical levels, and (2) those which have an impact through deposition, assessed against critical loads.

Critical Levels

2.10 Critical levels represent the maximum concentrations of pollutants in air for the protection of vegetation. These have been adopted by, amongst others, the European Union and the United Nations Economic Commission for Europe (UNECE) and are used as regulatory standards. These critical levels are summarised in Table 2.2.

Table 2.2: Critical Levels

Pollutant	Averaging Period Critical Level	Critical Level
Oxides of nitrogen (NO_X)	24 Hour maximum mean	75 / 200 $\mu g.m^{-3}$*
	Annual	30 $\mu g.m^{-3}$
Ammonia (NH_3)	Annual	1 $\mu g.m^{-3}$ (for lichens and bryophytes)
	Annual	3 $\mu g.m^{-3}$
Sulphur Dioxide (SO_2)	Annual	10 $\mu g.m^{-3}$ (for lichens and bryophytes)
	Annual	20 $\mu g.m^{-3}$
*The critical level is generally considered to be 75$\mu g.m^{-3}$; but this only applies where there are high concentrations of SO_2 and ozone, which is not generally the current situation in the UK, especially not in inland conurbations such as London.		

5 United States Environmental Protection Agency. (2012). Acute Exposure Guidance Levels for Selected Airborne Chemicals (Vol. 11).

Critical Loads

2.11 Critical loads represent estimates of exposure to one or more pollutants below which significant effects are not known to occur, according to present knowledge. Whilst critical levels relate to the concentration of pollutants in air, critical loads relate to a quantity of a pollutant being deposited onto a habitat / ecosystem.

2.12 The Air Pollution Information System (APIS)[6] provides critical loads for nitrogen deposition (leading to eutrophication) and acid deposition (leading to acidification). Critical loads for nitrogen deposition are in units of kilogrammes of nitrogen per hectare per year (kg N/ha/year) and vary with habitat sensitivity. Critical loads for acid deposition are in kilogrammes of acid equivalent per hectare per year (keq H^+/ha/year). Site specific critical loads are discussed later within this report.

6 Air Pollution Information System. (2024). Available at www.apis.ac.uk

3. BASELINE CONDITIONS

3.1 This chapter is intended to establish prevailing air quality conditions in the vicinity of the application site.

3.2 Baseline air quality conditions in the vicinity of the site are established through the compilation and review of appropriately sourced background concentration estimates and local monitoring data.

3.3 Defra provides estimated background concentrations of the UKAQS pollutants at the UK Air Information Resource (UK-AIR) website[7]. These estimates are produced using detailed modelling tools and are presented as concentrations at central 1km^2 National Grid square locations across the UK. At the time of writing, the most recent background maps were from August 2020 and based on monitoring data from 2018.

3.4 Being background concentrations, the UK-AIR data are intended to represent a homogenous mixture of all emissions sources within the general area of a particular grid square location. Concentrations of pollutants at various sensitive receptor locations can, therefore, be calculated by modelling the emissions from a nearby pollution source, such as a busy road, and then adding this to the appropriate UK-AIR background datum.

3.5 LBH's automatic and non-automatic monitoring data are also considered an appropriate source for establishing baseline air quality; the most recent available data from LBH's air quality annual status report for 2022[8] have been reviewed and included within the assessment.

3.6 The London Atmospheric Emissions Inventory (LAEI) also provides modelled ground level concentrations of annual mean NO_2, PM_{10} and $PM_{2.5}$ at 20m grid resolution across Greater London, for 2025[9], the proposed first year of full operation. This data has also been reviewed and incorporated into the assessment.

UK-AIR Background Pollution

3.7 UK-AIR predicted background pollution concentrations of NO_2, PM_{10} and $PM_{2.5}$ for 2019 to 2025 are presented in Table 3.1. These data were taken from the central grid square location closest to the site (i.e. grid reference: 511500, 180500).

7 Defra: UK-AIR. www.uk-air.defra.gov.uk
8 LBH (2023) 2022 Air Quality Annual Status Report
9 London Atmospheric Emissions Inventory (LAEI). (2023). https://data.london.gov.uk/dataset/london-atmospheric-emissions-inventory--laei--2025

Table 3.1: 2019 to 2025 background concentrations of pollutants at the application site.

Pollutant	Predicted annual mean background concentration ($\mu g.m^{-3}$)						
	2019	2020	2021	2022	2023	2024	2025
NO_2	24.9	23.5	22.7	21.9	21.3	20.5	19.9
PM_{10}	18.0	17.5	17.3	17.1	17.0	16.8	16.6
$PM_{2.5}$	12.0	11.7	11.5	11.4	11.3	11.1	11.0

3.8 The data in Table 3.1 show that annual mean background concentrations of NO_2, PM_{10} and $PM_{2.5}$, in the vicinity of the site between 2019 and 2025, are predicted to be below their respective AQSs. The data show that in 2024, NO_2, PM_{10} and $PM_{2.5}$ concentrations were predicted to be below their AQSs by 48.8%, 58.0% and 44.5% respectively. As such, annual mean background concentrations are likely to be well below the respective AQSs at the site.

3.9 Concentrations of all pollutants are predicted to decline each year. These reductions are principally due to the forecast effect of the roll out of cleaner vehicles, but also due to UK national and international plans to reduce emissions across all sectors.

3.10 UK-AIR also provides annual mean predictions for benzene, CO and SO_2, for 2001. These are summarised below for the UK-AIR grid square which contains the site.

- Benzene: 0.94 $\mu g.m^{-3}$
- CO: 466 $\mu g.m^{-3}$
- SO_2: 4.82 $\mu g.m^{-3}$

3.11 These background concentrations for Benzene, CO and SO_2 are all below their respective AQSs by over 80%.

London Atmospheric Emissions Inventory

3.12 The LAEI provides modelled ground level concentrations of annual mean NO_2, PM_{10} and $PM_{2.5}$ at 20m grid resolution across Greater London. Figures 3, 4 and 5 show predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ near the application site in 2025. The concentrations at the application site are similar to those predicted by UK-AIR.

Local Sources of Monitoring Data

3.13 Air quality monitoring is considered an appropriate source of data for the purposes of describing baseline air quality.

Automatic Monitoring

3.14 LBH currently undertakes automatic (continuous) monitoring at 11 sites across the Borough. The most recent available data for NO_2, PM_{10} and $PM_{2.5}$ from the monitoring sites located within 4km of the application site are included in Tables 3.2, 3.3 and 3.4, respectively.

Table 3.2: NO_2 monitoring data from LBH automatic monitors

Monitor	Type	Distance from the application site (km)	NO_2 annual mean concentration ($\mu g.m^{-3}$)				
			2016	2017	2018	2019	2022
HIL5	R	1.7	**45.9**	**47.0**	**43.0**	**41.0**	34.0
HI3	R	3.6	**41.9**	35.0	35.0	33.0	29.0
HRL	A	3.9	34.0	32.0	30.0	31.0	24.0

Note: "R" = Roadside; "A" = Airport. Exceedances of long-term AQS shown in **Bold**. Data from 2020 and 2021 were not considered, noting that air quality during this period was heavily influenced by the Covid-19 pandemic and associated lockdowns.

3.15 The data in Table 3.2 show that between 2016 and 2019 and within 4km of the application site, annual mean concentrations of NO_2 at roadside sites often exceeded the $40\mu g.m^{-3}$ AQS. The highest concentration in 2019 ($41.0\ \mu g.m^{-3}$) was measured at HIL5, which is located 1.7km to the southeast of the application site. Being a roadside location, this site is not considered to be representative of background conditions across the site.

3.16 There is strong evidence of a downward trend in measured NO_2 in the above dataset; this trend is particularly evident since the Covid-19 pandemic.

3.17 Table 3.3 includes the most recent annual mean PM_{10} results from the automatic monitoring sites stationed in LBH.

Table 3.3: PM_{10} monitoring data from the LBH automatic monitors

Monitor	Type	Distance from the application site (km)	PM_{10} annual mean concentration ($\mu g.m^{-3}$)				
			2016	2017	2018	2019	2022
HIL5	R	1.7	28.0	27.0	30.0	28.0	30.0
HI3	R	3.6	20.0	19.0	24.0	24.0	22.0
HRL	A	3.9	15.0	15.0	15.0	15.0	13.0

Note: "R" = Roadside; "A" = Airport. Data from 2020 and 2021 were not considered, noting that air quality during this period was heavily influenced by the Covid-19 pandemic and associated lockdowns.

3.18 The data in Table 3.3 show that annual mean PM_{10} concentrations have been well below the 40µg.m^{-3} AQS at all sites, between 2016 and 2022, within 4km of the site.

3.19 The highest concentration in 2022 was measured at HIL5, where a concentration 25% below the 40µg.m^{-3} AQS was recorded.

3.20 It is also relevant to note that no exceedance of the short-term AQO was recorded between 2016 and 2022.

3.21 Table 3.4 includes the most recent annual mean $PM_{2.5}$ results from the automatic monitoring sites stationed in LBH.

Table 3.4: $PM_{2.5}$ monitoring data from the LBH automatic monitors

Monitor	Type	Distance from the application site (km)	$PM_{2.5}$ annual mean concentration (µg.m^{-3})				
			2016	2017	2018	2019	2022
HRL	A	3.9	10.0	9.0	9.0	10.0	8.0

Note: "A" = Airport. Data from 2020 and 2021 were not considered, noting that air quality during this period was heavily influenced by the Covid-19 pandemic and associated lockdowns.

3.22 The data in Table 3.4 shows that annual mean $PM_{2.5}$ concentrations have been well below the 20 µg.m^{-3} AQS at HRL, between 2016 and 2022. In 2022, a concentration 60.0% below the 20 µg.m^{-3} AQS was recorded.

Non-Automatic Monitoring

3.23 LBH operates an extensive non-automatic, NO_2 diffusion tube monitoring network across the area. The most recent available monitoring data for diffusion tubes located within 2.5km of the site are included in Table 3.5.

Table 3.5: Monitoring data from LBH NO_2 diffusion tubes

Monitor	Type	Distance from the application site (km)	NO_2 annual mean concentration (µg.m^{-3})				
			2016	2017	2018	2019	2022
HD208	UB	0.8	28.9	27.3	30.8	26.5	-
HILL17	UB	1.0	26.1	32.7	31.0	31.6	24.1
HD209	UB	1.8	30.9	32.1	29.0	24.1	-
HILL18	R	1.8	**40.9**	**49.0**	38.5	37.4	28.3

Monitor	Type	Distance from the application site (km)	NO_2 annual mean concentration (µg.m^{-3})				
			2016	2017	2018	2019	2022
HILL07	R	1.9	34.7	**43.3**	37.7	36.9	30.5
HILL28	R	2.1	32.3	35.7	31.7	31.7	27.1
HILL08	R	2.1	32.1	33.4	33.9	33.9	26.7

Note: "R" = roadside; "UB" = urban background. **Bold** denotes exceedance of the AQS. Data from 2020 and 2021 were not considered, noting that air quality during this period was heavily influenced by the Covid-19 pandemic and associated lockdowns.

3.24 The data in Table 3.5 indicate that annual mean NO_2 concentrations in the vicinity of the application site were generally below the 40µg.m^{-3} AQS, with only 2 of the 7 closest diffusion tubes recording exceedances of the AQS in recent years.

3.25 The nearest background monitor (and nearest monitor) to the site is located approximately 0.8km to the west (HD208). The most recent result from 2019 was below the AQS by 33.8%. This value is also similar to the UK-AIR predictions for the site in Table 3.1.

4. METHODOLOGY

Guidance

4.1 Local Air Quality Management Technical Guidance (LAQM.TG(22))[10] was followed in carrying out this assessment.

4.2 The latest Environmental Protection UK (EPUK) & IAQM guidance on 'Planning for Air Quality'[11] was also referred to for the impact assessment. The criteria used to describe the impact at individual receptors were derived from this guidance, and have been included in Appendix A.

4.3 For the assessment of emissions from the SBGs, Defra's guidance on assessing air emissions for environmental permitting[12] and the Environment Agency's guidance on assessing impacts on limited hour operations[13] has also been followed. The EA's guidance on specified generators[14] and their Data Centre FAQ headline approach guidance[15] to aide permit applications for data centres has also been reviewed.

Baseline Concentrations for the Assessment

4.4 For the purposes of dispersion modelling assessments, it is important that the choice of background site captures all pollutant sources that are not being modelled, but does not capture any sources being modelled, which could result in double-counting emissions from sources in the study area.

4.5 As roads were not included in the model, it is important that background concentrations used to derive the PEC include their contribution. As such, UK-AIR data, which represent general air quality (i.e. away from any major emission sources, including roads) are not always considered appropriate.

4.6 NO_2, PM_{10} and $PM_{2.5}$ baseline concentrations used in this assessment were derived from 2025 LAEI predictions, noting their similarities to UK-AIR predictions and locally monitored data.

4.7 UK-AIR 2001 estimates were used for C_6H_6 and CO. NO baseline concentrations were obtained by subtracting UK-AIR NO_2 concentrations from UK-AIR NO_X concentrations, for 2025.

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10 Defra. 2022. Part IV of the Environment Act 1995, Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management, Technical Guidance LAQM. TG(22).
11 EPUK & IAQM. (2017). Land-Use Planning & Development Control: Planning For Air Quality.
12 Defra (2016) Air emissions risk assessment for your environmental permit. Available at: https://www.gov.uk/guidance/air-emissions-riskassessment-for-your-environmental-permit
13 Air Quality Modelling & Assessment Unit (AQMAU). (2016). Diesel generator short term NO_2 impact assessment.
14 Environment Agency (2019) Specified generators: dispersion modelling assessment
15 Environment Agency (2018) Data Centre FAQ Headline Approach

4.8 No future improvement in baseline concentrations beyond 2025 was assumed. This is a highly conservative approach, considering that improvements in NO_2 concentrations are predicted across the UK. Short-term background concentrations were assumed to be twice the long-term concentrations.

Assessment of Impacts

Generator Emissions

4.9 The key pollutant emissions associated with the SBGs are NO_X, PM_{10}, $PM_{2.5}$, CO, SO_2 and hydrocarbons (as benzene).

ADMS-6 Generator Assessment

4.10 Dispersion modelling was undertaken using ADMS-6 (version: 6.0.0.1), which is produced by Cambridge Environmental Research Consultants (CERC). ADMS-6 is a short-range dispersion model that simulates a wide range of buoyant and passive releases to the atmosphere. It is a “new generation” dispersion model, which uses a skewed Gaussian Concentration distribution to calculate dispersion under convective conditions.

Model Input Data

Meteorological Data and Surface Characteristics

4.11 Detailed, hourly sequential, meteorological data are used by the model to determine pollutant transportation and levels of dilution by the wind and vertical air movements. Meteorological data used in the model were obtained from London Heathrow Airport as it was considered to provide the most representative data of similar conditions to the site. Five years (2015-2019) of meteorological data were used in this assessment, with each wind rose displayed in Figure 2. Meteorological data were provided by ADM Ltd.

4.12 The surface roughness applied to the dispersion and meteorological site was 1.5m and 0.5m, respectively. The Minimum Monin-Obukhov length is used to help describe the stability of the atmosphere. In urban areas where there are multiple sources of heat, the air is less stable. For this model, a Minimum Monin-Obukhov length of 100m was used for the site, which is representative of large conurbations such as London.

Buildings and Terrain

4.13 Buildings can have significant effects on the dispersion of pollutants and can increase ground level concentrations. The data centre buildings were included in the model, so building downwash effects could be considered. When compared to the height of the proposed stacks (see Table 3.1), all other buildings in the vicinity of the site were considered short enough to exclude from the dispersion model. The building details, alongside a summary of other model inputs, are included in Appendix B.

4.14 Terrain can influence the dispersion of pollutants in the local area. However, ADMS-6 user guidance[16] suggests terrain effects should only be modelled where the gradient exceeds 1:10. The local area is flat and as such, the impact of complex terrain has not been modelled.

Emission Parameters

4.15 The assessment has been carried out assuming that the fuel type for all generators would be diesel, despite the understanding that these generators can run on HVO. Emissions from diesel generators are generally higher than when using HVO for PM, NO_X and SO_2 and as such, this is a conservative approach.

4.16 The emission parameters of the SBGs (e.g. volumetric flow rate, exhaust temperature) were derived from the manufacturers' datasheets. Key information is provided below and in Appendix C.

4.17 The generators are to be fitted with Selective Catalytic Reduction (SCR) technology to reduce NO_X emissions concentrations to 250 $mg.m^{-3}$ (5% O_2). As the SCR system is only effective after temperatures reach 250°C, there is a period after start-up when emissions from the generators would be unabated. It is a requirement under Environmental Permitting that this period lasts for no longer than 20 mins. If running at full load, SCR warm up time would likely be far quicker than 20 mins. For conservative purposes, all generators are assumed to run for 20 minutes unabated, regardless of the loads the SBGs are run at.

<u>Ammonia Slip</u>

4.18 Ammonia slip is anticipated to be minimal as the SCR system only starts dosing urea when the temperature sensor in the exhaust gas reaches a suitable temperature. Exact concentrations are difficult to predict, so highly conservative assumptions have been made:

- NH_3 emission concentrations have been obtained from the upper limit given within the 2017 BAT Conclusions for Large Combustion Plant[17], which is 15 mg $NH_3.Nm^{-3}$ (STP, dry, 15% O_2); and

16 CERC (2023). ADMS 6 User Guide
17 EA (2019). UK Interpretation Guidance and Permitting Advice on the Best Available Techniques (BAT) Conclusions for: LARGE COMBUSTION PLANTS (LCPs).

- Ammonia Slip can occur as soon as urea dosing commences. It is expected that dosing would not commence during the first 15 minutes (generator warm-up time). However, in this case, it was assumed that ammonia slip would occur as soon as the SBGs operate.

4.19 A summary of the emission parameters for the MTU generators is provided in Table 4.1, below:

Table 4.1: Model Inputs for Generators

Parameter	Unit	MTU 2.4MW Generator	MTU 2.6MW Generator
Power	kW	2670	3090
Stack(s) height	m	38.6	38.6
Stack(s) diameter	m	0.55	0.55
Exhaust gas temperature	°C	528	460
Exhaust Gas Velocity	m/s	31.55	40.89
NO_X emission rate (unabated)	g/s	5.71	5.58
NO_X emission rate (concentration post SCR not to exceed 250 $mg.Nm^{-3}$ (5% O_2))	g/s	0.52	0.60
PM_{10} and $PM_{2.5}$ emission rate	g/s	0.030	0.017
CO emission rate	g/s	0.371	0.172
Hydrocarbons (benzene) emission rate	g/s	0.111	0.060
NH_3 emission rate	g/s	0.083	0.097
SO_2 emission rate	g/s	0.0015	0.0052

4.20 For the purposes of this assessment, it has been assumed that 100% of hydrocarbons are emitted as benzene. It has also been assumed that 100% of PM is emitted as both PM_{10} and $PM_{2.5}$. These are highly conservative and precautionary approaches.

