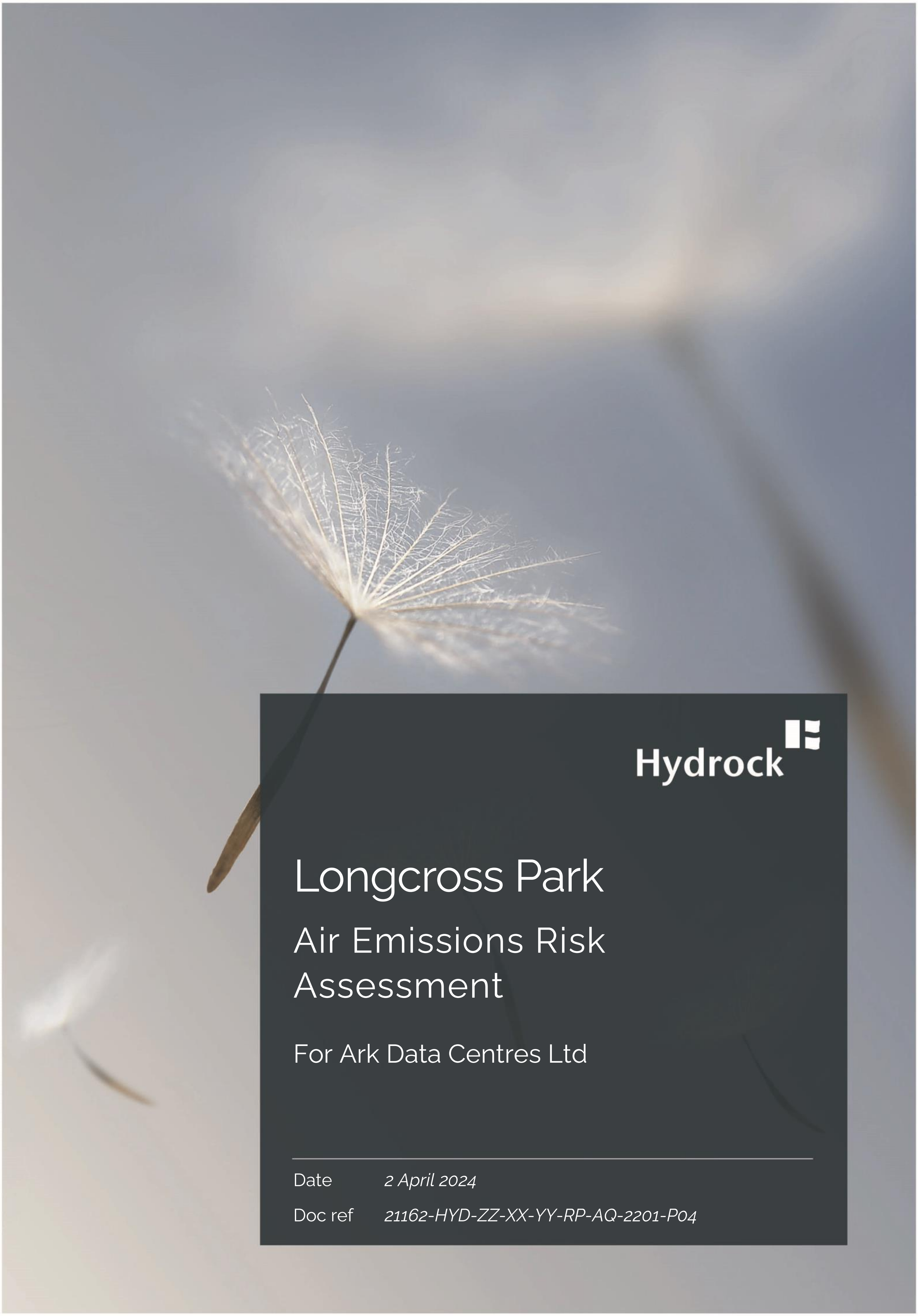

Hydrock

Longcross Park

Air Emissions Risk Assessment

For Ark Data Centres Ltd

Date *2 April 2024*

Doc ref *21162-HYD-ZZ-XX-YY-RP-AQ-2201-P04*

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Issued by	Hydrock Consultants Limited Great Suffolk Yard 127-131 Great Suffolk Street, London SE1 1PP United Kingdom	T +44 (0)117 9459225 www. Hydrock.com
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Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