4.21 As is displayed in Appendix C, pollutant concentrations were provided under Normal conditions at both 5% and measured O_2. Using these and the given mass emission rates, volumetric flow rates were determined, which were corrected for temperature and O_2. Moisture content was unknown, so was considered to be 0% for conservatism. Corrected volumetric flows were then used to establish the exhaust gas velocities.

Generator Scenarios

4.22 This assessment has modelled two scenarios, as set out below:

Scenario 1

4.23 Scenario 1 accounts for the routine 'Testing and Maintenance' of the SBGs, which shall comprise the following:

- Black Building Tests: All generators to run concurrently for 1 hour each month at 100% load; and
- Functional Load Tests: Generators to be tested independently for up to 2 hours every 3 months at up to 100% load.

4.24 Overall, each generator is anticipated to operate for a total of 20 hours per year during routine testing and maintenance. The decision to assess generator impacts under the assumption that they will operate at 100% load is considered conservative, understanding that the generators are highly unlikely to operate at full load.

Scenario 2

4.25 The second scenario accounts for the above, alongside an improbable 72-hour long 'Grid Failure'/ power outage, with all generators operating concurrently at 100% load. Again, the decision to assess generator impacts under the assumption that they will operate at 100% load is considered conservative, understanding that the generators are highly unlikely to operate at full load.

4.26 Input parameters for NO_X have been time-weighted to account for the provision of SCR in the generators. A summary of these time-weighted parameters is provided in Table 4.2 below.

Table 4.2: Time-Weighted Model Inputs

Generator Scenario	Time Weighted Emission Rates ($g.s^{-1}$)
	NO_X
2.4MW Generator Testing & Maintenance	1.903
2.6MW Generator Testing & Maintenance	1.931
2.4MW Generator Testing + Grid Failure	0.834
2.6MW Generator Testing + Grid Failure	0.911

Modelled Receptors

Human Receptors

4.27 Discrete model human receptors closest to the site were identified. The below table lists the human receptors included within this assessment. All modelled receptors are shown in Figure 3.

4.28 All receptors were modelled at "breathing height", which is by convention 1.5m above ground level, plus the relevant floor height, if receptors are at elevated floor levels. Details of modelled human receptors are included in Table 4.3.

Table 4.3: Modelled Human Receptors

ID	Location/Description	Height (m)	UK Grid Reference	
			X	Y
R1	Blair Peach Primary School	1.5	511690.66	180105.36

ID	Location/Description	Height (m)	UK Grid Reference	
			X	Y
R2	Residential Dwelling, Cherry Avenue	1.5	511770.59	180176.81
R3	Residential Dwelling, Bankside	1.5	511778.66	180439.45
R4	Residential Dwelling, Cherry Avenue	1.5	511814.81	180268.67
R5	Residential Dwelling, Ranleigh Road	1.5	511893.06	180306.09
R6	Residential Dwelling, Beaconsfield Road	1.5	511857.34	180054.33
R7	Allotments	1.5	511711.06	180246.12
R8	Residential Dwelling, Beresford Road	1.5	511779.09	180331.19
R9	Guru Nanak School 1	1.5	511372.53	180105.36
R10	Guru Nanak School 2	1.5	511307.91	180110.45
R11	Guru Nanak School 3	1.5	511275.38	179940.47
R12	Goals, Football Club	1.5	511168.12	180251.8
R13	Hayes and Yeading Football Club	1.5	511496.72	180090.05
R14	Residential Use under construction (PP/2015/4682)	1.5, 15, 28.5	511683.5	180037.69
R15	Residential Use under construction (PP/2015/4682)	1.5, 15, 28.5	511668.59	179959.78
R16	Minet Country Park Play Area	1.5	511090.75	180141.97
R17	Residential Dwelling, Abbotswood Way	1.5	510878.44	180639.22
R18	Residential Dwelling, Uxbridge Road	1.5	511528.31	180727.42
R19	Residential Dwelling, Beresford Road	1.5	511892.81	180510.36
R20	Wellings House Apartments	1.5, 15, 30	510775.53	180255.25

4.29 A grid of receptor points was also modelled to predict the pattern of dispersion of pollutants across the local area at a height of 1.5m. The modelled grids originated at UK Grid Reference 510600, 179600, with 181 × 141 grid points (10m spacing) used to produce the contour plots shown in Figures 7 to 11.

Ecological Receptors

4.30 Environment Agency guidance sets out that the assessment must consider all Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites within 10km of an application site, and all Sites of Special Scientific Interest (SSSI) and local nature sites, such as Local Nature Reserves (LNRs) and Sites of Importance for Nature Conservation (SINCs), within 2km. The list of ecological sites considered in this assessment, their critical loads, and critical levels are included in Table 4.4, below.

Table 4.4: Modelled Ecological Sites

Site Name	Distance to Site (km)	X	Y	Critical Loads		Critical Levels		
				Nitrogen Deposition (Kg/Ha/Yr)	Max N Acid Deposition (Keq/Ha/Yr)	Annual Mean NO_X (μg/m^3)	Max. 24-Hr NOx (μg/m^3)	Annual Mean NH_3 (μg/m^3)
Richmond Park SAC	9.6	518850	174044	10	1.009	30	200	1
Ruislip Woods SSSI	8.6	509538	188558	10	2.688	30	200	1
Yeading Meadows LNR	2.0	510387	181946	10	1.000	30	200	1
Minet Country Park SINC	0.5	511105	179753	10	1.000	30	200	1
Yeading Brooks SINC	0.1	511596	180092	10	1.000	30	200	1
Willowtree Park SINC	1.2	512218	181127	10	1.000	30	200	1
St Mary's Wood End SINC	1.9	509768	181078	10	1.000	30	200	1
Havelock Cemetery SINC	1.3	512549	179345	10	1.000	30	200	1
Hortus Cemetery SINC	1.5	512832	179549	10	1.000	30	200	1
Avenue Road Hedge SINC	1.4	512826	180037	10	1.000	30	200	1
Southall Railsides SINC	1.5	512967	179964	10	1.000	30	200	1
Crane Corridor SINC	1.8	510421	178819	10	1.000	30	200	1
London Canals SINC	0.2	511719	180310	10	1.000	30	200	1

4.31 The critical levels and critical loads used for this assessment, as displayed in Table 4.4, have been selected for conservatism. The critical levels are as stringent as they can be, accounting for uncertainties relating to the habitat profiles of the locally designated ecological sites (e.g. whether they contain lichens/ bryophytes). The same approach has been applied for nitrogen deposition critical loads.

4.32 For acid deposition, values were selected based on which identified habitat within each ecological site was considered to be most vulnerable to acid deposition. The Local Nature Reserve (LNR) and Local Wildlife Sites (LWSs) would likely have a considerably higher critical load for acid deposition; a value of 1 $Keq.ha^{-1}.yr^{-1}$ has been selected for conservatism.

Model Outputs

NO_X to NO_2/ NO Conversion

4.33 Following Environment Agency guidance[18], it has been assumed that 70% of NO_X converts to NO_2 over the long-term (i.e. annual average) and that 35% converts to NO_2 in the short-term (i.e. hourly averaging periods); these are worst-case conversion rates that assume that significant proportions of emitted NO_X converts to NO_2 in a relatively short space and time.

4.34 Environment Agency guidance[13] suggests that within 500m of a source, NO_X to NO_2 conversion can be as low as 15% in the short-term. As such, the use of a 35% short-term conversion rate is conservative.

4.35 For Nitrogen Monoxide, it has been assumed that 30% of NO_x is from NO over the long-term (i.e. annual average) and 85% in the short-term (i.e. hourly averaging periods).

Modelling of long- and short-term emissions

<u>Short-term emissions</u>

4.36 With regard to short-term impacts, it is normal to assess the 1-hour mean NO_2 objective by considering the 99.79th percentile of 1-hour mean concentrations, which represents the 19th highest concentration in a year (8760 hours). Results using this percentile are presented in Appendix D, for context. However, when there are far fewer hours of operation in a year, this is an unrealistic worst-case approach and consideration should be given to the limited hours of operation through the use of hypergeometric distribution statistics.

18 Environment Agency. Conversion Ratios For NO_X and NO_2. Available at: https://webarchive.nationalarchives.gov.uk/20140328232919/http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf

4.37 As such, the hypergeometric distribution has been used to ascertain the likelihood of 19 or more hours of exceedance in a calendar year coinciding with the 20 routine operational hours, and highly conservative 72 grid failure hours. For the purposes of this assessment, a probability threshold of 2% (due to Monte Carlo simulations, this equates to a 5% probability) has been considered as an indicator of 'unlikely exceedance'; this is in line with EA guidance[13]. The percentile used for this assessment is 25.86% for Testing & Maintenance and 87.35% with Grid Failure. Both percentiles assume that during routine testing, all generators run concurrently for all 20 hours of operation; this has been undertaken for conservatism and was considered the most appropriate way to consider the possible cumulative contributions to short-term exceedances caused by both the 12 hours of concurrent operation and 8 hours of independent operation.

4.38 The same statistical approach has been applied when assessing SBG impacts against the EPA's AEGL for NO_2. This AEGL has been taken as a 'not to exceed' concentration, so the hypergeometric distribution has been used to identify the likely maximum concentration for the limited generator operation. The percentile used to identify the maximum concentration during Testing & Maintenance was 99.8% and was 99.97% for the Grid Failure scenario. A 100th percentile concentration (maximum hourly concentration if generators ran all hours of the year) was also obtained, for completeness, with results presented in Appendix D.

4.39 The statistical approach was also applied to consider the 24-hour critical level for NO_X, where the critical level concentration is not to be exceeded in any day of the year. During routine testing, black building tests would last no longer than 1 hour in any given day, so it is reasonable to anticipate that this test would not lead to exceedances of the 24-hour critical level; the maximum 1-hour NO_X concentration has been used to demonstrate this, later in the report. The functional load tests are carried out independently, which could equate to multiple days' worth of operation; to account for this, a percentile of 100% was used. For the 72-hour Grid Failure scenario, the percentile used was 99.17%.

Long-term emissions

4.40 To calculate the long-term process contribution, the modelled output, which is based on the model running for every hour in the year, was scaled down to account for the actual number of SBGs operating at one time and the hours of operation per year.

Deposition Velocities

4.41 For the assessment of ecological impacts, deposition velocities were obtained from AQTAG06[19] and velocities for forested areas were assumed for all ecological sites, for conservative purposes. The velocities used are provided below:

- NO_X = 0.003 m.s^{-1}

[19] Habitats Directive (2014). AQTAG06 Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air.

- SO_2 = 0.024 m.s^{-1}
- NH_3 = 0.030 m.s^{-1}

4.42 Nitrogen and acid deposition fluxes were also obtained from the AQTAG06[19] document:

- N deposition (as NO_X) = 95.9 kg N.ha^{-1}.yr^{-1}
- N deposition (as NH_3) = 260 kg N.ha^{-1}.yr^{-1}
- Acid deposition (as NO_X) = 6.84 keq.ha^{-1}.yr^{-1}
- Acid deposition (as NH_3) = 18.5 keq.ha^{-1}.yr^{-1}
- Acid deposition (as SO_2) = 9.84 keq.ha^{-1}.yr^{-1}

Significance of Impacts

Impacts at Human Receptors

4.43 The significance of impacts from the proposed energy centre is determined in terms of criteria set out in Defra's 'Air emissions risk assessment for your environmental permit'[12], EPUK and IAQM's 'Planning for air quality'[11] and EPA's AEGL for NO_2[5]. The significance of impacts is considered both in terms of the:

- **Process Contribution (PC):** the impact of direct, additional emissions associated with the new processes only, and
- **Predicted Environmental Concentration (PEC):** the impact associated with combined PC and existing background pollutant concentrations.

4.44 Defra's guidance advocates that when undertaking detailed modelling, the PC can be considered *insignificant* if:

- the long-term PC at a sensitive receptor is <1% of the long term AQS; and
- the short-term PC at a sensitive receptor is <10% of the short term AQS.

4.45 If the above criteria are exceeded, significant impacts can be screened out if:

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

4.46 The EA, however, provide no guidance (at detailed modelling stage) to determine whether the PC or PEC is *significant*.

4.47 Joint EPUK & IAQM guidance provides impact descriptors that also offer a means to communicate the numerical output of detailed modelling. The impact descriptor used to describe the change in long term average concentrations is derived from both the magnitude of change at a sensitive receptor and the ambient concentration at that receptor. The impact can either be '*adverse*' or '*beneficial*' and be described as '*negligible*', '*slight*', '*moderate*' or '*substantial*. These descriptors are summarised In Appendix A.

4.48 The impact descriptors described in Appendix A are intended for application at a series of individual receptors. The assessment of overall significance is, however, based on professional judgement and the reasons for reaching an overall judgement of significance must be clear, set out logically and will take into consideration factors such as:

- the existing and future air quality in the absence of the development.
- the extent of current and future population exposure to the impacts;
- the spatial and temporal extent of any impacts; and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

4.49 Regarding short term impacts, total percentile concentrations (PEC) at locations of relevant exposure below the AQS/AQO or AEGL were considered "not significant". This is considered a sufficiently robust criterion given the conservative inputs (see Table 4.5).

Impacts at Ecological Receptors

4.50 The EA provides different screening criteria for assessing changes in pollution concentrations and deposition depending on the sensitivity of the habitat.

4.51 For SPAs, SACs, Ramsar sites or SSSIs, changes can be considered insignificant if:

- the short term PC is less than 10% of the short term environmental standard for protected conservation areas; and/or
- the long term PC is less than 1% of the long term environmental standard for protected conservation areas.

4.52 EA guidance provides the following commentary if the standards above are exceeded:

"If you do not meet these requirements you need to calculate the PEC and check the PEC against the standard for protected conservation areas.

You do not need to calculate PEC for short term targets.

If your short term PC exceeds the screening criteria of 10%, you need to do detailed modelling.

If your long term PC is greater than 1% and your PEC is less than 70% of the long term environmental standard, the emissions are insignificant – you do not need to assess them any further.

If your PEC is greater than 70% of the long term environmental standard, you need to do detailed modelling."

4.53 For Local Nature sites, changes can be considered insignificant if:

- the short term PC is less than 100% of the short term environmental standard for protected conservation areas; and/or
- the long term PC is less than 100% of the long term environmental standard for protected conservation areas.

Model Uncertainties and Assumptions

4.54 There are a number of inherent uncertainties associated with the modelling process, including:

- Model uncertainty – due to model formulations;
- Data uncertainty – due to inaccuracies in input data, including emissions estimates, background estimates and meteorology; and
- Variability – randomness of measurements used.

4.55 Using a validated air quality model such as ADMS-6 reduces the modelling uncertainty.

4.56 The choices of the practitioner throughout the air quality assessment process are also essential to the management of uncertainty, including the decision to bias the predicted impact towards a worst-case estimate or a central estimate. This assessment has used inputs tending towards 'worst-case', where appropriate, to provide a conservative and robust assessment.

4.57 Table 4.5 below summarises the approach to minimising the uncertainty in the conclusions drawn.

Table 4.5: Summary of conservative methods used in assessment

Source of uncertainty	Approach	Comments
Future Background Concentrations	It has been assumed that there will be no improvement in background conditions from the 2025 predictions. Furthermore, 2001 UK-AIR predictions for benzene, CO and SO_2 have been used.	Given the measures being undertaken across the UK to reduce emissions across all sectors, these inputs are considered to be highly conservative.

Meteorological Data	The model has been run with 5 years of meteorological data to account for potential differences in meteorology from year to year. The maximum concentration from 5 years' worth of data, at each receptor or grid point was used in the analysis, increasing the probability that worst-case meteorological conditions are identified.	This is the recommended approach for Environmental Permitting.
Length of possible Grid Failure	An Emergency Grid Failure scenario has been modelled in which the failure lasts a full 72-hour period.	Noting the reliability of the grid (99.999966% availability), grid failures are highly unlikely. As such, it is reasonable to consider a 72-hour outage to be a highly conservative modelling assumption.
NO_X to NO_2 Conversion factors	The EA's recommended conversion factor of 35% was used for short-term NO_2.	AQMAU suggest that within 500m of a pollutant source, the conversion rate is likely to be closer to 15%. All modelled receptors are within 500m of the site.
'Ammonia Slip' Emission Assumptions	Due to uncertainties surrounding the NH_3 emission concentrations, assumptions as listed in paragraph 4.18 have been applied.	This is a worst-case approach, especially considering that none of the generators are categorised as 'large combustion plant'.
Engine Loads	At the request of the Client, all generators have been modelled to operate at 100% load.	Realistically, generators are likely to run at considerably lower loads than this, meaning that releases of NO_X in particular will be consierably lower than that modelled in this assessment.

5. ASSESSMENT OF IMPACTS

5.1 The proposed development's predicted impact on air quality under normal testing and maintenance, and under an emergency grid failure operation, is presented below.

Long Term Impacts at Human Receptors

Scenario 1 – Testing and Maintenance

5.2 Table 5.1 below shows the predicted impact of the proposed development on annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$, benzene and NO, during normal testing and maintenance. The annual mean AQSs/ EALs for each of these pollutants are 40 µg.m^{-3}, 40 µg.m^{-3}, 20 µg.m^{-3}, 5 µg.m^{-3} and 310 µg.m^{-3}, respectively.

Table 5.1: Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$, C_6H_6 and NO (Scenario 1)

Receptor Point	Annual Mean Concentration				
	PC (µg.m^{-3})	% AQS	PEC (µg.m^{-3})	% AQS	EPUK / IAQM Impact
			NO_2		
R1	0.14	0.4%	20.06	50%	Negligible
R2	0.26	0.6%	20.26	51%	Negligible
R3	0.19	0.5%	20.27	51%	Negligible
R4	0.26	0.7%	20.33	51%	Negligible
R5	0.19	0.5%	20.18	50%	Negligible
R6	0.11	0.3%	20.09	50%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.26	0.7%	20.26	51%	Negligible
R9	0.17	0.4%	20.29	51%	Negligible
R10	0.15	0.4%	20.43	51%	Negligible
R11	0.13	0.3%	20.49	51%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.16	0.4%	20.09	50%	Negligible
R15	0.11	0.3%	20.10	50%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.02	0.0%	21.28	53%	Negligible
R18	0.07	0.2%	23.55	59%	Negligible
R19	0.11	0.3%	20.61	52%	Negligible
R20	0.03	0.1%	21.37	53%	Negligible
			PM_{10}		
R1	0.002	0.01%	14.22	35.6%	Negligible
R2	0.004	0.01%	14.34	35.8%	Negligible
R3	0.003	0.01%	14.46	36.1%	Negligible
R4	0.004	0.01%	14.42	36.0%	Negligible

Receptor Point	Annual Mean Concentration				
	PC ($\mu g.m^{-3}$)	% AQS	PEC ($\mu g.m^{-3}$)	% AQS	EPUK / IAQM Impact
R5	0.003	0.01%	14.42	36.0%	Negligible
R6	0.002	0.00%	14.34	35.8%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.004	0.01%	14.36	35.9%	Negligible
R9	0.003	0.01%	14.17	35.4%	Negligible
R10	0.002	0.01%	14.25	35.6%	Negligible
R11	0.002	0.01%	14.22	35.6%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.003	0.01%	14.20	35.5%	Negligible
R15	0.002	0.00%	14.21	35.5%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.000	0.00%	15.00	37.5%	Negligible
R18	0.001	0.00%	16.94	42.4%	Negligible
R19	0.002	0.00%	14.98	37.5%	Negligible
R20	0.000	0.00%	14.86	37.1%	Negligible
$PM_{2.5}$					
R1	0.002	0.01%	9.11	45.6%	Negligible
R2	0.004	0.02%	9.17	45.8%	Negligible
R3	0.003	0.02%	9.22	46.1%	Negligible
R4	0.004	0.02%	9.20	46.0%	Negligible
R5	0.003	0.02%	9.21	46.1%	Negligible
R6	0.002	0.01%	9.16	45.8%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.004	0.02%	9.19	45.9%	Negligible
R9	0.003	0.01%	9.11	45.5%	Negligible
R10	0.002	0.01%	9.15	45.7%	Negligible
R11	0.002	0.01%	9.13	45.7%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.003	0.01%	9.10	45.5%	Negligible
R15	0.002	0.01%	9.10	45.5%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.000	0.00%	9.42	47.1%	Negligible
R18	0.001	0.01%	10.00	50.0%	Negligible
R19	0.002	0.01%	9.38	46.9%	Negligible
R20	0.000	0.00%	9.39	47.0%	Negligible
Benzene					
R1	0.009	0.2%	0.94	18.9%	Negligible
R2	0.016	0.3%	0.95	19.0%	Negligible
R3	0.012	0.2%	0.95	18.9%	Negligible
R4	0.016	0.3%	0.95	19.0%	Negligible
R5	0.011	0.2%	0.95	18.9%	Negligible
R6	0.007	0.1%	0.94	18.8%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.016	0.3%	0.95	19.0%	Negligible
R9	0.010	0.2%	0.95	18.9%	Negligible

Receptor Point	Annual Mean Concentration				
	PC ($\mu g.m^{-3}$)	% AQS	PEC ($\mu g.m^{-3}$)	% AQS	EPUK / IAQM Impact
R10	0.009	0.2%	0.94	18.9%	Negligible
R11	0.008	0.2%	0.94	18.7%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.010	0.2%	0.94	18.9%	Negligible
R15	0.007	0.1%	0.94	18.7%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.001	0.0%	0.91	18.3%	Negligible
R18	0.004	0.1%	0.94	18.8%	Negligible
R19	0.007	0.1%	0.94	18.8%	Negligible
R20	0.002	0.0%	0.91	18.3%	Negligible
Nitrogen Monoxide					
R1	0.06	0.02%	9.15	3.0%	Negligible
R2	0.11	0.04%	9.20	3.0%	Negligible
R3	0.08	0.03%	9.17	3.0%	Negligible
R4	0.11	0.04%	9.20	3.0%	Negligible
R5	0.08	0.03%	9.17	3.0%	Negligible
R6	0.05	0.02%	9.14	2.9%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.11	0.04%	9.20	3.0%	Negligible
R9	0.07	0.02%	9.16	3.0%	Negligible
R10	0.06	0.02%	9.15	3.0%	Negligible
R11	0.06	0.02%	10.11	3.3%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.07	0.02%	9.16	3.0%	Negligible
R15	0.05	0.01%	10.10	3.3%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.01	0.00%	8.94	2.9%	Negligible
R18	0.03	0.01%	9.12	2.9%	Negligible
R19	0.05	0.02%	9.14	2.9%	Negligible
R20	0.01	0.00%	8.95	2.9%	Negligible

Note: Any discrepancies due to rounding. Receptors which are labelled "N/A" are locations where the annual mean AQSs do not apply.

5.3 As shown in Table 5.1, annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$, C_6H_6 and NO are all modelled to be below relevant annual mean AQSs at all locations of relevant exposure.

5.4 The data in Table 5.1 show that annual mean PCs of all of these pollutants are anticipated to be less than the 1% screening criterion at all discrete receptors in the vicinity of the site.

5.5 All increases in annual mean concentrations would be considered 'negligible' with reference to EPUK and IAQM's impact descriptors, which considers both the PC and the PEC.

5.6 Considering the above, emissions associated with maintenance and testing would not have a significant impact on annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$, C_6H_6 and NO. Therefore, long-term impacts from maintenance and testing can be screened out.

Scenario 2 – Emergency Operation

5.7 Table 5.2 below shows the predicted impact of the proposed development on annual mean NO_2, PM_{10}, $PM_{2.5}$, benzene and NO, adding 72 hours of operation during a grid failure. The annual mean AQSs for each of these pollutants are 40 $\mu g.m^{-3}$, 40 $\mu g.m^{-3}$, 20 $\mu g.m^{-3}$, 5 $\mu g.m^{-3}$ and 310 $\mu g.m^{-3}$, respectively.

Table 5.2: Predicted annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$, C_6H_6 and NO (Scenario 2)

Receptor Point	Annual Mean Concentration				
	PC ($\mu g.m^{-3}$)	% AQS	PEC ($\mu g.m^{-3}$)	% AQS	EPUK / IAQM Impact
			NO_2		
R1	0.30	0.7%	20.22	51%	Negligible
R2	0.54	1.3%	20.54	51%	Negligible
R3	0.39	1.0%	20.47	51%	Negligible
R4	0.55	1.4%	20.62	52%	Negligible
R5	0.39	1.0%	20.39	51%	Negligible
R6	0.23	0.6%	20.21	51%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.55	1.4%	20.55	51%	Negligible
R9	0.36	0.9%	20.48	51%	Negligible
R10	0.32	0.8%	20.60	52%	Negligible
R11	0.28	0.7%	20.63	52%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.33	0.8%	20.26	51%	Negligible
R15	0.22	0.6%	20.21	51%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.04	0.1%	21.30	53%	Negligible
R18	0.15	0.4%	23.63	59%	Negligible
R19	0.24	0.6%	20.74	52%	Negligible
R20	0.05	0.1%	21.40	53%	Negligible
			PM_{10}		
R1	0.011	0.03%	14.23	35.6%	Negligible
R2	0.020	0.05%	14.35	35.9%	Negligible
R3	0.015	0.04%	14.47	36.2%	Negligible
R4	0.021	0.05%	14.43	36.1%	Negligible
R5	0.014	0.04%	14.43	36.1%	Negligible
R6	0.009	0.02%	14.35	35.9%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.020	0.05%	14.38	35.9%	Negligible
R9	0.013	0.03%	14.18	35.4%	Negligible
R10	0.011	0.03%	14.25	35.6%	Negligible
R11	0.010	0.02%	14.23	35.6%	Negligible

Receptor Point	Annual Mean Concentration				
	PC ($\mu g.m^{-3}$)	% AQS	PEC ($\mu g.m^{-3}$)	% AQS	EPUK / IAQM Impact
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.012	0.03%	14.21	35.5%	Negligible
R15	0.008	0.02%	14.22	35.5%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.001	0.00%	15.00	37.5%	Negligible
R18	0.005	0.01%	16.95	42.4%	Negligible
R19	0.009	0.02%	14.99	37.5%	Negligible
R20	0.002	0.00%	14.86	37.1%	Negligible
$PM_{2.5}$					
R1	0.011	0.05%	9.12	45.6%	Negligible
R2	0.020	0.10%	9.18	45.9%	Negligible
R3	0.015	0.07%	9.23	46.2%	Negligible
R4	0.021	0.10%	9.22	46.1%	Negligible
R5	0.014	0.07%	9.22	46.1%	Negligible
R6	0.009	0.04%	9.16	45.8%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.020	0.10%	9.20	46.0%	Negligible
R9	0.013	0.06%	9.12	45.6%	Negligible
R10	0.011	0.05%	9.15	45.8%	Negligible
R11	0.010	0.05%	9.14	45.7%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.012	0.06%	9.11	45.6%	Negligible
R15	0.008	0.04%	9.11	45.5%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.001	0.01%	9.42	47.1%	Negligible
R18	0.005	0.03%	10.00	50.0%	Negligible
R19	0.009	0.04%	9.39	46.9%	Negligible
R20	0.002	0.01%	9.39	47.0%	Negligible
Benzene					
R1	0.040	0.8%	0.97	19.5%	Negligible
R2	0.074	1.5%	1.01	20.2%	Negligible
R3	0.053	1.1%	0.99	19.8%	Negligible
R4	0.075	1.5%	1.01	20.2%	Negligible
R5	0.052	1.0%	0.99	19.7%	Negligible
R6	0.031	0.6%	0.97	19.3%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.074	1.5%	1.01	20.2%	Negligible
R9	0.046	0.9%	0.98	19.6%	Negligible
R10	0.039	0.8%	0.97	19.5%	Negligible
R11	0.036	0.7%	0.96	19.3%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.045	0.9%	0.98	19.6%	Negligible
R15	0.030	0.6%	0.96	19.2%	Negligible
R16	N/A	N/A	N/A	N/A	N/A

Receptor Point	Annual Mean Concentration				
	PC ($\mu g.m^{-3}$)	% AQS	PEC ($\mu g.m^{-3}$)	% AQS	EPUK / IAQM Impact
R17	0.005	0.1%	0.92	18.4%	Negligible
R18	0.019	0.4%	0.95	19.1%	Negligible
R19	0.031	0.6%	0.97	19.3%	Negligible
R20	0.007	0.1%	0.92	18.4%	Negligible
Nitrogen Monoxide					
R1	0.13	0.04%	9.22	3.0%	Negligible
R2	0.23	0.07%	9.32	3.0%	Negligible
R3	0.17	0.05%	9.26	3.0%	Negligible
R4	0.24	0.08%	9.33	3.0%	Negligible
R5	0.17	0.05%	9.26	3.0%	Negligible
R6	0.10	0.03%	9.19	3.0%	Negligible
R7	N/A	N/A	N/A	N/A	N/A
R8	0.24	0.08%	9.33	3.0%	Negligible
R9	0.16	0.05%	9.25	3.0%	Negligible
R10	0.14	0.04%	9.23	3.0%	Negligible
R11	0.12	0.04%	10.17	3.3%	Negligible
R12	N/A	N/A	N/A	N/A	N/A
R13	N/A	N/A	N/A	N/A	N/A
R14	0.14	0.05%	9.23	3.0%	Negligible
R15	0.10	0.03%	10.15	3.3%	Negligible
R16	N/A	N/A	N/A	N/A	N/A
R17	0.06	0.02%	9.15	3.0%	Negligible
R18	0.02	0.01%	8.95	2.9%	Negligible
R19	0.06	0.02%	9.15	3.0%	Negligible
R20	0.10	0.03%	9.19	3.0%	Negligible

Note: Any discrepancies due to rounding. Receptors which are labelled "N/A" are locations where the annual mean AQSs do not apply.

5.8 As shown in Table 5.2, annual mean concentrations (PEC) of NO_2, PM_{10}, $PM_{2.5}$, C_6H_6 and NO are all modelled to be below the relevant annual mean AQSs at all locations of relevant exposure, even with a prolonged grid failure.

5.9 The data in Table 5.2 show that annual mean PCs are mostly estimated to be less than the 1% screening criterion at discrete receptors in the vicinity of the site. Where, in the cases of NO_2 and C_6H_6, the PC was greater than 1% at some receptors, the background concentrations are sufficiently low to screen out significant impacts.

5.10 Emissions associated with a prolonged grid failure would not have an overall significant impact on annual mean concentrations of NO_2, PM_{10}, $PM_{2.5}$, C_6H_6 and NO. Therefore, long-term impacts from a 72-hour prolonged grid failure can be screened out.

Short Term Impacts at Human Receptors

Scenario 1 – Testing and Maintenance

NO_2

5.11 Table 5.3 below shows the predicted impacts of the site's SBGs, with reference to the hourly mean AQS for NO_2.

Table 5.3: Predicted short term percentile mean concentrations of NO_2 (Scenario 1)

Receptor Point	25.86th Percentile Hourly Mean NO_2	
	PC ($\mu g.m^{-3}$)	PC % of AQS
R1	0.00	0.00
R2	0.00	0.00
R3	0.00	0.00
R4	0.00	0.00
R5	0.00	0.00
R6	0.00	0.00
R7	0.00	0.00
R8	0.00	0.00
R9	0.00	0.00
R10	0.00	0.00
R11	0.00	0.00
R12	0.00	0.00
R13	0.00	0.00
R14	0.00	0.00
R15	0.00	0.00
R16	0.00	0.00
R17	0.00	0.00
R18	0.00	0.00
R19	0.00	0.00
R20	0.00	0.00

5.12 The data in Table 5.3 show that the 25.86th percentile process contribution concentration (i.e. the 19th highest concentration in a year, assuming 20 hours of generator operation every year for 20 years) is incremental and well below the EA's 10% screening criterion.

5.13 As such, routine testing and maintenance is not anticipated to have a significant adverse effect on the hourly NO_2 AQS.

Assessing against the AEGL for NO_2

5.14 It is also noted that all concentrations of NO_2 are lower than the US EPA's Acute Exposure Guidance Levels (AEGLs)[5]. The model was run for every hour, with the maximum modelled concentration following 20 hours of routine testing being 642.1 $\mu g.m^{-3}$, at Receptor R9. The AEGL for non-disabling impacts is at 940 $\mu g.m^{-3}$.

5.15 As such, toxicological health effects are not anticipated as a result of the routine testing of the SBGs, and impacts can be considered insignificant.

PM_{10}

5.16 Short-term pollutant concentrations of PM_{10} have been screened out of the assessment, noting that there will not be 35 days' worth of generator operation per year, so exceedances of the short-term AQS is not possible.

C_6H_6, CO, NO and SO_2

5.17 Short-term impacts against the AQSs/ EALs for C_6H_6, CO, NO and SO_2 are presented in Appendix E. CO and SO_2 process contributions remained well below the EA's screening thresholds, so the site can reasonably be considered to have an insignificant effect on short-term CO and SO_2 concentrations. The 10% screening threshold is exceeded for maximum hourly C_6H_6 and NO concentrations, with 99.89th percentile Process Contribution concentrations of 84.5 $\mu g.m^{-3}$ and 1715.3 $\mu g.m^{-3}$ predicted at Receptor R9, respectively. However, with PECs well below the AQS, these process contributions can be considered insignificant.

Scenario 2 – Emergency Operation

5.18 Upon the addition of 72 hours of emergency operation (taking the total annual hours to 92), short-term impacts would be expected to be more likely.

NO_2

5.19 Table 5.4 below shows the predicted impacts of the site's SBGs, with reference to the hourly mean AQS for NO_2.

Table 5.4: Predicted short term percentile mean concentrations of NO_2

Receptor Point	87.35th Percentile Hourly Mean NO_2				
	PC ($\mu g.m^{-3}$)	PC % of AQS	PEC ($\mu g.m^{-3}$)	PC % of (AQS – 2* background)	PEC % of AQS
R1	17.7	9%	57.6	11%	29%
R2	96.8	**48%**	136.8	**60%**	68%
R3	64.8	**32%**	105.0	**41%**	52%
R4	95.8	**48%**	136.0	**60%**	68%
R5	65.4	**33%**	105.4	**41%**	53%
R6	26.8	**13%**	66.8	17%	33%
R7	148.6	**74%**	188.4	**93%**	94%
R8	91.1	**46%**	131.1	**57%**	66%
R9	32.3	**16%**	72.6	**20%**	36%
R10	26.2	**13%**	66.7	16%	33%
R11	42.5	**21%**	83.2	**27%**	42%
R12	0.7	0%	41.4	0%	21%
R13	32.5	**16%**	72.4	**20%**	36%
R14	20.7	**10%**	60.6	13%	30%
R15	6.2	3%	46.2	4%	23%
R16	2.7	1%	43.7	2%	22%
R17	0.1	0%	42.6	0%	21%
R18	21.4	**11%**	68.3	14%	34%
R19	39.5	**20%**	80.5	**25%**	40%
R20	0.1	0%	42.8	0%	21%

Note: Values in **Bold** denote exceedances of EA screening thresholds.

5.20 The data in Table 5.4 show that the hourly percentile mean PC of NO_2 is greater than the 10% screening criterion at 14 of 20 discrete receptors. Furthermore, 10 of these receptors are anticipated to exceed the second screening criterion.

5.21 The 19th highest concentration (PEC) at Receptor R7 (The Allotments) was predicted to be below the short-term AQS of 200 $\mu g.m^{-3}$, by 6%. All other receptor locations are also predicted to be below the 200 $\mu g.m^{-3}$ AQS.

5.22 All locations can reasonably be anticipated to not experience significant short-term NO_2 impacts.

Assessing against the AEGL for NO_2

5.23 It is also noted that all concentrations of NO_2 are lower than the US EPA's Acute Exposure Guidance Levels (AEGLs)[5]. The model was run for every hour, with the maximum modelled concentration following routine testing plus 72 hours of emergency operation being 345.5 $\mu g.m^{-3}$, at Receptor R9. The AEGL for non-disabling impacts is at 940 $\mu g.m^{-3}$.

5.24 As such, toxicological health effects are not anticipated as a result of the SBGs, and impacts can be considered insignificant.

CO

5.25 Predicted impacts of the facility with reference to the 1-hour mean and 8-hour rolling daily maximum mean AQOs for CO are tabulated in Appendix E and summarised below.

5.26 At no location of relevant exposure is a short-term concentration of CO predicted to exceed the relevant AQS.

5.27 The data in Appendix E show that all short-term increases in CO are significantly less than the 10% screening criterion, even when assuming constant operation all year around.

5.28 As such, significant short-term impacts on CO are not anticipated and can be screened out.

PM_{10}

5.29 Short-term pollutant concentrations of PM_{10} have been screened out of the assessment, noting that there will not be 35 days' worth of generator operation per year, so exceedances of the short-term AQS is not possible.

C_6H_6

5.30 Predicted impacts of the facility with reference to the hourly maximum mean EAL for benzene are tabulated in Appendix E and summarised below.

5.31 As with the generator operation for testing and maintenance, the emergency operation of the generators also causes no exceedances of the maximum hourly EAL for C_6H_6 (195 $\mu g.m^{-3}$). The highest predicted process contribution was 90.26 $\mu g.m^{-3}$, 54% below the EAL.

5.32 As such, significant short-term impacts from hydrocarbons (modelled as benzene) are not anticipated and can be screened out.

NO

5.33 Predicted impacts of the facility with reference to the hourly maximum mean EAL for NO is tabulated in Appendix E and summarised below.