Executive Summary

Hydrock has been commissioned by Ark Data Centres Ltd to prepare an Air Emissions Risk Assessment (AERA) to support the environmental permit application (SP3004SB) for three Data Centres at Longcross Park, Chertsey. The Proposed Development includes 28. No standby generators (SBG) which will be operated during testing, maintenance and unplanned emergency.

The Site is located within the administrative boundary of Runnymede Borough Council and lies to the north west of the M3 and adjacent to Longcross Studios. The Site is not located within an Air Quality Management Area and baseline air quality at the Site and surrounding locale is below the relevant air quality assessment levels.

This AERA evaluates the impacts of the SBG emissions on local air quality during the Testing and Maintenance Scenario 1 and Emergency Running Scenario 2 operations. This report presents the likely significant air quality effects of the Proposed Development on human and ecological receptors within the study area. The main pollutants of concern for local air quality are nitrogen oxide (NO_x), nitrogen dioxide (NO_2), nitrogen monoxide (NO) and particulate matter (PM_{10} and $PM_{2.5}$).

The modelling assessment has shown that the long term impact of the Proposed Development on human health within the Site locale is insignificant for annual mean NO_2, NO and PM_{10}.

In Scenario 1, exceedances of the short-term Air Quality Assessment Levels (AQALs) were predicted at one short-term location (R01), where it was predicted there is a chance of exceeding the hourly mean NO_2 AQAL (AQSR). At all remaining receptors, the model predicted a <1% chance of exceedance. It should be noted, this was calculated on the basis that the generators will run concurrently for 63 hours, which is a conservative approach given the generators will only run concurrently for 7 out of the 63 hours. During the remaining 56 hours, the generators will run one at a time. When analysing the maximum hourly mean percentile data per generator, a <1% chance of exceedance at all modelled receptors.

Comparison against the short-term US AEGLs for NO_2 illustrated all receptors were below the EA screening stages, with the exception of the 10-minute mean at R01 and R04. It should be noted comparison against the 100th percentile is considered highly conservative as this is the highest concentrations predicted over five years of meteorological data and assuming all SBGs are running continuously for 63 hours.

A <1% chance of exceeding the short term PM_{10} was also predicted at all modelled receptors within the study area.

The short-term NO concentrations exceeded the EA screening stages at four receptors within the study area (R01 – R03 and R15). However, concentrations are based on the 100th percentile and 63 hours of concurrent SBGs running, which is highly conservative.

Scenario 2 operational impacts on annual mean NO_2 concentrations were deemed not significant; however, short term impacts (the 82.74th hourly mean percentile) returned several potential exceedances of 200µg/m^3 across the study area. The highest PEC was 702µg/m^3 at R01, with concentrations also above 200µg/m^3 predicted at R04 – R10. As such, there is a chance of exceedance of the hourly NO2 AQAL at these locations. All remaining receptors predicted a less than 1% chance of exceedance. It should be emphasised this scenario is highly conservative and unlikely to occur as a sustained 72 hour outage is highly unlikely and represents a worst case scenario as grid outages are highly rare events occurring less than 1 in 10 years and last less than 2 hours. Additionally it is unlikely that all generators would operate and the realistic load would be 30-50%.

On this basis, the overall effect on human health is considered 'not significant'.

A detailed assessment has also been undertaken to assess the impacts of the Proposed Development on the most sensitive habitat types at the nearby ecological designated sites; Thursley, Ash, Pirbright & Chobham SAC, Thames Basin Heaths SPA, Chobham Common SSSI and Windsor Forest and Great Park SAC.

The modelling has shown that there were exceedances of the annual and daily mean NO_x critical level in both Scenarios 1 and 2 at Thursley, Ash, Pirbright & Chobham SAC, Thames Basin Heaths SPA, Chobham Common SSSI.

With regard to nitrogen deposition, the Thames Basin Heaths SPA, Thursley, Ash, Pirbright & Chobham SAC and Chobbam Common SSSI exceeded both the minimum and maximum critical load criteria in both Scenarios 1 and 2. Exceedances of the acid deposition critical loads were predicted at Thursley, Ash, Pirbright & Chobham SAC only.

As such, and acknowledging the conservative methodology applied to the assessment, the overall effects associated with the Proposed Development are considered not significant on local air quality with respect to human health.

Contents

Tables

Figures

Appendices

1. Introduction

Hydrock have been commissioned by Ark Data Centres Ltd ('the Client') to prepare an Air Emissions Risk Assessment (AERA) to support the environmental permit application (SP3004SB) for three Data Centres (the 'Installation'), at Longcross Park, Chertsey (The 'Site'). The Site is located within the administrative boundary of Runnymede Borough Council (RBC); however, it is worth noting the Site also borders the administrative area of Surrey Heath Borough Council (SHBC).

The Site is centred on the National Grid Reference (NGR); x497882, y165534 and shown below in Figure 1. The Site is situated to the north west of Longcross within Longcross Park. Chobham Lane borders the Site to the south, beyond which lies the M3. A film production company, Longcross Studios, borders the Site to the west, with commercial / industrial properties bordering the north and north eastern boundaries.

The wider locale is primarily characterised by designated green space, known as Chobham Common Site of Special Scientific Interest (SSSI) and National Nature Reserve (NNR) to the south and west. It should also be noted that this area is also designated as Thursley, Ash, Pirbright & Chobham Special Area of Conservation (SAC) and Thames Basin Heaths Special Protection Area (SPA).

The Wentworth Estate is located to the north, with the closest residential dwellings approximately 180m to the east.

Figure 1: Site Location

1.1 Background

This AERA has been prepared to support a permit application for a installation comprising the following:

- Three Data Centres (DC01, DC02 and DC03);

  - » Data Centre 1 (DC01) - 3 storey building;
  - » Data Centre 2 (DC02) - 5 storeys building; and
  - » Data Centre 3 (DC03) - 5 storeys building.
- » Generator Block - 14 diesel generators to be double stacked (28no. in total).

An illustrative proposed Site plan is presented below in Figure 2.