5.34 As with the generator operation for testing and maintenance, the emergency operation of the generators also causes no exceedances of the maximum hourly EAL for NO (4,400 $\mu g.m^{-3}$). The highest PC concentration, following routine testing plus 72 hours of emergency operation, was 839 $\mu g.m^{-3}$, 80% below the EAL.

5.35 As such, significant short-term impacts from NO are not anticipated and can be screened out.

SO_2

5.36 Predicted impacts of the facility with reference to the short-term AQSs for SO_2 are tabulated in Appendix E and summarised below.

5.37 As with the generator operation for testing and maintenance, the emergency operation of the generators also causes no exceedances of the short-term AQSs.

5.38 As such, significant short-term impacts from SO_2 are not anticipated and can be screened out.

Air Quality Impacts at Ecological Receptors

5.39 The proposed development's predicted impact on air quality at ecological sites during routine testing and maintenance of the generators, as well as during prolonged 72-hour emergency operation, is presented below.

Annual Mean Air Quality Impacts

5.40 Tables 5.5, 5.6 and 5.7, below, show the modelled impacts on annual mean NO_x NH_3 and SO_2 concentrations, respectively.

Table 5.5: Annual mean NO_x impacts from routine testing and a prolonged grid failure.

Modelled Receptor	Annual Mean NO_X ($\mu g.m^{-3}$)				Potentially Significant
	NO_X	%CL	PEC	%CL	
Testing and Maintenance					
Richmond Park SAC	0.002	0.01%	N/A	N/A	No
Ruislip Woods NNR	0.001	0.00%	N/A	N/A	No
Yeading Meadows LNR	0.008	0.03%	N/A	N/A	No
Minet Country Park SINC	0.089	0.30%	N/A	N/A	No
Yeading Brooks SINC	0.191	0.64%	N/A	N/A	No
Willowtree Park SINC	0.048	0.16%	N/A	N/A	No
St Mary's Wood End SINC	0.006	0.02%	N/A	N/A	No
Havelock Cemetery SINC	0.023	0.08%	N/A	N/A	No
Hortus Cemetery SINC	0.025	0.08%	N/A	N/A	No
Avenue Road Hedge SINC	0.037	0.12%	N/A	N/A	No
Southall Railsides SINC	0.031	0.10%	N/A	N/A	No
Crane Corridor SINC	0.021	0.07%	N/A	N/A	No
London Canals SINC	0.492	1.64%	N/A	N/A	No
Grid Failure					
Richmond Park SAC	0.003	0.01%	N/A	N/A	No
Ruislip Woods NNR	0.003	0.01%	N/A	N/A	No
Yeading Meadows LNR	0.018	0.06%	N/A	N/A	No
Minet Country Park SINC	0.189	0.63%	N/A	N/A	No
Yeading Brooks SINC	0.402	1.34%	N/A	N/A	No
Willowtree Park SINC	0.102	0.34%	N/A	N/A	No
St Mary's Wood End SINC	0.013	0.04%	N/A	N/A	No
Havelock Cemetery SINC	0.048	0.16%	N/A	N/A	No
Hortus Cemetery SINC	0.054	0.18%	N/A	N/A	No

Avenue Road Hedge SINC	0.079	0.26%	N/A	N/A	No
Southall Railsides SINC	0.065	0.22%	N/A	N/A	No
Crane Corridor SINC	0.044	0.15%	N/A	N/A	No
London Canals SINC	1.037	3.46%	N/A	N/A	No

Note: Any discrepancies are due to rounding.

5.41 As shown in Table 5.5, the largest annual mean NO_X concentration increase from process contributions was 1.037 $\mu g.m^{-3}$ (grid failure scenario), which is just 3.46% of the 30 $\mu g.m^{-3}$ critical level.

5.42 As all increases (process contributions) are less than 1% of the critical level at internationally designated sites, and less than 100% of the critical level at locally designated sites, the EA's screening criteria[12] have not been exceeded and all impacts in relation to annual mean NO_X can be considered insignificant.

Table 5.6: Annual mean NH_3 impacts from routine testing and a prolonged grid failure.

Modelled Receptor	Annual Mean NH_3 ($\mu g.m^{-3}$)				Potentially Significant
	NH_3	%CL	PEC	%CL	
Testing and Maintenance					
Richmond Park SAC	0.0001	0.01%	N/A	N/A	No
Ruislip Woods NNR	0.0001	0.01%	N/A	N/A	No
Yeading Meadows LNR	0.0004	0.04%	N/A	N/A	No
Minet Country Park SINC	0.0043	0.43%	N/A	N/A	No
Yeading Brooks SINC	0.0090	0.90%	N/A	N/A	No
Willowtree Park SINC	0.0023	0.23%	N/A	N/A	No
St Mary's Wood End SINC	0.0003	0.03%	N/A	N/A	No
Havelock Cemetery SINC	0.0011	0.11%	N/A	N/A	No
Hortus Cemetery SINC	0.0012	0.12%	N/A	N/A	No
Avenue Road Hedge SINC	0.0018	0.18%	N/A	N/A	No
Southall Railsides SINC	0.0015	0.15%	N/A	N/A	No
Crane Corridor SINC	0.0010	0.10%	N/A	N/A	No
London Canals SINC	0.1071	10.71%	N/A	N/A	No
Grid Failure					
Richmond Park SAC	0.0003	0.03%	N/A	N/A	No
Ruislip Woods NNR	0.0003	0.03%	N/A	N/A	No
Yeading Meadows LNR	0.0018	0.18%	N/A	N/A	No
Minet Country Park SINC	0.0196	1.96%	N/A	N/A	No
Yeading Brooks SINC	0.0416	4.16%	N/A	N/A	No
Willowtree Park SINC	0.0106	1.06%	N/A	N/A	No
St Mary's Wood End SINC	0.0014	0.14%	N/A	N/A	No
Havelock Cemetery SINC	0.0050	0.50%	N/A	N/A	No
Hortus Cemetery SINC	0.0056	0.56%	N/A	N/A	No
Avenue Road Hedge SINC	0.0081	0.81%	N/A	N/A	No

Southall Railsides SINC	0.0068	0.68%	N/A	N/A	No
Crane Corridor SINC	0.0045	0.45%	N/A	N/A	No
London Canals SINC	0.0233	2.33%	N/A	N/A	No

Note: Any discrepancies are due to rounding.

5.43 As shown in Table 5.6, the largest annual mean NH_3 concentration increase from process contributions was 0.1071 µg.m^{-3} (grid failure scenario), which is 10.71% of the 1 µg.m^{-3} critical level (assuming the habitat includes lichens / bryophytes).

5.44 As all increases (process contributions) are less than 1% of the critical level at internationally designated sites, and less than 100% of the critical level at locally designated sites, the EA's screening criteria[12] have not been exceeded and all impacts in relation to annual mean NH_3 can be considered insignificant.

Table 5.7: Annual mean SO_2 impacts from routine testing and a prolonged grid failure.

Modelled Receptor	Annual Mean NH_3 (µg.m^{-3})				Potentially Significant
	SO_2	%CL	PEC	%CL	
Testing and Maintenance					
Richmond Park SAC	0.00000	0.0000%	N/A	N/A	No
Ruislip Woods NNR	0.00000	0.0000%	N/A	N/A	No
Yeading Meadows LNR	0.00002	0.0002%	N/A	N/A	No
Minet Country Park SINC	0.00018	0.0018%	N/A	N/A	No
Yeading Brooks SINC	0.00036	0.0036%	N/A	N/A	No
Willowtree Park SINC	0.00009	0.0009%	N/A	N/A	No
St Mary's Wood End SINC	0.00001	0.0001%	N/A	N/A	No
Havelock Cemetery SINC	0.00004	0.0004%	N/A	N/A	No
Hortus Cemetery SINC	0.00005	0.0005%	N/A	N/A	No
Avenue Road Hedge SINC	0.00007	0.0007%	N/A	N/A	No
Southall Railsides SINC	0.00006	0.0006%	N/A	N/A	No
Crane Corridor SINC	0.00004	0.0004%	N/A	N/A	No
London Canals SINC	0.00091	0.0091%	N/A	N/A	No
Grid Failure					
Richmond Park SAC	0.00001	0.0001%	N/A	N/A	No
Ruislip Woods NNR	0.00001	0.0001%	N/A	N/A	No
Yeading Meadows LNR	0.00008	0.0008%	N/A	N/A	No
Minet Country Park SINC	0.00082	0.0082%	N/A	N/A	No
Yeading Brooks SINC	0.00165	0.0165%	N/A	N/A	No
Willowtree Park SINC	0.00043	0.0043%	N/A	N/A	No
St Mary's Wood End SINC	0.00006	0.0006%	N/A	N/A	No
Havelock Cemetery SINC	0.00020	0.0020%	N/A	N/A	No
Hortus Cemetery SINC	0.00022	0.0022%	N/A	N/A	No
Avenue Road Hedge SINC	0.00033	0.0033%	N/A	N/A	No
Southall Railsides SINC	0.00027	0.0027%	N/A	N/A	No

Crane Corridor SINC	0.00019	0.0019%	N/A	N/A	No
London Canals SINC	0.00418	0.0418%	N/A	N/A	No

Note: Any discrepancies are due to rounding.

5.45 As shown in Table 5.7, the largest annual mean SO_2 concentration increase from process contributions was 0.00418 $\mu g.m^{-3}$ (grid failure scenario), which is just 0.418% of the 10 $\mu g.m^{-3}$ critical level (assuming the habitat includes lichens / bryophytes).

5.46 As all increases (process contributions) are less than 1% of the critical level at internationally designated sites, and less than 100% of the critical level at locally designated sites, the EA's screening criteria[12] have not been exceeded and all impacts in relation to annual mean SO_2 can be considered insignificant.

Short Term Air Quality Impacts

5.47 Short-term impacts for NO_X are provided in Table 5.8, below, assessed against the maximum daily critical level of 200 $\mu g.m^{-3}$.

Table 5.8: 24-hour maximum NO_x impacts from routine testing and a prolonged grid failure.

Modelled Receptor	Maximum 24-Hour NO_X ($\mu g.m^{-3}$)		Potentially Significant
	NO_X	%CL	
Testing and Maintenance			
Richmond Park SAC	0.24	0.1%	No
Ruislip Woods NNR	0.12	0.1%	No
Yeading Meadows LNR	0.98	0.5%	No
Minet Country Park SINC	8.65	4.3%	No
Yeading Brooks SINC	24.06	12.0%	No
Willowtree Park SINC	2.55	1.3%	No
St Mary's Wood End SINC	1.35	0.7%	No
Havelock Cemetery SINC	2.46	1.2%	No
Hortus Cemetery SINC	2.50	1.2%	No
Avenue Road Hedge SINC	2.77	1.4%	No
Southall Railsides SINC	2.57	1.3%	No
Crane Corridor SINC	2.56	1.3%	No
London Canals SINC	24.86	12.4%	No
Grid Failure			
Richmond Park SAC	3.3	1.6%	No
Ruislip Woods NNR	2.3	1.2%	No
Yeading Meadows LNR	17.2	8.6%	No
Minet Country Park SINC	133.2	66.6%	No
Yeading Brooks SINC	345.2	172.6%	Yes
Willowtree Park SINC	42.0	21.0%	No
St Mary's Wood End SINC	18.5	9.3%	No
Havelock Cemetery SINC	38.3	19.2%	No
Hortus Cemetery SINC	38.2	19.1%	No
Avenue Road Hedge SINC	38.3	19.1%	No

Modelled Receptor	Maximum 24-Hour NO_X ($\mu g.m^{-3}$)		Potentially Significant
	NO_X	%CL	
Southall Railsides SINC	33.9	16.9%	No
Crane Corridor SINC	36.0	18.0%	No
London Canals SINC	342.5	171.2%	Yes

Note: Any discrepancies are due to rounding.

5.48 As shown in Table 5.8, maximum 24-hour NO_x concentrations are modelled to be below the critical level at each ecological site during testing and maintenance. However, if a prolonged 72-hour grid failure were to occur multiple times over a 20-year period, results suggest that there would be a possibility of an exceedance at the Yeading Brooks SINC and London Canals SINC, which are located directly to the east of the permit site.

5.49 All other increases are less than 10% of the critical level at internationally designated sites, and less than 100% of the critical level at locally designated sites, so all other impacts in relation to daily maximum NO_x can be considered insignificant.

Deposition

5.50 Tables 5.9 and 5.10, below, show modelled impacts on nitrogen and acid deposition, respectively. Nitrogen deposition and acid deposition considers the cumulative contributions of NO_X and NH_3.

Table 5.9: Nitrogen deposition impacts from routine testing and a prolonged grid failure.

Modelled Receptor	Nitrogen deposition (Kg N/ha/yr.)				Potentially Significant
	N Deposition PC	%CL	N Deposition PEC	%CL	
Testing and Maintenance					
Richmond Park SAC	0.001	0.01%	N/A	N/A	No
Ruislip Woods NNR	0.001	0.01%	N/A	N/A	No
Yeading Meadows LNR	0.006	0.06%	N/A	N/A	No
Minet Country Park SINC	0.059	0.59%	N/A	N/A	No
Yeading Brooks SINC	0.125	1.25%	N/A	N/A	No
Willowtree Park SINC	0.032	0.32%	N/A	N/A	No
St Mary's Wood End SINC	0.004	0.04%	N/A	N/A	No
Havelock Cemetery SINC	0.015	0.15%	N/A	N/A	No
Hortus Cemetery SINC	0.017	0.17%	N/A	N/A	No
Avenue Road Hedge SINC	0.025	0.25%	N/A	N/A	No
Southall Railsides SINC	0.020	0.20%	N/A	N/A	No
Crane Corridor SINC	0.014	0.14%	N/A	N/A	No
London Canals SINC	0.323	3.23%	N/A	N/A	No
Grid Failure					

Modelled Receptor	Nitrogen deposition (Kg N/ha/yr.)				Potentially Significant
	N Deposition PC	%CL	N Deposition PEC	%CL	
Richmond Park SAC	0.004	0.04%	N/A	N/A	No
Ruislip Woods NNR	0.003	0.03%	N/A	N/A	No
Yeading Meadows LNR	0.019	0.19%	N/A	N/A	No
Minet Country Park SINC	0.208	2.08%	N/A	N/A	No
Yeading Brooks SINC	0.440	4.40%	N/A	N/A	No
Willowtree Park SINC	0.112	1.12%	N/A	N/A	No
St Mary's Wood End SINC	0.014	0.14%	N/A	N/A	No
Havelock Cemetery SINC	0.053	0.53%	N/A	N/A	No
Hortus Cemetery SINC	0.059	0.59%	N/A	N/A	No
Avenue Road Hedge SINC	0.086	0.86%	N/A	N/A	No
Southall Railsides SINC	0.072	0.72%	N/A	N/A	No
Crane Corridor SINC	0.048	0.48%	N/A	N/A	No
London Canals SINC	1.134	11.34%	N/A	N/A	No

Note: Any discrepancies are due to rounding.

5.51 As shown in Table 5.9, the largest nitrogen deposition increase from process contributions is 1.134 kg $N.Ha^{-1}.Yr^{-1}$ (grid failure scenario), which is 11.34% of the 10 kg $N.Ha^{-1}.Yr^{-1}$ critical load.

5.52 As all increases are less than 1% of the critical load at internationally designated sites, and less than 100% of the critical load at locally designated sites, the EA's screening criteria[12] have not been exceeded and all impacts in relation to nitrogen deposition can be considered insignificant.

Table 5.10: Acid deposition impacts from routine testing and a prolonged grid failure.

Modelled Receptor	Acid deposition (Keq H^+/ha/yr)				Potentially Significant
	Acid Deposition PC	%CL	Acid Deposition PEC	%CL	
Testing and Maintenance					
Richmond Park SAC	0.0001	0.01%	N/A	N/A	No
Ruislip Woods NNR	0.0001	0.01%	N/A	N/A	No
Yeading Meadows LNR	0.0004	0.04%	N/A	N/A	No
Minet Country Park SINC	0.0042	0.42%	N/A	N/A	No
Yeading Brooks SINC	0.0089	0.89%	N/A	N/A	No
Willowtree Park SINC	0.0023	0.23%	N/A	N/A	No
St Mary's Wood End SINC	0.0003	0.01%	N/A	N/A	No
Havelock Cemetery SINC	0.0011	0.05%	N/A	N/A	No
Hortus Cemetery SINC	0.0012	0.12%	N/A	N/A	No

Avenue Road Hedge SINC	0.0017	0.17%	N/A	N/A	No
Southall Railsides SINC	0.0015	0.15%	N/A	N/A	No
Crane Corridor SINC	0.0010	0.05%	N/A	N/A	No
London Canals SINC	0.0230	1.13%	N/A	N/A	No
Grid Failure					
Richmond Park SAC	0.0003	0.03%	N/A	N/A	No
Ruislip Woods NNR	0.0002	0.01%	N/A	N/A	No
Yeading Meadows LNR	0.0014	0.14%	N/A	N/A	No
Minet Country Park SINC	0.0148	1.48%	N/A	N/A	No
Yeading Brooks SINC	0.0313	3.13%	N/A	N/A	No
Willowtree Park SINC	0.0079	0.79%	N/A	N/A	No
St Mary's Wood End SINC	0.0010	0.10%	N/A	N/A	No
Havelock Cemetery SINC	0.0038	0.38%	N/A	N/A	No
Hortus Cemetery SINC	0.0042	0.42%	N/A	N/A	No
Avenue Road Hedge SINC	0.0061	0.61%	N/A	N/A	No
Southall Railsides SINC	0.0051	0.51%	N/A	N/A	No
Crane Corridor SINC	0.0034	0.34%	N/A	N/A	No
London Canals SINC	0.0807	8.07%	N/A	N/A	No

Note: Any discrepancies are due to rounding.

5.53 As shown in Table 5.10, the largest acid deposition increase from process contributions was 0.0807 Keq $H^+.Ha^{-1}.Yr^{-1}$ (grid failure scenario), which is 8.07% of the conservatively assumed 1 Keq $H^+.Ha^{-1}.Yr^{-1}$ critical load for that habitat.

5.54 As all increases are less than 1% of the critical load at internationally designated sites, and less than 100% of the critical load at locally designated sites, the EA's screening criteria[12] have not been exceeded and all impacts in relation to acid deposition can be considered insignificant.

Results Summary and Discussion

5.55 The model results have determined that there will be no significant effects on long-term air quality, with respect to any annual mean AQS/ EAL, Critical Level or Critical Load. Additionally, there will be a less than 5% risk of the generators exceeding any short-term AQS/ EAL/ Critical Level, during routine testing and maintenance. As such, it can reasonably be expected that the generators will not significantly affect local air quality when operating as planned.