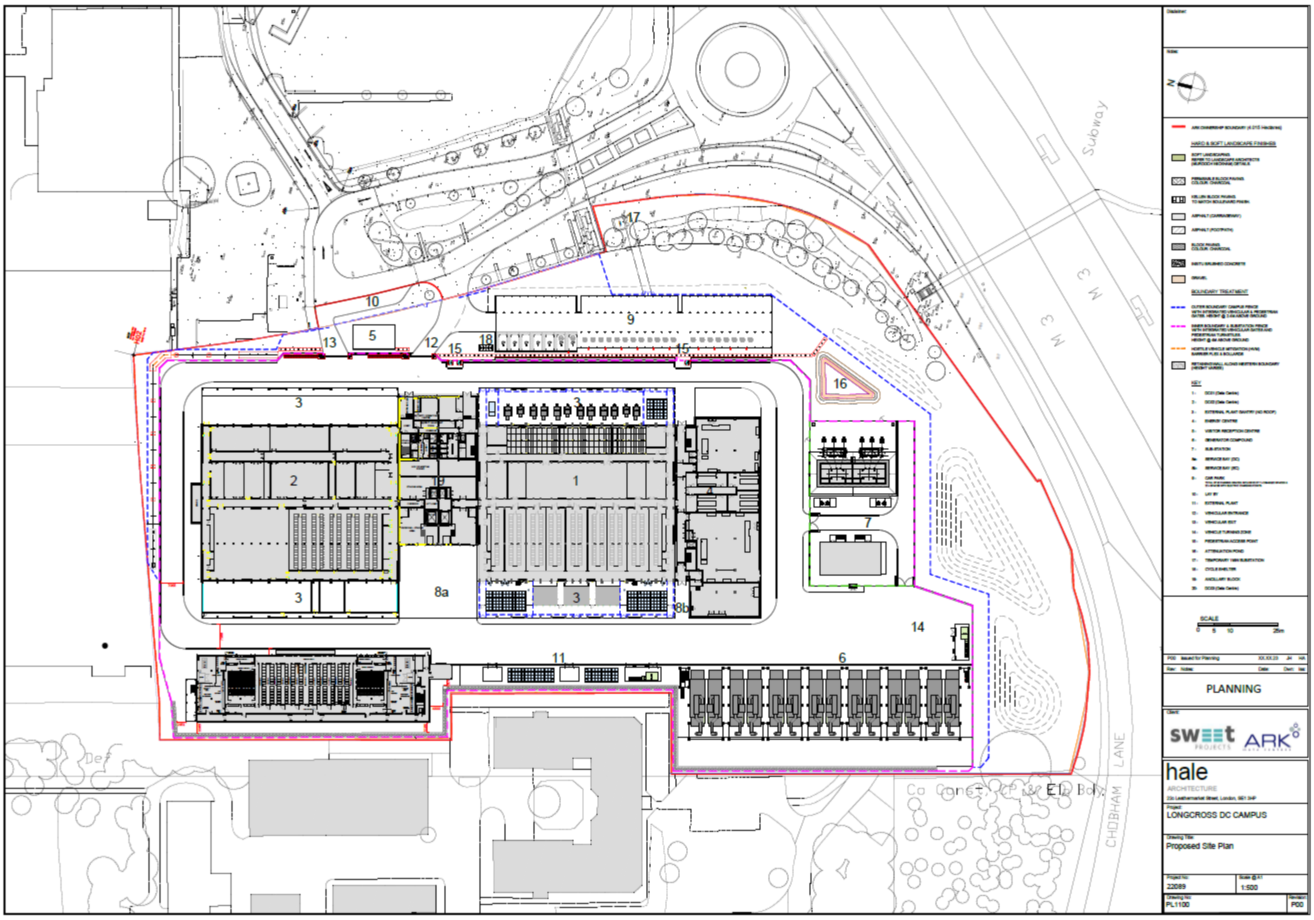

Figure 2: Proposed Site Plan

1.2 Purpose of Air Quality Assessment

The scope of the assessment is limited to the point source combustion emissions to air at the generators as defined above and the key pollutant releases of oxides of nitrogen (NO_x) and Particulate Matter (PM_{10}). The combustion of diesel with low sulphur fuel is not associated with significant emissions of sulphur dioxide (SO_2); therefore, this pollutant has been scoped out of the assessment.

The objective of the study is to assess the impact of NO_x, NO, NO_2 and PM_{10} emissions against the relevant Air Quality Standards for the protection of human health and ecological receptors

The report describes the relevant legislation, assessment methodology and the baseline conditions currently existing in the area. It then presents the findings of the AERA.

2. Relevant Legalisation

2.1 Air Quality Regulations and Standards

There are two sets of air quality legislation which include ambient air quality thresholds for the protection of public health that apply in England, these include legally binding limit values originally set by the European Union (EU) Directive 2008/50/EC[1] on ambient air quality and cleaner air for Europe; and regulations implementing national air quality objectives as set out in the Air Quality Strategy (AQS) for England,[2] which local authorities are required to work towards achieving.

The EU (Withdrawal Agreement) Act 2020 sets out arrangement for implementing air quality limit values that are included in the EU Directive on ambient air quality and cleaner air for Europe (2008/50/EC) included in the following:

- Air Quality Regulations (SI 2010 No.1001)[3] and amended (SI 2016 No.1184)[4] ;
- The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (SI 2019 74)[5] ;
- The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (SI 2020 1313)[6] amend the Air Quality Regulations (SI 2010 No.1001) to account for EU withdrawal;
- The AQS objectives are implemented in the Air Quality (England) Regulations 2000 (SI 2000/928)[7] and Air Quality (England) (Amendment) Regulations 2002 (SI 2002/3043)[8];

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[9] brought forward a new target level for $PM_{2.5}$.