5.56 An additional scenario has been considered, whereby the generators run for an additional 72 hours per year (i.e. unplanned emergency operations). Results again determined that there will be a less than 5% risk of the generators exceeding any AQS/ EAL during prolonged generator use. However, there is a risk of the 24-hour NO_X Critical Level being exceeded at the adjacent Yeading Brooks SINC and London Canals SINC. As such, further investigation might be necessary to determine the sensitivity of these locally designated ecological sites to short-term increases in NO_X concentrations. If the site is identified as being vulnerable to such NO_X increases, an Air Quality Management Plan will be implemented to address and mitigate the risks associated with unlikely prolonged grid failure events.

6. CONCLUSIONS

6.1 Phlorum Ltd has been commissioned by Black & White Engineering Ltd to undertake an air quality assessment (AQA) to support the permit application to operate the Colt Lon4 Data Centre Emergency Back-up Generation Facility.

6.2 A dispersion modelling assessment of the 44 No. standby generators was undertaken. Concentrations of NO_2, PM, CO, C_6H_6, NO and SO_2 were predicted at selected human receptors using a detailed dispersion model and compared with the relevant long and short-term AQSs. Concentrations of NO_x, NH_3 and SO_2 were predicted at selected ecological receptors.

6.3 Long term impacts from the generators were predicted to be insignificant during testing and maintenance and a prolonged grid failure at all relevant modelled receptor locations when assessed against all relevant long-term UK Air Quality Standards, Acute Exposure Guideline Levels, Critical Levels and Critical Loads. Short term impacts were also found to be insignificant during testing and maintenance operations. Exceedances of the short-term NO_X Critical Level were predicted as a result of prolonged 72-hour grid failure events, at the adjacent Yeading Brooks and London Canals local wildlife sites.

6.4 Prolonged 72-hour grid failure events are considered to be extremely rare events and therefore do not reflect the likely impacts from the installation. To address and mitigate the risks associated with a prolonged grid failure, an Air Quality Management Plan shall be implemented.

Figures

Figure 1: Site Location Plan

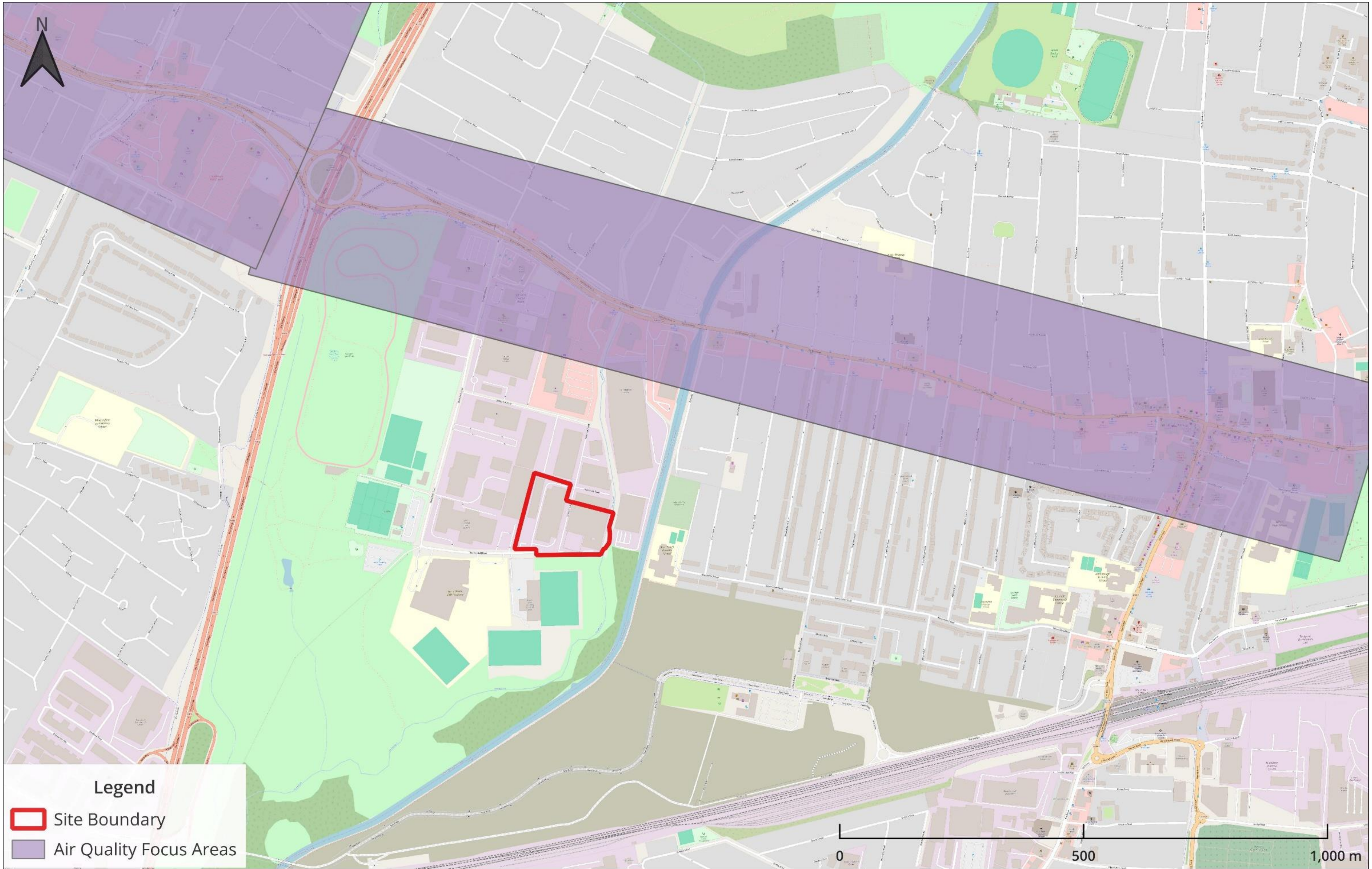

Figure 1: Site Location Plan

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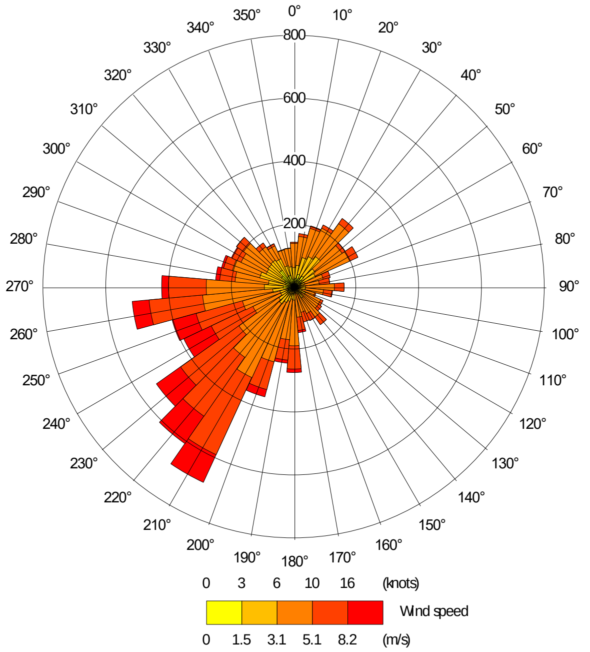
Figure 2: Heathrow Airport Wind Roses (2015 – 2019)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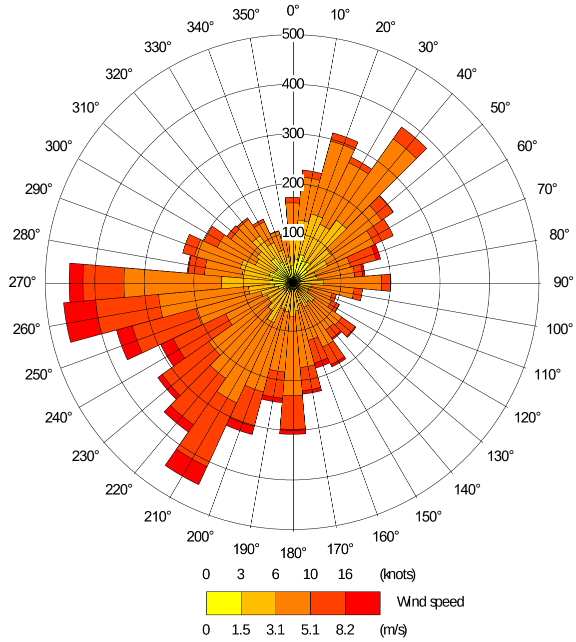
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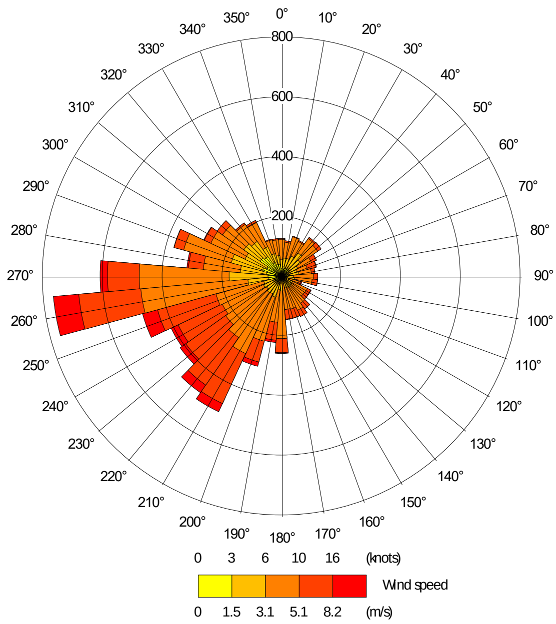
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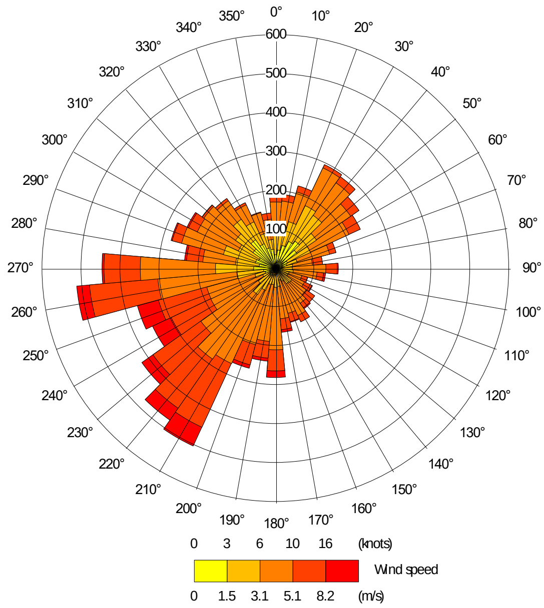
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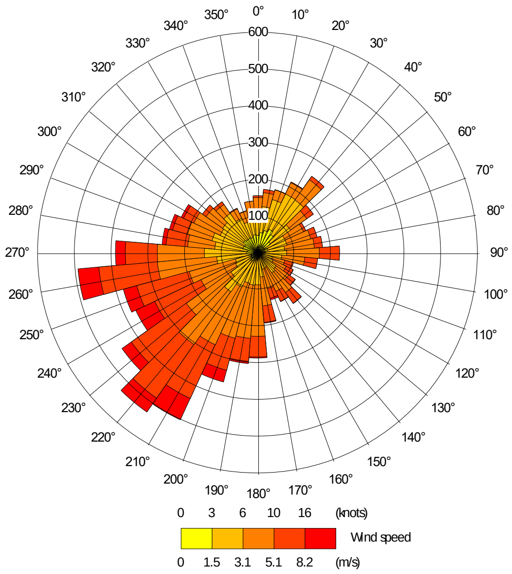
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Figure 3: LAEI NO_2 Concentration Contours (2025)

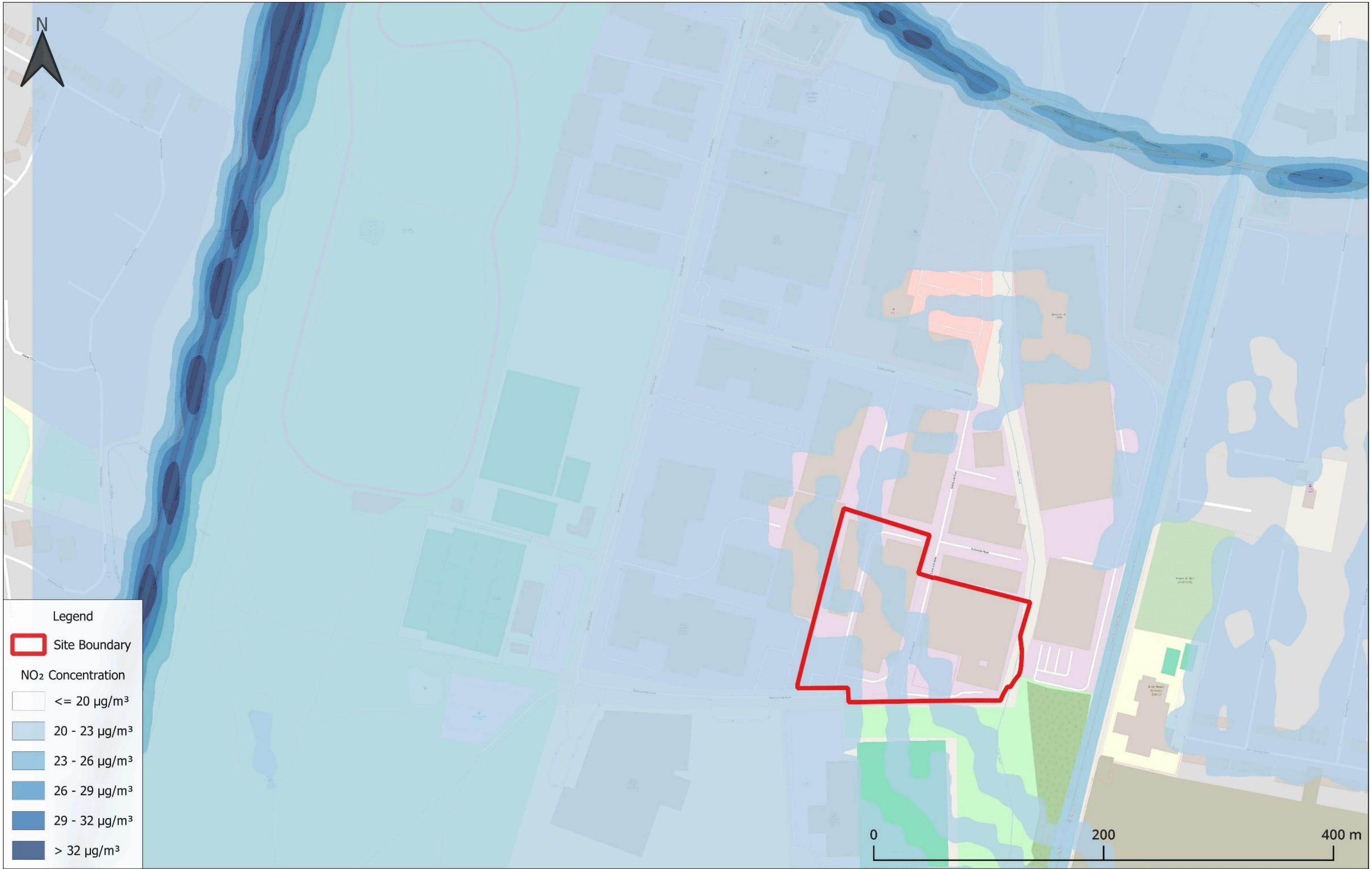

Figure 3: LAEI NO_2 Concentration Contours (2025)

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Figure 4: LAEI PM_{10} Concentration Contours (2025)

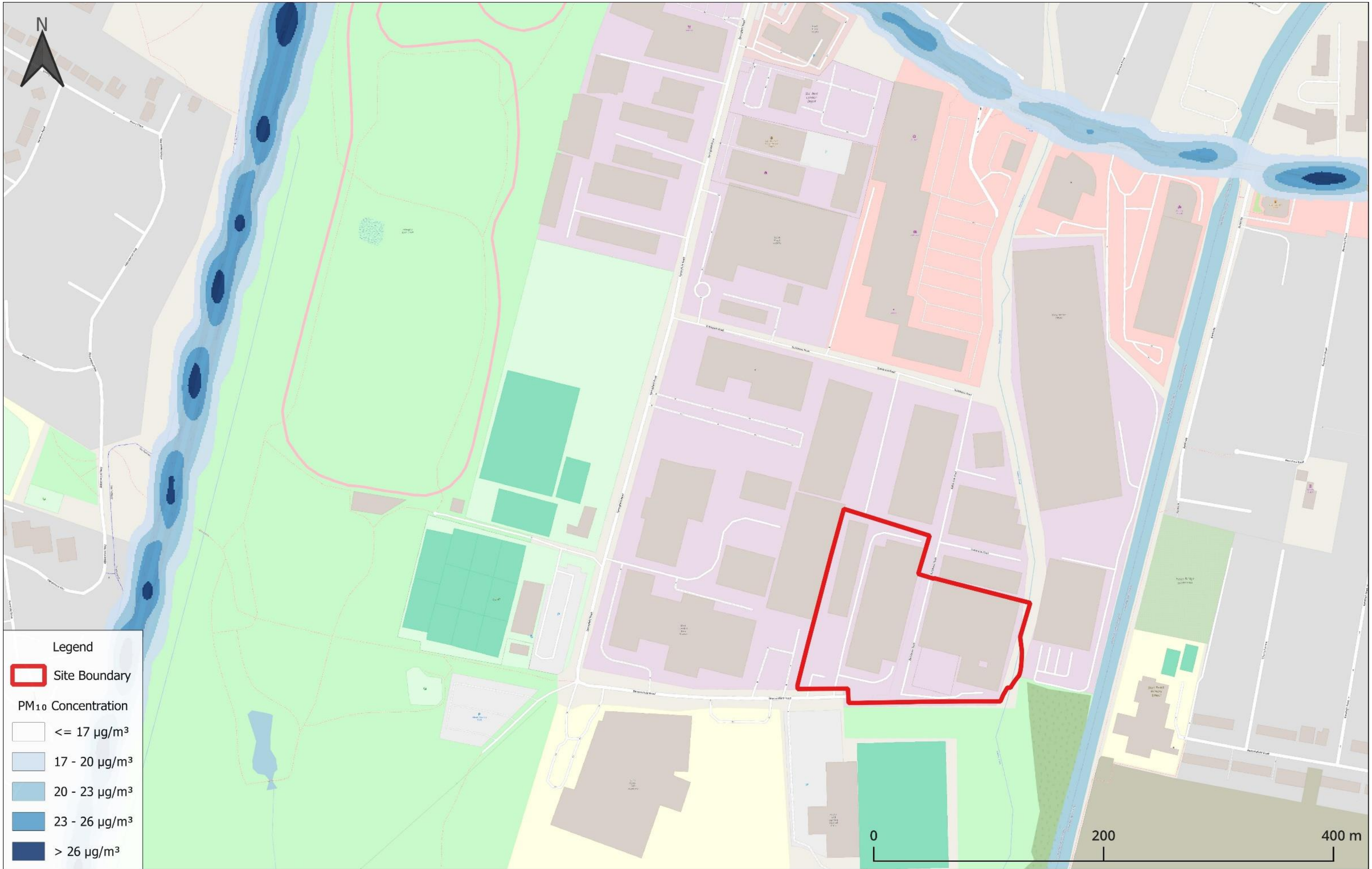

Figure 4: LAEI PM_{10} Concentration Contours (2025)