The AQS[2] sets out the government's policies and framework for improving air quality in England with the aim of meeting the requirements of above legislation. The AQS also outlines the Limit Values, Target Values, Standards, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment.

2.2 Environmental Permitting Regulations

The installation will be regulated under the Environmental Permitting Regulations 2016[10]. The EPR transpose the European Union Directives including 2010/75/EU (the Industrial Emissions Directive, IED) into UK legislation. The EPR are designed to ensure the competent authority regulates emissions, including emissions to air, from processes to minimise adverse impacts.

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[1] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe Available at: https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32008L0050

[2] Defra. "The Air Quality Strategy for England". Available at: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england/air-quality-strategy-framework-for-local-authority-delivery

[3] The National Archives. "The Air Quality Standards Regulations 2010". Available at: http://www.legislation.gov.uk/uksi/2010/1001/contents/made

[4] The National Archives (2016). "The Air Quality Standards (Amendment) Regulations 2016". Available at: https://www.legislation.gov.uk/uksi/2016/1184/contents/made

[5] The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (legislation.gov.uk). Available at: https://www.legislation.gov.uk/uksi/2019/74/contents/made

[6] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 (legislation.gov.uk). Available at: https://www.legislation.gov.uk/uksi/2020/1313/contents/made

[7] The National Archives. "The Air Quality (England) Regulations 2000". Available at: http://www.legislation.gov.uk/uksi/2000/928/contents/made

[8] The National Archives. "The Air Quality (England) (Amended) Regulations 2002". Available at: http://www.legislation.gov.uk/uksi/2002/3043/contents

[9] https://www.legislation.gov.uk/uksi/2023/96/contents/made

[10] The Environmental Permitting (England and Wales) Regulations 2016 Statutory Instruments No. 1154.

European and National Environmental Standards exist only for a limited number of substances emitted to air. Therefore, regulators-derived benchmarks for other substances, known as "Environmental Assessment Levels" (EALs), have been published within the Environment Agency's (EA) Air Emissions Risk Assessment (AERA) guidance[11].

EALs for emissions to air represent a pollutant concentration in ambient air at which no significant risks to human health are expected. Although EALs do not carry any statutory basis, they are a benchmark for harm against which any exceedance should be viewed as unacceptable[12].

2.3 Standards for Human Health

The relevant standards applied in this assessment are taken from the air quality standard regulations (AQSR), US Acute exposure guideline levels (AEGLs)[13] and the EA's AERA guidance (collectively termed Air Quality Assessment Levels (AQALs) throughout this report). Those relevant to this assessment are provided below in Table 1.

Table 1: Air Quality Assessment Levels

Pollutant	AQAL (µg/m³)		Information Source
	Annual	Short Term	
Nitrogen Dioxide (NO_2)	40	200 (1-hour) not to be exceeded more than 18 times per year	AQSR
	-	940 (1-hour)	US AEGLs[1]
Nitrogen Monoxide (NO)	310	4,400 (1-hour)	AQSR
Particulate Matter (PM_{10})	40	50 (24-hour) not to be exceeded more than 35 times per year	AQSR

[1] United States Environmental Protection Agency (EPA) AEGL 1 (for which there are exposure periods of 10 min, 30 min, 60 min 4hr and 8hr for this AEGL expressed as ppm (mg/m3). AEGL 1 is the airbourne concentration of a substance above which it is predicted the general population could experience discomfort, irritation and for which the effects are not disabling and are reversible upon cessation of exposure. The Enviornment Agency requests AEGL 1 for NO_2 are considered for human health receptors.

2.3.1 Relevant Exposure

Defra's Local Air Quality Management Technical Guidance 2022 (LAQM.TG(22))[14] provides guidance on where the above AQAL's should apply. This is summarised below, in Table 2.

[11] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[12] Environment Agency, Using our 2012 methodology to derive new Environmental Assessment Levels for emissions to air, Revision of [10] existing EALs and derivation of two new EALs, October 2020

[13] https://www.epa.gov/aegl

[14] Defra, "LAQM Technical Guidance (TG22)" (Department for Food, Environment and Rural Affairs (Defra), August 2022), https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf

Table 2: Summary of where AQALs should apply

Averaging Period	Objectives should apply at:	Objectives should generally NOT apply at:
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.
24 Hour, 4 Hour and 8 Hour Mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties	Kerbside sites (as opposed to other locations at the building façade) or any other location where public exposure is expected to be short term.
1 Hour Mean	All locations where the annual Mean and: 24 and 8-hour mean objectives apply. Kerbside site (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railways stations etc. which are not fully enclosed, where members of the public might be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15 Minute Mean	All locations where member of the public might reasonably be exposed for a period of 15 minutes	
10 and 30 Minute Means (for AEGLs)	All locations where sensitive human receptors may be exposed for this time period (general public)	

2.4 Standards for Designated Ecological Sites

Designated ecological sites with importance at a European, national and local level, are provided environmental protection with respect to air quality. Standards for the protection of ecological receptors are known as Critical Levels (C_{Le}) for airborne concentrations and Critical Loads (C_{Lo}) for deposition to land from air.

2.4.1 Critical Levels (C_{Le})

C_{Le} are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur. C_{Le} for important gas pollutants which apply to all vegetation, are available for annual mean and 24-hour mean periods, where relevant. The C_{Le} relevant to this assessment are shown in Table 3.

Table 3: Critical Levels

Pollutant	Concentration (µg/m³)	Habitat and Averaging Period
Nitrogen oxides (NO_x)	30	Annual Mean (all ecosystems)
	75 / 200*	Daily mean (all ecosystems)
Note: the 75µg.m³ critical level for 24-hour maximum mean NO_x only applies where there are elevated concentrations of both sulphur dioxide and ozone; these conditions are widely not met in the UK.		

2.4.2 Critical Loads (C_{Lo})

C_{Lo}'s are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur.

The deposition of air pollutant critical loads is given as a range for different habitats and are provided by Air Pollution Information System (APIS)[15]. APIS provides critical loads for nitrogen deposition (leading to eutrophication) and acid deposition (leading to acidification).

The Thames Basin Heaths SPA/ Chobham Common SSSI/ Thursley, Ash, Pirbright & Chobham SAC consists a number of habitats which are sensitive to nitrogen deposition, including coniferous woodland and Valley mires, poor fens and transition mires [16]. Table 5 presents the relevant critical loads for the most sensitive habitat within each ecological designation.

3. Methodology

3.1 Guidance

The following guidance has been used to undertake this Air Quality Assessment:

- Defra's LAQM.TG(22)[14];
- Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites[17];

[15] http://www.apis.ac.uk/

[16] Air Pollution Information System. (2020) Thames Basin Heaths SPA: http://www.apis.ac.uk/srcl/select-a-feature?site=UK9012141&SiteType=SPA&submit=Next

[17] IAQM, "A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites" (Institute for Air Quality Management (IAQM), June 2019), https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf.

- Chartered Institute of Ecology and Environmental Management (CIEEM) Advisory Note: Ecological Assessment of Air Quality Impacts[18];
- Environment Agency (EA) & Defra Air emissions risk assessment for your environmental permit[19]; and
- Environment Agency's guidance on assessing impacts on limited hour operations[20].

3.2 Baseline Environment

The baseline air quality conditions in the vicinity of the Site have been established through the compilation and review of the following sources. The Baseline Assessment can be found in Section 4.

- Data from the National Atmospheric Emissions Inventory (NAEI) [21], Environment Agency (EA)[22] and Defra's Pollutant Release and Transfer Register (PRTR) data[23];
- Defra's modelled background concentrations of AQS pollutants (UK-AIR)[24]. These estimates are produced using detailed modelling tools and are available as concentrations at central 1km^2 National Grid square locations across the UK, and include projections to future years;
- Multi Agency Geographic Information for the Countryside (MAGIC)[25], which incorporates Natural England's interactive maps and; and
- RBC's latest air quality monitoring data, derived from the latest available air quality annual status report published in 2022[26].