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Figure 5: LAEI $PM_{2.5}$ Concentration Contours (2025)

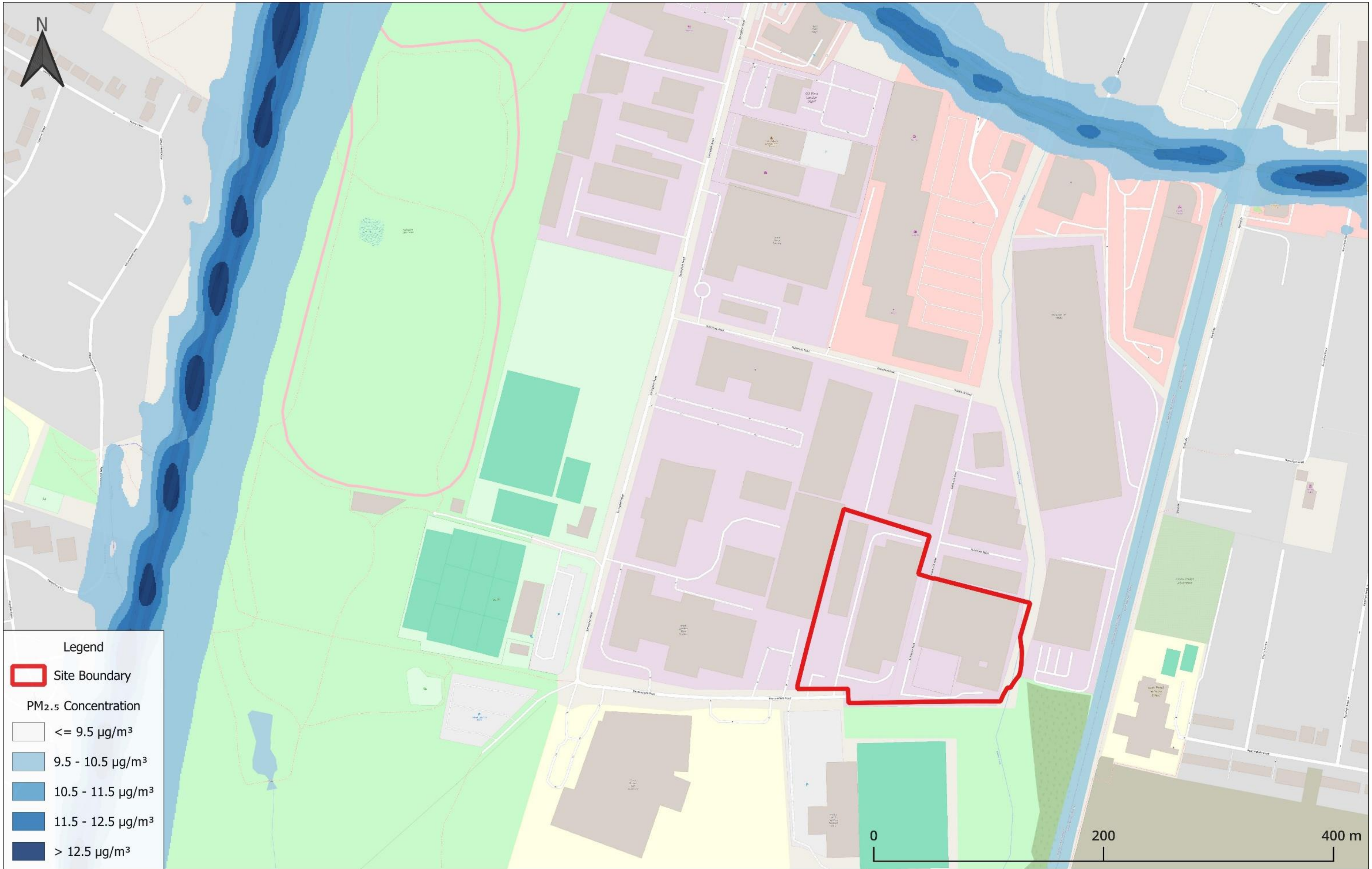

Figure 5: LAEI $PM_{2.5}$ Concentration Contours (2025)

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Figure 6: Model Domain

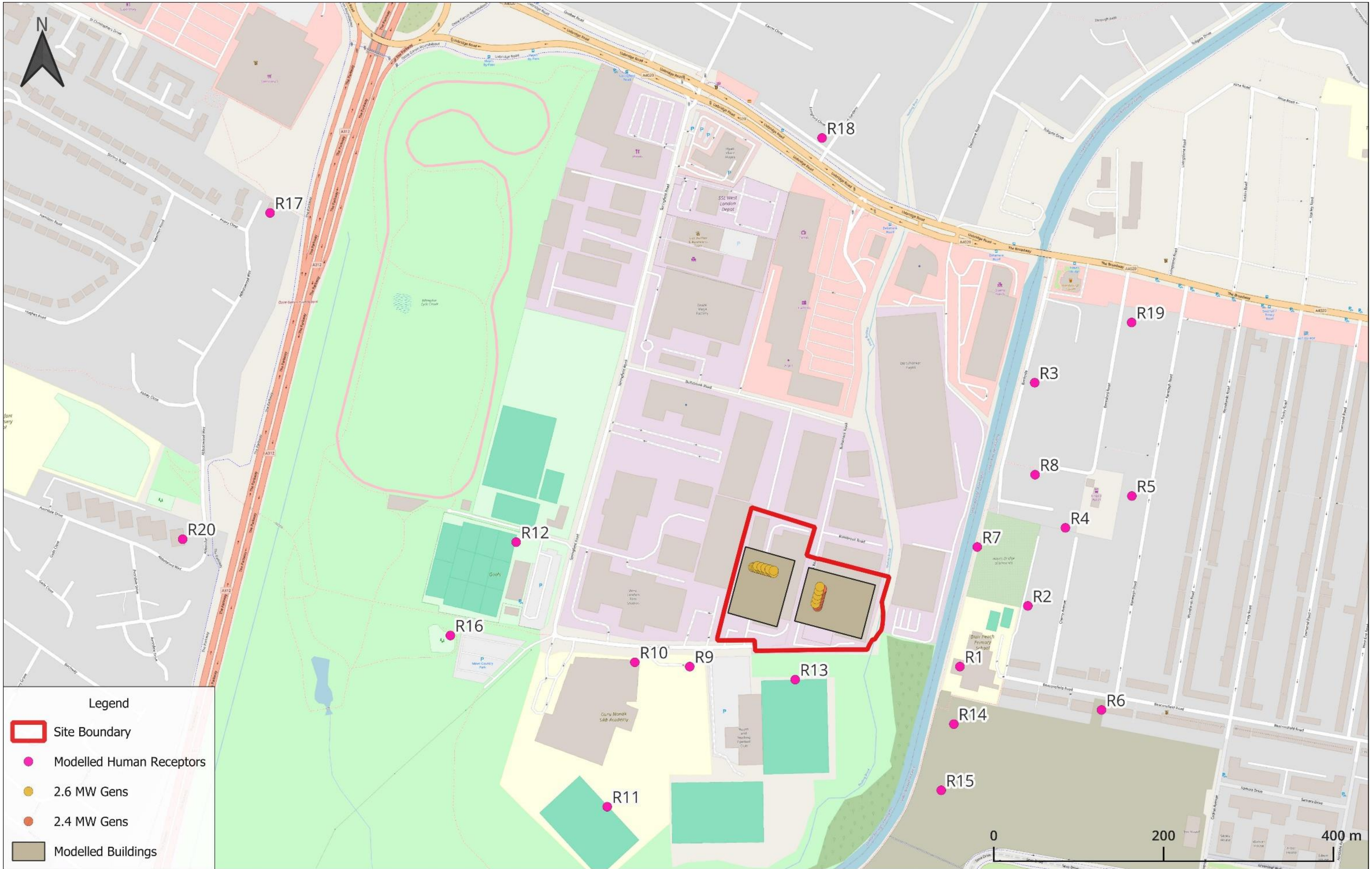

Figure 6: Model Domain

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Figure 7: Annual Mean NO_2 Process Contribution – Testing and Maintenance (1.5m)

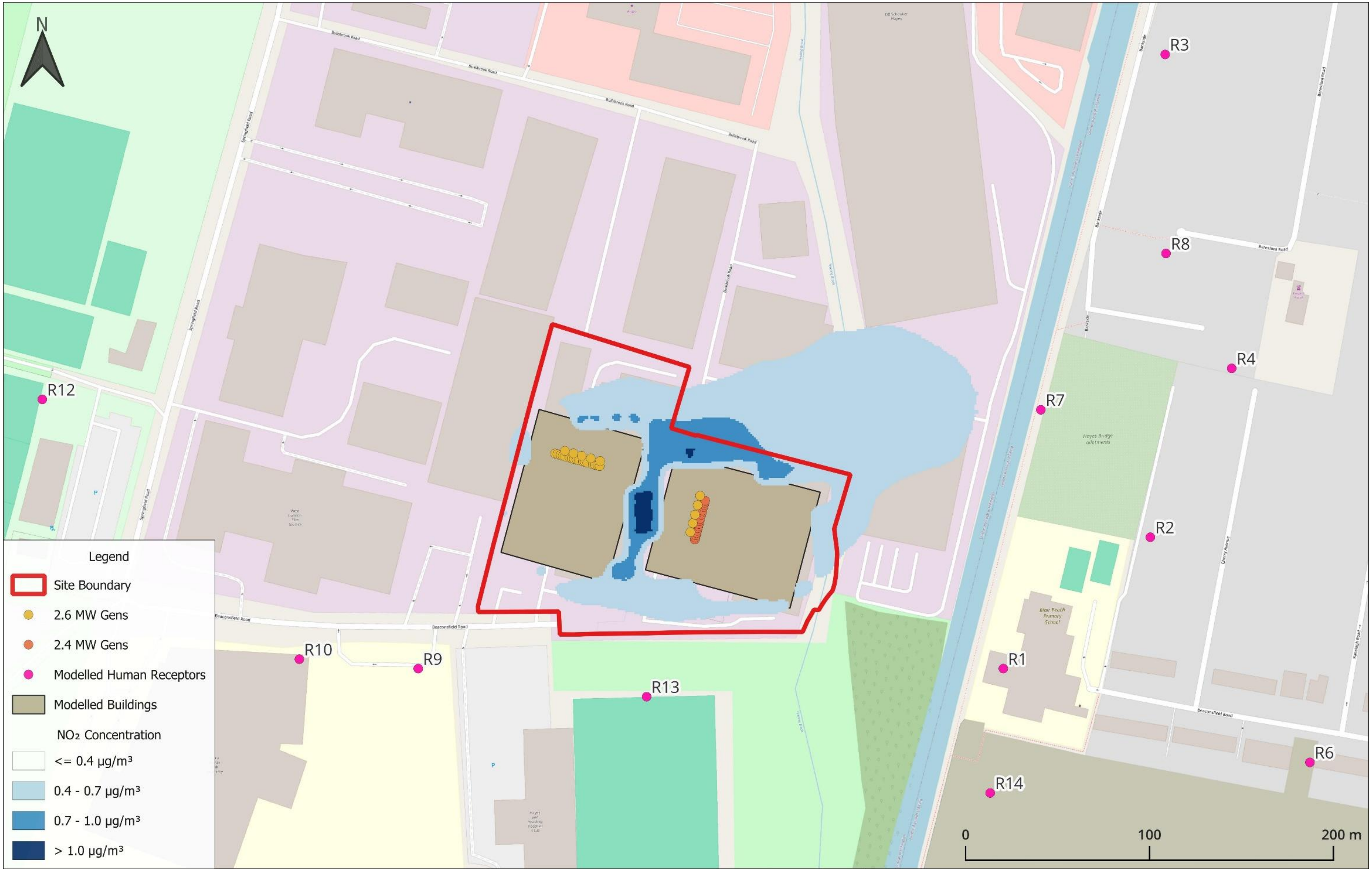

Figure 7: Annual Mean NO_2 Process Concentration - Routine Testing

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Figure 8: Annual Mean NO_2 Process Contribution – With Emergency Operation (1.5m)

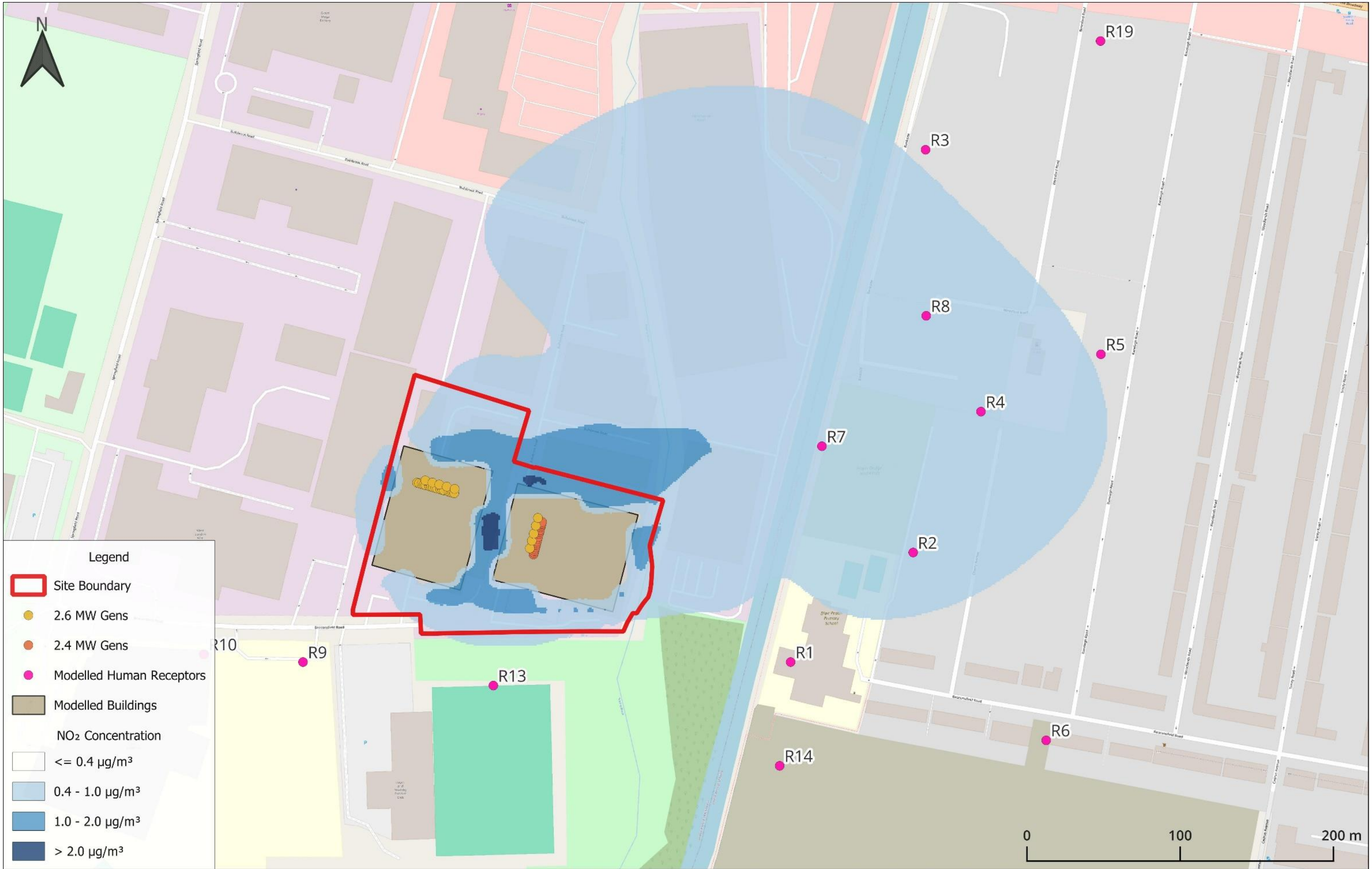

Figure 8: Annual Mean NO_2 Process Concentration - Emergency Operation

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Figure 9: Hourly Mean NO_2 Process Contribution – Testing and Maintenance (1.5m)

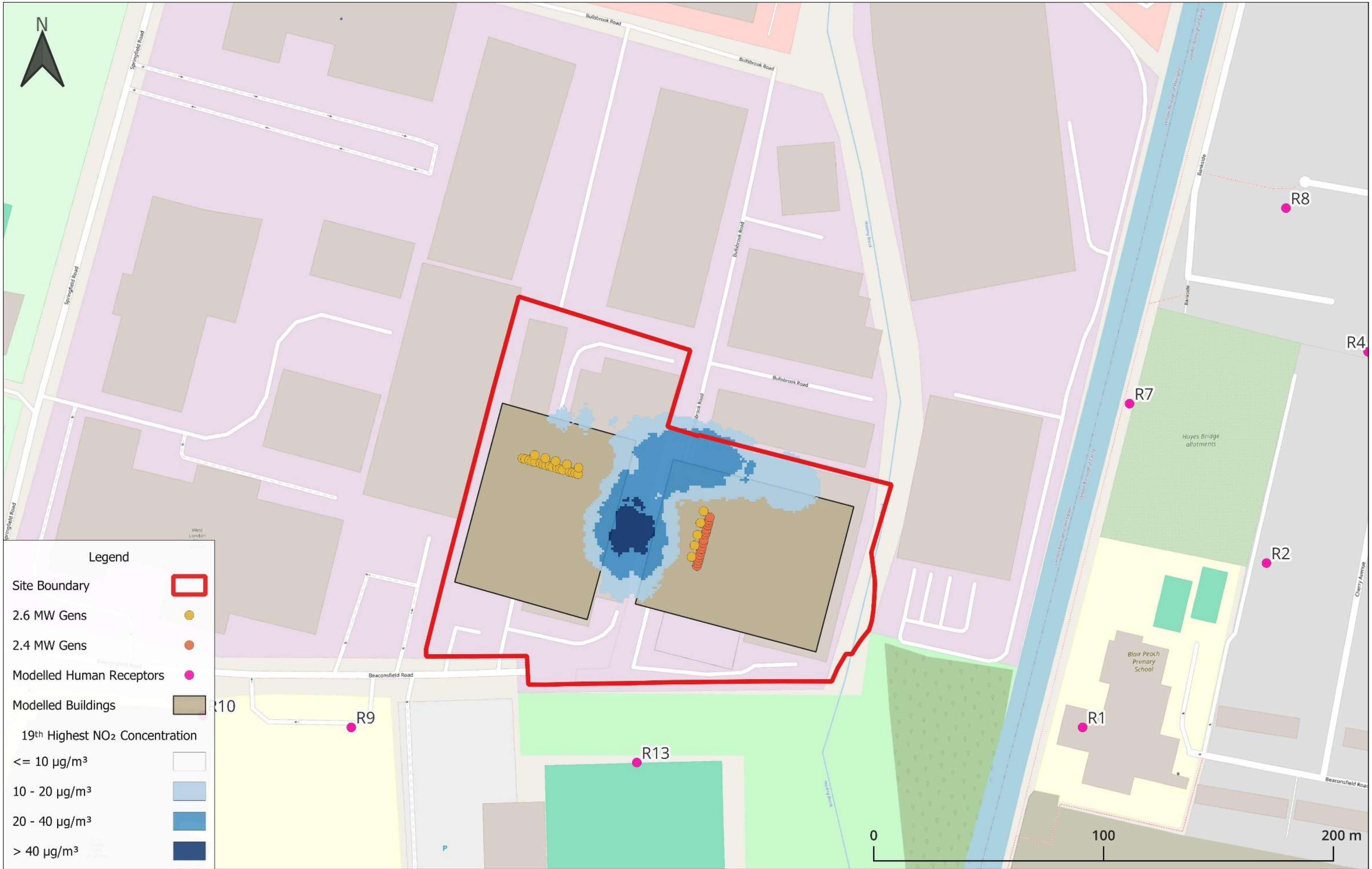

Figure 9: Hourly Mean NO_2 Process Concentration - Routine Testing

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Figure 10: Hourly Mean NO_2 Process Contribution – With Emergency Operation (1.5m)

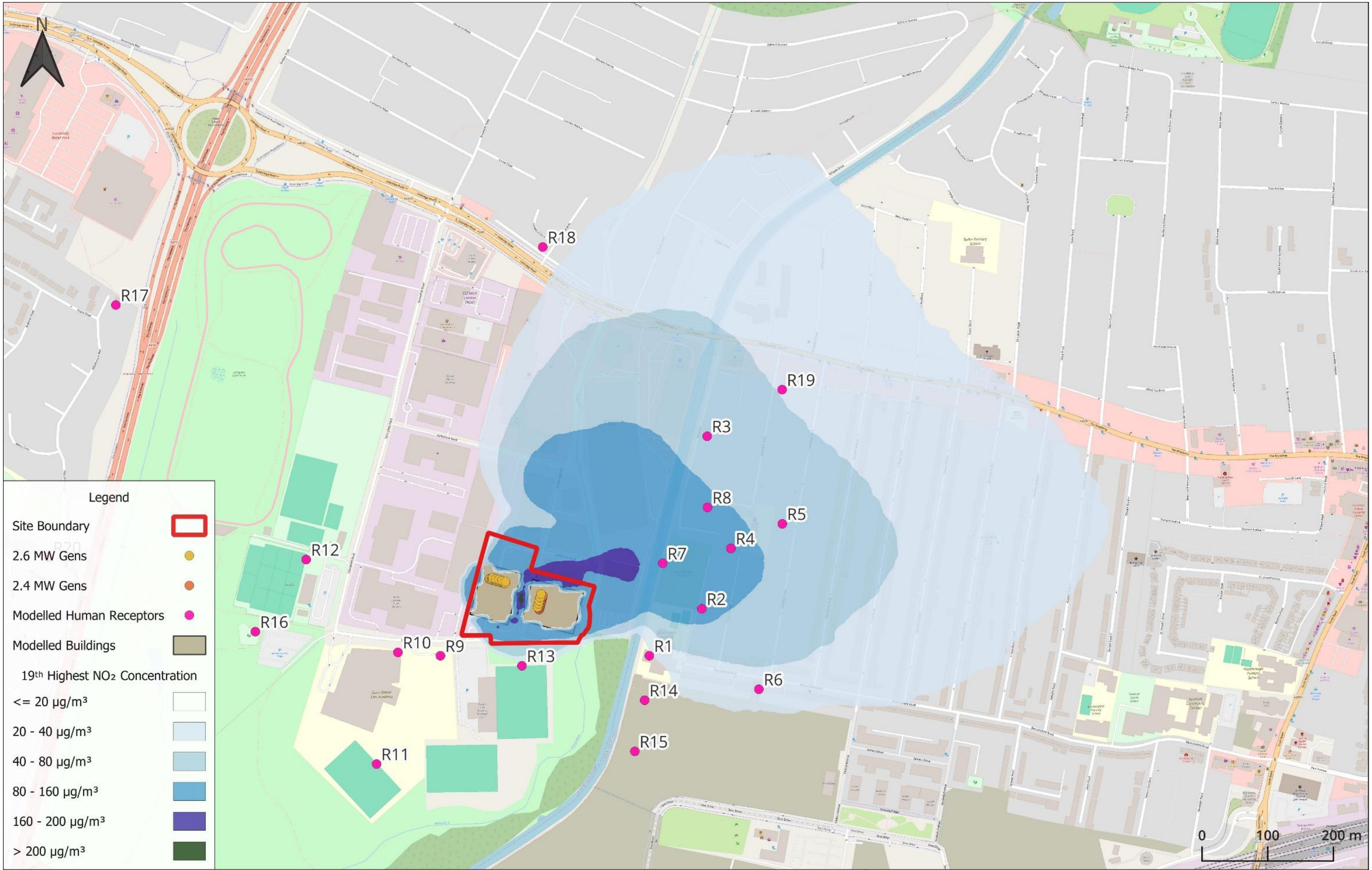

Figure 10: Hourly Mean NO_2 Process Concentration - Emergency Operation

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Figure 11: Daily Max NOx Process Contribution – With Emergency Operation (1.5m)

Figure 11: Daily Max NO_2 Process Concentration - Emergency Operation

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Appendices

Appendix A: EPUK & IAQM Impact Descriptors

Table A.1: IAQM Impact Descriptors for Individual Receptors (Based on Table 6.3 from the EPUK & IAQM guidance[11])

Long-term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	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 of AQAL	Moderate	Substantial	Substantial	Substantial

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 (see Chapter 7). 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.

Appendix B: Model Input Data

Table B.1 Modelled Buildings

Building	Centroid		Height (m)	Length(m)	Width(m)	Angle(degrees)
	X	Y				
Lon4 Building 1	511456.8	180199.3	38.15	80	60	15
Lon4 Building 2	511543.6	180180.1	36.17	81	65	284

Table B.2 Stack Locations

Stack	Type	X	Y	Height above ground (m)
2.4MW 1	*MTU 20V4000 G74F*	511522.8903	180175.5588	38.6
2.4MW 2	*MTU 20V4000 G74F*	511523.1876	180176.7073	38.6
2.4MW 3	*MTU 20V4000 G74F*	511523.4984	180177.8828	38.6
2.4MW 4	*MTU 20V4000 G74F*	511523.8362	180179.126	38.6
2.4MW 5	*MTU 20V4000 G74F*	511524.1469	180180.288	38.6
2.4MW 6	*MTU 20V4000 G74F*	511524.5118	180181.7068	38.6
2.4MW 7	*MTU 20V4000 G74F*	511524.8226	180182.8553	38.6
2.4MW 8	*MTU 20V4000 G74F*	511525.1198	180184.0174	38.6
2.4MW 9	*MTU 20V4000 G74F*	511525.5522	180185.5983	38.6
2.4MW 10	*MTU 20V4000 G74F*	511525.836	180186.7874	38.6
2.4MW 11	*MTU 20V4000 G74F*	511526.471	180189.0845	38.6
2.4MW 12	*MTU 20V4000 G74F*	511526.7953	180190.2465	38.6
2.4MW 13	*MTU 20V4000 G74F*	511527.0656	180191.3815	38.6
2.4MW 14	*MTU 20V4000 G74F*	511527.579	180193.2057	38.6
2.4MW 15	*MTU 20V4000 G74F*	511527.8898	180194.3947	38.6
2.4MW 16	*MTU 20V4000 G74F*	511528.1736	180195.5568	38.6
2.4MW 17	*MTU 20V4000 G74F*	511528.4979	180196.7324	38.6
2.6MW 20	*MTU 20V4000 G94F*	511520.5054	180179.5584	38.6
2.6MW 21	*MTU 20V4000 G94F*	511521.8296	180184.5038	38.6
2.6MW 22	*MTU 20V4000 G94F*	511523.0592	180189.0574	38.6
2.6MW 23	*MTU 20V4000 G94F*	511524.4239	180194.2731	38.6
2.6MW 24	*MTU 20V4000 G94F*	511525.8022	180199.3537	38.6
2.6MW 25	*MTU 20V4000 G94F*	511446.972	180222.3245	38.6
2.6MW 26	*MTU 20V4000 G94F*	511448.2152	180222.0002	38.6
2.6MW 27	*MTU 20V4000 G94F*	511449.8907	180221.4867	38.6
2.6MW 28	*MTU 20V4000 G94F*	511451.1338	180221.1354	38.6
2.6MW 29	*MTU 20V4000 G94F*	511452.3499	180220.7841	38.6
2.6MW 30	*MTU 20V4000 G94F*	511454.8361	180220.1355	38.6
2.6MW 31	*MTU 20V4000 G94F*	511455.9982	180219.7571	38.6
2.6MW 32	*MTU 20V4000 G94F*	511457.2143	180219.4058	38.6
2.6MW 33	*MTU 20V4000 G94F*	511458.7817	180218.9734	38.6
2.6MW 34	*MTU 20V4000 G94F*	511459.9708	180218.6491	38.6
2.6MW 35	*MTU 20V4000 G94F*	511462.0787	180218.0276	38.6
2.6MW 36	*MTU 20V4000 G94F*	511463.2678	180217.7033	38.6
2.6MW 37	*MTU 20V4000 G94F*	511464.4568	180217.379	38.6
2.6MW 38	*MTU 20V4000 G94F*	511467.5376	180216.5142	38.6
2.6MW 39	*MTU 20V4000 G94F*	511468.7807	180216.1359	38.6
2.6MW 40	*MTU 20V4000 G94F*	511469.9968	180215.8656	38.6
2.6MW 41	*MTU 20V4000 G94F*	511471.1589	180215.5143	38.6
2.6MW 42	*MTU 20V4000 G94F*	511452.2688	180223.7838	38.6

Stack	Type	X	Y	Height above ground (m)
2.6MW 43	*MTU 20V4000 G94F*	511456.944	180222.4055	38.6
2.6MW 44	*MTU 20V4000 G94F*	511461.4301	180221.1354	38.6
2.6MW 45	*MTU 20V4000 G94F*	511466.3215	180219.7571	38.6
2.6MW 46	*MTU 20V4000 G94F*	511471.4291	180218.2708	38.6

Appendix C: Generator Specification Sheets

Specifications for *MTU 20V4000 G74F*

Revision Change index					

Motordaten
engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G74F				
Application group	3D				
Emission Stage/Optimisation	NEA-Singapure für ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	measured				

Motor Rohemissionen*
*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/Pcycle)	[-]	1	0,75	0,50	0,25	0,10			
Power	[kW]	2670	2002	1335	667	267			
Speed (n/nN)	[-]	1	1	1	1	1			
Speed	[rpm]	1500	1500	1500	1500	1500			
Exhaust temperature after turbine	[°C]	528	498	463	366	224			
Exhaust massflow	[kg/h]	12872	11019	8525	5859	4658			
Exhaust back pressure (static)	[mbar]	84	58	30	12	6			
NOx	[g/kWh]	7,7	5,5	4,3	4,9	9,5			
	[mg/mN³]	2232	1390	941	762	735			
CO	[g/kWh]	0,5	0,6	0,8	1,5	4,3			
	[mg/mN³]	136	148	168	240	331			
HC	[g/kWh]	0,15	0,19	0,27	0,58	2,00			
	[mg/mN³]	44	47	60	91	154			
O2	[%]	8,0	9,3	10,5	12,9	16,1			
Particulate measured	[g/kWh]	0,04	0,05	0,10	0,24	0,77			
	[mg/mN³]	12	12	21	38	59			
Particulate calculated	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-			
FSN	[-]	0,2	0,3	0,7	0,8	0,1			
NO/NO2**	[-]	-	-	-	-	-			
CO2	[g/kWh]	618,7	638,3	669,8	717,2	871,2			
	[mg/mN³]	181916	163142	146414	112329	67288			
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,003			
	[mg/mN³]	0,6	0,5	0,5	0,4	0,2			
CH2O	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			

* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.
These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.
Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.
All data applies to an engine in new condition and were measured after combined exhaust streams. Over extended operating time deterioration may occur which might have an impact on emission. Exhaust temperature depends on engine ambient conditions.

** No standard test. To be measured on demand.

MTU Friedrichshafen GmbH

WORD	Datum/ Date	Name
Erstell. Drawn	13.02.2018 13:53:27	lini
Bearb. Change	17.07.2018 14:16:48	zwiskep
Inhalt Content	26.06.2018	Lenhof
Gepr. Checked		

Projekt-/Auftrags-Nr. Project/Order No.
Verwendbar f.Typ Applicable to Model
Format/Size A3
Material-Nr./Material No. EDS 4000 1273
Benennung/ Title
EMISSIONSDATENBLATT
EMISSION DATA SHEET
Motortyp / Engine Type 20V4000G74F
Zeichnungs-Nr./Drawing No. ZNG00013330
Blatt/ Sheet 2 von/of 8
Aenderungsbeschreibung/Description of Revision
Freigabe
Kommt von/Frequency
Beschreibung/Description

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-3		In Arbeit

Revision Change index					

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G74F				
Application group	3D				
Emission Stage/Optimisation	NEA-Singapure für ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	5				
mg/mN³ values base on residual oxygen value of [%]	5				

Motor Rohemissionen*

*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/Pcycle)	[-]	1	0,75	0,50	0,25	0,10			
Power	[kW]	2670	2002	1335	667	267			
Speed (n/nN)	[-]	1	1	1	1	1			
Speed	[rpm]	1500	1500	1500	1500	1500			
Exhaust temperature after turbine	[°C]	528	498	463	366	224			
Exhaust massflow	[kg/h]	12872	11019	8525	5859	4658			
Exhaust back pressure (static)	[mbar]	84	58	30	12	6			
NOx	[g/kWh]	7,7	5,5	4,3	4,9	9,5			
	[mg/mN³]	2751	1907	1435	1507	2390			
CO	[g/kWh]	0,5	0,6	0,8	1,5	4,3			
	[mg/mN³]	168	203	256	475	1077			
HC	[g/kWh]	0,15	0,19	0,27	0,58	2,00			
	[mg/mN³]	54	65	91	180	500			
O2	[%]	8,0	9,3	10,5	12,9	16,1			
Particulate measured	[g/kWh]	0,04	0,05	0,10	0,24	0,77			
	[mg/mN³]	15	16	32	75	193			
Particulate calculated	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-			
FSN	[-]	0,2	0,3	0,7	0,8	0,1			
NO/NO2**	[-]	-	-	-	-	-			
CO2	[g/kWh]	618,7	638,3	669,8	717,2	871,2			
	[mg/mN³]	224170	223769	223274	222139	218787			
SO2	[g/kWh]	0,002	0,002	0,002	0,002	0,003			
	[mg/mN³]	0,7	0,7	0,7	0,7	0,7			
CH2O	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			

* Emission data measurement procedures are consistent with the respective emission evaluation process. Noncertified engines are measured to sales data (TVU/TEN) standard conditions.
These boundary conditions might not be representative for detailed dimensioning of exhaust gas aftertreatment, in this case it is recommended to contact the responsible department for more information.
Measurements are subject to variation. The nominal emission data shown is subject to instrumentation, measurement, facility, and engine-to-engine variations.
All data applies to an engine in new condition and were measured after combined exhaust streams. Over extended operating time deterioration may occur which might have an impact on emission. Exhaust temperature depends on engine ambient conditions.

** No standard test. To be measured on demand.

MTU Friedrichshafen GmbH	WORD	Datum/ Date	Name
	Erstell. Drawn	13.02.2018 13:53:27	Ink
	Bearb. Change	17.07.2018 14:18:49	zuiskep
	Inhalt Content	29.06.2018	Lenhof
	Gepr. Checked		

Project-/Auftrags-Nr. Project/Order No.
Verwendbar f.Typ Applicable to Model
Format/Size A3
Material-Nr./Material No. EDS 4000 1273
Benennung/ Title
EMISSIONSDATENBLATT
EMISSION DATA SHEET
Motortyp / Engine Type 20V4000G74F
Zeichnungs-Nr./Drawing No. ZNG00013330
Blatt/ Sheet 5 von/of 8
Beschreibung/Description

Aenderungsbeschreibung/Description of Revision | Kommt von/Frequency
Freigabe

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
-3		In Arbeit

Specifications for *MTU 20V4000 G94F*

Revision Change index	d	g			

Motordaten

engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G94F				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	15 (max. value of DIN EN 590)				
mg/mN³ values base on residual oxygen value of [%]	measured				

Motor Rohemissionen*

*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/Pcycle)	[-]	1	0,75	0,50	0,25	0,10			
Power	[kW]	3090	2317	1545	772	309			
Speed (n/nN)	[-]	1	1	1	1	1			
Speed	[rpm]	1501	1501	1501	1501	1500			
Exhaust temperature after turbine	[°C]	460	427	436	394	262			
Exhaust massflow	[kg/h]	18500	15819	11326	7150	5284			
Exhaust back pressure (total)	[mbar]	52	35	16	5	0			
NOx	[g/kWh]	6,5	5,3	4,8	4,6	9,2			
	[mg/mN³]	1541	1108	918	686	735			
CO	[g/kWh]	0,2	0,3	1,1	1,4	3,2			
	[mg/mN³]	54	58	206	201	251			
HC	[g/kWh]	0,07	0,08	0,10	0,18	0,84			
	[mg/mN³]	16	16	18	27	66			
O2	[%]	10,3	11,5	12,0	13,3	16,0			
Particulate measured	[g/kWh]	0,02	0,02	0,09	0,14	0,06			
	[mg/mN³]	4	5	17	21	5			
Particulate calculated	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-			
FSN	[-]	0,2	0,2	0,7	0,9	0,0			
NO/NO2**	[-]	24,5	20,7	16,0	9,3	6,7			
CO2	[g/kWh]	642,1	655,7	668,8	721,9	867,8			
	[mg/mN³]	149443	132804	125858	106693	68168			
SO2	[g/kWh]	0,006	0,006	0,006	0,007	0,008			
	[mg/mN³]	1,4	1,3	1,2	1,0	0,7			

* Please note that these data are physical and/or technical values only referring to and representing a normative defined operating condition. Any change in operating time and conditions will have impact on these values mentioned above and as well on engine behavior, which have to be reflected and assessed within the complete propulsion system especially in regard to emission compliance and product safety.
These data are representing the contractual agreed scope or will represent, if there is so far no agreed contract, of the MTU engine at the time of delivery.
MTU doesn´t take any responsibility or liability neither out or in connection with the contract or contract to be agreed nor on any other basis
• beyond these specified operating conditions of the engine
• and for any installation/modification of the entire propulsion system by the customer itself or any third party
and the customer will indemnify MTU on first demand for any third party claim out or in connection with this.