3.3 Installation Emissions

In order to determine the impact on local air quality from the operation of the back-up generators, a dispersion model has been used to predict pollutant concentrations across the local area. The model used was Atmospheric Dispersion Modelling Software (ADMS 6), which is a new generation Gaussian plume dispersion model produced by the Cambridge Environmental Research Centre (CERC). This model has been validated and approved by the Defra for use as an assessment tool to assess the dispersion of pollutants from point sources.

ADMS 6 is able to provide an estimate of air quality impacts after development, considering important input data such as background pollutant concentrations, meteorological data and process emission rates.

The generators are to be powered by Hydrotreated vegetable oil (HVO); however, generator manufacturers have not yet produced emission datasheets using HVO so emissions rates are based on diesel operation.

Emissions of NO_x, and PM_{10} are of prime concern[27]; emissions of fine particulates and other pollutants are of less significance and have not been assessed further in this report. The generators will utilise low sulphur

[18] https://cieem.net/wp-content/uploads/2020/12/Air-Quality-advice-note.pdf

[19] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[20] Air Quality Modelling & Assessment Unit (AQMAU). (2016). Diesel generator short term NO2 impact assessment.

[21] National Atmospheric Emissions Inventory, UK Emissions Interactive Map (beis.gov.uk).

[22] https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory

[23] UK Pollutant Release and Transfer Register (PRTR) https://prtr.defra.gov.uk/map-search

[24] UK-AIR, "Background Mapping Data for Local Authorities - 2018," n.d., https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018.

[25] https://magic.defra.gov.uk/MagicMap.aspx

[26] Runnymeade Borough Council, 2022 Air Quality Annual Status Report (ASR), In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, September, 2022

[27] Environment Agency/ Natural Resources Wales www.gov.uk/guidance/specified-generators-dispersion-modelling- assessment

diesel and therefore emissions of SO_2 have been screened out as they are considered to have a negligible impact.

3.3.1 Dispersion Model Parameters

3.3.1.1 Stack Parameters

The model input parameters for the proposed generators have been derived from the datasheets, as provided in Appendix A. A number of pollutant emissions are reported dependant on the load of the generator. To represent a realistic testing scenario, emissions have been based on 25% load.

For the emergency running scenario, emissions have been calculated based on the maximum load (100%) and therefore the highest emission rates for each pollutant have been used in the model.

The stack locations for input into the model have been based on drawing No.22089_PL1100_Proposed Site Plan. The generators will be double stacked and each flue will exhaust to the top of the outer stack (the outer stack will contain two generator flues). As such, each generator flue has been modelled individually.

Further details of the dispersion model parameters are included in Appendix B.

3.3.1.2 Meteorological Data

To calculate pollutant concentrations at sensitive receptor locations the dispersion model uses hourly sequential meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

The dispersion modelling has been undertaken using a total of five years of meteorological data (2018 – 2022) from Heathrow Airport. This site is located approximately 14km north west of the Proposed Development. It is also the closest and most relevant meteorological station that records all of the parameters necessary for dispersion modelling. Due to low cloud cover data capture (below 85%), data were infilled with data from Northolt meteorological station. which is the closest station with the required cloud cover. The modelled wind roses are presented in Appendix C.

3.3.1.3 Surface Characteristics

The following surface roughness parameters have been applied in the model:

- Dispersion site surface roughness = 0.5m (ADMS pre-set 'parkland open suburbia');
- Met site surface roughness = 0.05m (ADMS pre-set 'open grassland / root crop');

The following Minimum Monin-Obukhov (MO) lengths were applied:

- Dispersion site = 30m (ADMS pre-set 'mixed urban/ industrial');
- Met site = 30m (ADMS pre-set 'mixed urban/ industrial').