** No standard test. To be measured on demand.

MTU Friedrichshafen GmbH	WORD	Datum/ Date	Name	Projekt-Auftrags-Nr. Project/Order No. / Verwendbar f.Typ Applicable to Model — Format/Size A3
	Erstell. Drawn	17.01.2019 13:19:28	Irik	Material-Nr./Material No. EDS 4000 1186
	Bearb. Change	20.02.2019 13:47:31	Irik	
	Inhalt Content	17.01.2019	Lenhof	Benennung/ Title: Emissionsdatenblatt / Emission Data Sheet
	Gepr. Checked			
	Motortyp / Engine Type: 20V4000G94F			

Aenderungsbeschreibung/Description of Revision | Komint von/Frequency
NO/NO2 Verhältnis mit aufgenommen sowie die Fußzeile ausgetauscht

Zeichnungs-Nr./Drawing No. ZNG00005098

Beschreibung/Description NEA Singapore for ORDE

Blatt/ Sheet 2 von/of 8

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
g.1		In Arbeit

Revision / Change index	d	e	f	g	

Motordaten
engine data

	Genset	Marine	O & G	Rail	C & I
Application	x				
Engine model	20V4000G94F				
Application group	3D				
Emission Stage/Optimisation	NEA Singapore for ORDE				
Test cycle	D2				
fuel sulphur content [ppm]	15 (max. value of DIN EN 590)				
mg/mN³ values base on residual oxygen value of [%]	5				

Motor Rohemissionen*
*Engine raw emissions**

Cycle point	[-]	n1	n2	n3	n4	n5	n6	n7	n8
Power (P/Pcycle)	[-]	1	0,75	0,50	0,25	0,10			
Power	[kW]	3090	2317	1545	772	309			
Speed (n/nN)	[-]	1	1	1	1	1			
Speed	[rpm]	1501	1501	1501	1501	1500			
Exhaust temperature after turbine	[°C]	460	427	436	394	262			
Exhaust massflow	[kg/h]	18500	15819	11326	7150	5284			
Exhaust Volumetric Flowrate	[m³/s]	10,6	8,7	6,3	3,8	2,3			
Exhaust back pressure (total)	[mbar]	52	35	16	5	0			
NOx	[g/kWh]	6,5	5,3	4,8	4,6	9,2			
	[g/s]	5,5	3,4	2,1	1,0	0,8			
	[mg/mN³]	2306	1865	1624	1429	2350			
CO	[g/kWh]	0,2	0,3	1,1	1,4	3,2			
	[g/s]	0,2	0,2	0,5	0,3	0,3			
	[mg/mN³]	81	98	365	418	803			
HC	[g/kWh]	0,07	0,08	0,10	0,18	0,84			
	[g/s]	0,06	0,05	0,04	0,04	0,07			
	[mg/mN³]	24	27	32	56	210			
O2	[%]	10,3	11,5	12,0	13,3	16,0			
Particulate measured	[g/kWh]	0,02	0,02	0,09	0,14	0,06			
	[g/s]	0,02	0,01	0,04	0,03	0,01			
	[mg/mN³]	6	8	30	43	15			
Particulate calculated	[g/kWh]	-	-	-	-	-			
	[mg/mN³]	-	-	-	-	-			
Dust (only TA-Luft)	[mg/mN³]	-	-	-	-	-			
FSN	[-]	0,2	0,2	0,7	0,9	0,0			
NO/NO2**	[-]	24,5	20,7	16,0	9,3	6,7			
CO2	[g/kWh]	642,1	655,7	668,8	721,9	867,8			
	[g/s]	551,1	422,0	287,0	154,9	74,4			
	[mg/mN³]	223679	223481	222717	222190	217875			
SO2	[g/kWh]	0,006	0,006	0,006	0,007	0,008			
	[g/s]	0,002	0,002	0,001	0,001	0,000			
	[mg/mN³]	2,2	2,1	2,1	2,1	2,1			

* Please note that these data are physical and/or technical values only referring to and representing a normative defined operating condition. Any change in operating time and conditions will have impact on these values mentioned above and as well on engine behavior, which have to be reflected and assessed within the complete propulsion system especially in regard to emission compliance and product safety.
These data are representing the contractual agreed scope or will represent, if there is so far no agreed contract, of the MTU engine at the time of delivery.
MTU doesn´t take any responsibility or liability neither out or in connection with the contract or contract to be agreed nor on any other basis
• beyond these specified operating conditions of the engine
• and for any installation/modification of the entire propulsion system by the customer itself or any third party
and the customer will indemnify MTU on first demand for any third party claim out or in connection with this.

** No standard test. To be measured on demand.

Aenderungsbeschreibung/Description of Revision — NO/NO2 Verhältnis mit aufgenommen sowie die Fußzeile ausgetauscht
Kommt vor/Frequency

Buchst./Rev. Ltr.	Aenderungs-Nr./Revision Notice No.	Bearbeitungsstatus/Lifecycle
g.1		In Arbeit

MTU
Friedrichshafen GmbH

WORD	Datum/ Date	Name
Erstell. Drawn	17.01.2019 13:19:28	link
Bearb. Change	20.02.2019 13:47:31	link
Inhalt Content	17.01.2019	Lenhof
Gepr. Checked		

Motortyp / Engine Type: **20V4000G94F**

Projekt-Auftrags-Nr. Project/Order No.:
Verwendbar f.Typ Applicable to Model:
Format/Size: **A3**
Material-Nr./Material No.: **EDS 4000 1186**
Benennung/ Title: **Emissionsdatenblatt** / **Emission Data Sheet**
Zeichnungs-Nr./Drawing No.: **ZNG00005098**
Blatt/ Sheet **5** von/of **8**
Beschreibung/Description: NEA Singapore for ORDE

Appendix D: Tabulated 99.79th and 100th Percentile NO_2 results

99.79th Percentile NO_2 Results

Table D.1 below shows the predicted impact of the site's SBGs, with reference to the 99.79th percentile (i.e., the 19th highest hourly NO_2 concentration if all generators ran all hours of the year). The hourly mean AQS for NO_2 is 200 $\mu g.m^{-3}$, not to be exceeded more than 18 times in a year.

Table D.1: Predicted 99.79th percentile concentrations of NO_2 (for comparison with hourly mean AQO)

Receptor Point	99.79th Percentile NO_2			
	PC ($\mu g.m^{-3}$)	PC % of AQS	PEC ($\mu g.m^{-3}$)	PEC % of AQS
R1	210.0	105%	249.9	125%
R2	185.7	93%	225.7	113%
R3	147.2	74%	187.4	94%
R4	164.6	82%	204.7	102%
R5	137.0	68%	177.0	88%
R6	139.5	70%	179.5	90%
R7	206.6	103%	246.5	123%
R8	170.1	85%	210.1	105%
R9	294.6	147%	334.8	167%
R10	227.3	114%	267.8	134%
R11	149.0	74%	189.7	95%
R12	154.6	77%	195.3	98%
R13	169.6	85%	209.6	105%
R14	243.6	122%	283.5	142%
R15	208.2	104%	248.1	124%
R16	133.6	67%	174.6	87%
R17	71.5	36%	114.0	57%
R18	92.1	46%	139.1	70%
R19	108.7	54%	149.7	75%
R20	68.9	34%	111.6	56%

Most of the receptors would be close to or in exceedance of the short-term AQS for NO_2, if all generators ran cumulatively for all hours of the year. However, under no circumstances would the generators ever run for such lengths of time.

100th Percentile NO_2 Results

Table D.2 below shows the predicted impact of the site's SBGs, with reference to the 100th percentile (i.e., the maximum hourly NO_2 concentration if all the generators ran all hours of the year, cumulatively, during routine testing).

Table D.4: Predicted 100th percentile concentrations of NO_2

Receptor Point	100th Percentile NO_2	
	PC (µg.m^{-3})	PC % of AEGL
R1	488.4	52%
R2	413.9	44%
R3	340.4	36%
R4	370.4	39%
R5	312.0	33%
R6	326.2	35%
R7	476.4	51%
R8	393.1	42%
R9	803.4	85%
R10	516.8	55%
R11	342.0	36%
R12	354.2	38%
R13	514.6	55%
R14	592.7	63%
R15	488.0	52%
R16	311.6	33%
R17	169.5	18%
R18	212.2	23%
R19	255.5	27%
R20	164.3	17%

At no location is the hourly maximum concentration of NO_2 predicted to exceed the relevant AEGL.

Table D.3 below shows the predicted impact of the site's SBGs, with reference to the 100th percentile (i.e., the maximum hourly NO_2 concentration if all the generators ran all hours of the year, cumulatively, during a prolonged grid failure).

Table D.4: Predicted 100th percentile concentrations of NO_2

Receptor Point	100th Percentile NO_2	
	PC ($\mu g.m^{-3}$)	PC % of AEGL
R1	223.7	24%
R2	189.4	20%
R3	156.4	17%
R4	169.7	18%
R5	142.9	15%
R6	149.6	16%
R7	218.4	23%
R8	180.4	19%
R9	369.0	39%
R10	238.3	25%
R11	157.2	17%
R12	163.0	17%
R13	239.1	25%
R14	271.4	29%
R15	223.2	24%
R16	143.2	15%
R17	78.0	8%
R18	97.6	10%
R19	117.3	12%
R20	75.5	8%

At no location is the hourly maximum concentration of NO_2 predicted to exceed the relevant AEGL.

Appendix E: Tabulated short-term results for CO, C_6H_6, NO and SO_2

Carbon Monoxide

Table E.1 below shows the predicted impact of the facility with reference to the 1-hour mean and 8-hour rolling daily maximum mean AQSs for CO.

Table E.1: Predicted percentile mean concentrations of CO

Receptor Point	8-hour maximum daily rolling mean				1-hour maximum mean			
	PC ($\mu g.m^{-3}$)	PC % of AQS	PEC ($\mu g.m^{-3}$)	PEC % of AQS	PC ($\mu g.m^{-3}$)	PC % of AQS	PEC ($\mu g.m^{-3}$)	PEC % of AQS
R1	161.93	1.6%	1093.93	10.9%	191.96	0.64%	1123.96	3.7%
R2	147.23	1.5%	1079.23	10.8%	164.32	0.55%	1096.32	3.7%
R3	100.11	1.0%	1032.11	10.3%	127.94	0.43%	1059.94	3.5%
R4	130.59	1.3%	1062.59	10.6%	144.87	0.48%	1076.87	3.6%
R5	97.71	1.0%	1029.71	10.3%	121.11	0.40%	1053.11	3.5%
R6	106.72	1.1%	1038.72	10.4%	125.48	0.42%	1057.48	3.5%
R7	165.40	1.7%	1097.40	11.0%	186.07	0.62%	1118.07	3.7%
R8	127.14	1.3%	1059.14	10.6%	151.91	0.51%	1083.91	3.6%
R9	253.19	2.5%	1185.19	11.9%	302.59	1.01%	1234.59	4.1%
R10	164.32	1.6%	1096.32	11.0%	187.56	0.63%	1119.56	3.7%
R11	113.53	1.1%	1045.53	10.5%	128.70	0.43%	1060.70	3.5%
R12	104.46	1.0%	1036.46	10.4%	130.76	0.44%	1062.76	3.5%
R13	136.87	1.4%	1068.87	10.7%	216.43	0.72%	1148.43	3.8%
R14	202.73	2.0%	1134.73	11.3%	231.86	0.77%	1163.86	3.9%
R15	159.01	1.6%	1091.01	10.9%	193.13	0.64%	1125.13	3.8%
R16	98.85	1.0%	1030.85	10.3%	117.31	0.39%	1049.31	3.5%
R17	46.21	0.5%	968.21	9.7%	62.54	0.21%	984.54	3.3%
R18	61.40	0.6%	993.40	9.9%	78.92	0.26%	1010.92	3.4%
R19	69.81	0.7%	1001.81	10.0%	96.58	0.32%	1028.58	3.4%
R20	43.30	0.4%	965.30	9.7%	61.86	0.21%	983.86	3.3%

At no location of relevant exposure is a short-term concentration of CO predicted to exceed the relevant AQS, or the EA's screening thresholds.

Benzene

Table E.2 below shows the predicted impact of the facility with reference to the maximum 1-hour AQO for C_6H_6, if the generators ran all hours of the year.

Table E.2: Predicted percentile mean concentrations of C_6H_6

Receptor Point	Hourly maximum Mean Benzene			
	PC ($\mu g.m^{-3}$)	PC % of AQS	PEC ($\mu g.m^{-3}$)	PEC % of AQS
R1	60.77	31%	62.641	32%
R2	51.92	27%	53.794	28%
R3	40.82	21%	42.694	22%
R4	45.91	24%	47.781	25%
R5	38.43	20%	40.304	21%
R6	39.89	20%	41.761	21%
R7	58.90	30%	60.765	31%

Receptor Point	Hourly maximum Mean Benzene			
	PC ($\mu g.m^{-3}$)	PC % of AQS	PEC ($\mu g.m^{-3}$)	PEC % of AQS
R8	48.24	25%	50.110	26%
R9	96.59	50%	98.456	50%
R10	60.15	31%	62.022	32%
R11	40.97	21%	42.825	22%
R12	41.90	21%	43.770	22%
R13	66.22	34%	68.091	35%
R14	73.47	38%	75.345	39%
R15	61.07	31%	62.928	32%
R16	37.44	19%	39.315	20%
R17	20.04	10%	21.869	11%
R18	25.25	13%	27.124	14%
R19	30.81	16%	32.675	17%
R20	19.75	10%	21.574	11%

At no location is the hourly maximum concentration of benzene predicted to exceed the relevant AQS.

Nitrogen Monoxide

Table E.3 below shows the predicted impact of the facility with reference to the maximum 1-hour AEL for NO, during routine testing.

Table E.3: Predicted percentile mean concentrations of NO

Receptor Point	Hourly maximum Nitrogen Monoxide (99.89th %ile)			
	PC ($\mu g.m^{-3}$)	PC % of EAL	PEC ($\mu g.m^{-3}$)	PEC % of EAL
R1	1150.5	26%	1168.7	27%
R2	993.7	23%	1011.9	23%
R3	799.9	18%	818.1	19%
R4	892.0	20%	910.2	21%
R5	738.2	17%	756.4	17%
R6	765.4	17%	783.6	18%
R7	1108.3	25%	1126.4	26%
R8	913.1	21%	931.2	21%
R9	1715.3	39%	1733.5	39%
R10	1220.5	28%	1238.7	28%
R11	815.4	19%	835.5	19%
R12	836.1	19%	854.3	19%
R13	993.1	23%	1011.3	23%
R14	1331.4	30%	1349.6	31%
R15	1143.9	26%	1164.0	26%
R16	728.8	17%	747.0	17%
R17	384.9	9%	402.8	9%
R18	500.4	11%	518.6	12%
R19	596.9	14%	615.1	14%
R20	380.0	9%	397.9	9%

At no location is the hourly maximum concentration of NO predicted to exceed the relevant AQS.

Table E.4 below shows the predicted impact of the facility with reference to the maximum 1-hour AEL for NO, after 72 hours of emergency operation.

Table E.4: Predicted percentile mean concentrations of NO

Receptor Point	Hourly maximum Nitrogen Monoxide (99.89th %ile)			
	PC ($\mu g.m^{-3}$)	PC % of EAL	PEC ($\mu g.m^{-3}$)	PEC % of EAL
R1	532.7	12%	550.9	13%
R2	457.9	10%	476.1	11%
R3	373.6	8%	391.8	9%
R4	411.2	9%	429.4	10%
R5	344.2	8%	362.4	8%
R6	361.8	8%	380.0	9%
R7	520.9	12%	539.0	12%
R8	436.3	10%	454.5	10%
R9	839.0	19%	857.2	19%
R10	578.0	13%	596.2	14%
R11	381.3	9%	401.4	9%
R12	392.9	9%	411.1	9%
R13	492.1	11%	510.3	12%
R14	646.2	15%	664.3	15%
R15	474.5	11%	494.6	11%
R16	538.1	12%	558.2	13%
R17	346.1	8%	364.3	8%
R18	187.1	4%	205.0	5%
R19	235.0	5%	253.2	6%
R20	283.5	6%	301.6	7%

At no location is the hourly maximum concentration of NO predicted to exceed the relevant EAL.

Table E.5 below shows the predicted impact of the facility with reference to the 15-minute, 1-hour and 24-hour mean AQSs for SO_2, if the generators ran all hours of the year.

Table E.5: Predicted percentile mean concentrations of SO_2

Receptor Point	15-minute mean (99.9 %ile)		1-hour mean (99.73%ile)		24-hour mean (99.18 %ile)	
	PC ($\mu g.m^{-3}$)	PC % of AQS			PC ($\mu g.m^{-3}$)	PC % of AQS
R1	2.61	1.0%	2.41	0.7%	1.28	1.0%
R2	2.36	0.9%	2.09	0.6%	1.26	1.0%
R3	2.13	0.8%	1.73	0.5%	0.91	0.7%
R4	2.25	0.8%	1.89	0.5%	1.12	0.9%
R5	1.98	0.7%	1.56	0.4%	0.82	0.7%
R6	2.03	0.8%	1.62	0.5%	0.78	0.6%
R7	2.58	1.0%	2.38	0.7%	1.68	1.3%
R8	2.35	0.9%	1.99	0.6%	1.14	0.9%

Receptor Point	15-minute mean (99.9 %ile)		1-hour mean (99.73%ile)		24-hour mean (99.18 %ile)	
	PC (µg.m^{-3})	PC % of AQS			PC (µg.m^{-3})	PC % of AQS
R9	3.98	1.5%	3.45	1.0%	2.13	1.7%
R10	3.09	1.2%	2.89	0.8%	2.14	1.7%
R11	2.15	0.8%	1.81	0.5%	1.23	1.0%
R12	2.21	0.8%	1.88	0.5%	0.85	0.7%
R13	2.83	1.1%	2.52	0.7%	1.16	0.9%
R14	3.49	1.3%	2.74	0.8%	1.44	1.1%
R15	3.07	1.2%	2.34	0.7%	1.29	1.0%
R16	2.00	0.8%	1.59	0.5%	0.91	0.7%
R17	1.26	0.5%	0.87	0.2%	0.29	0.2%
R18	1.41	0.5%	1.10	0.3%	0.57	0.5%
R19	1.68	0.6%	1.28	0.4%	0.57	0.5%
R20	1.18	0.4%	0.81	0.2%	0.30	0.2%

At no location of relevant exposure is a short-term concentration of SO_2 predicted to exceed the relevant AQS, or the EA's screening thresholds.

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