3.3.1.4 Topography

LAQM.TG (22) states that including terrain data in dispersion modelling is unnecessary where the gradient of the slope is less than 10%. The study area is predominantly flat. Accordingly, flat terrain was assumed for the dispersion model.

3.3.1.5 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations.

Building downwash has been considered for buildings that have a maximum height equivalent to at least 40% of the emission height and are within a distance defined as five times the lesser of the height or maximum projected width of the building.

3.3.2 Receptors Included in Dispersion Model

3.3.2.1 Human Receptors

High-sensitivity human receptors are defined as locations in the study area where annual mean AQALs apply (i.e., residential dwellings, schools and hospitals). As the Site is partially located within an industrial/commercial area, medium-sensitivity commercial receptors were included as the short-term objectives apply to these locations. Receptors chosen were considered representative of worst-case locations, as pollutant concentrations would reasonably be expected to decline with increased distance from a source.

Discrete model receptors were positioned at breathing height (1.5 m plus relevant floor height – assuming 3m per floor) within the vicinity of the Proposed Development. Details of the modelled existing and proposed receptors are included in Table 4 and presented in Figure 3, below.

Table 4: Discrete Receptor Locations Included in Dispersion Model

Receptor ID	Location	X	Y	Z(m)	Sensitivity	Receptor Type	LT/ST AQAL apply
R01	Longcross studio, Burma Road	497843	165508	1.5	Medium	Commercial	ST
R02	Longcross studio, Burma Road	497818	165571	1.5	Medium	Commercial	ST
R03	Industrial Building, Burma Road	497819	165674	1.5	Medium	Industrial	ST
R04	Industrial Building, Burma Road	497967	165692	1.5	Medium	Industrial	ST
R05a, b, c	Discovery Building, Burma Road	498035	165767	1.5, 4.5, 7.5	Medium	Commercial	ST
R06a, b, c, d, e	Estienne House, Chieftain Road	498070	165779	1.5, 4.5, 7.5, 10.5, 13.5	High	Residential	LT
R07a, b, c, d, e	Estienne House, Chieftain Road	498100	165773	1.5, 4.5, 7.5, 10.5, 13.5	High	Residential	LT
R08a, b	Albury House, Cromwell Road	498089	165743	1.5, 4.5	High	Residential	LT
R09a, b	Cromwell House, Cromwell Road	498098	165714	1.5, 4.5	High	Residential	LT
R10a, b	Cromwell House, Cromwell Road	498133	165696	1.5, 4.5	High	Residential	LT
R11	Longcross Film Studios	498243	165612	1.5	Medium	Commercial	ST

Receptor ID	Location	X	Y	Z(m)	Sensitivity	Receptor Type	LT/ST AQAL apply
R12	Longcross Film Studios	498304	165480	1.5	Medium	Commercial	ST
R13a, b	21 Albury Close, Longcross Road	498136	165336	1.5, 4.5	High	Residential	LT
R14a, b	19 Albury Close, Longcross Road	498108	165310	1.5, 4.5	High	Residential	LT
R15a, b	Farifields, Longcross Road	497972	165298	1.5, 4.5	Medium	Commercial	ST
R16a, b, c	Longcross House, Longcross Road	498299	165159	1.5, 4.5, 7.5	High	Residential	LT
R17a, b	Carne Cottage, Longcross Road	499015	165216	1.5, 4.5	High	Residential	LT
R18a, b	Longcross Film Studios	498994	165719	1.5, 4.5	High	Residential	LT
R19a, b	Wild Woods, Trumps Green Road	499109	166409	1.5, 4.5	High	Residential	LT
R20a, b	Heatherlands, South Drive	498284	166479	1.5, 4.5	High	Residential	LT
R21a, b	Pipits Hill, West Drive	497526	166615	1.5, 4.5	High	Residential	LT
R22a, b	Wentworth, West Drive	497190	166859	1.5, 4.5	High	Residential	LT
R23	Longcross Train Station	497913	166063	1.5	Low	N/A	ST

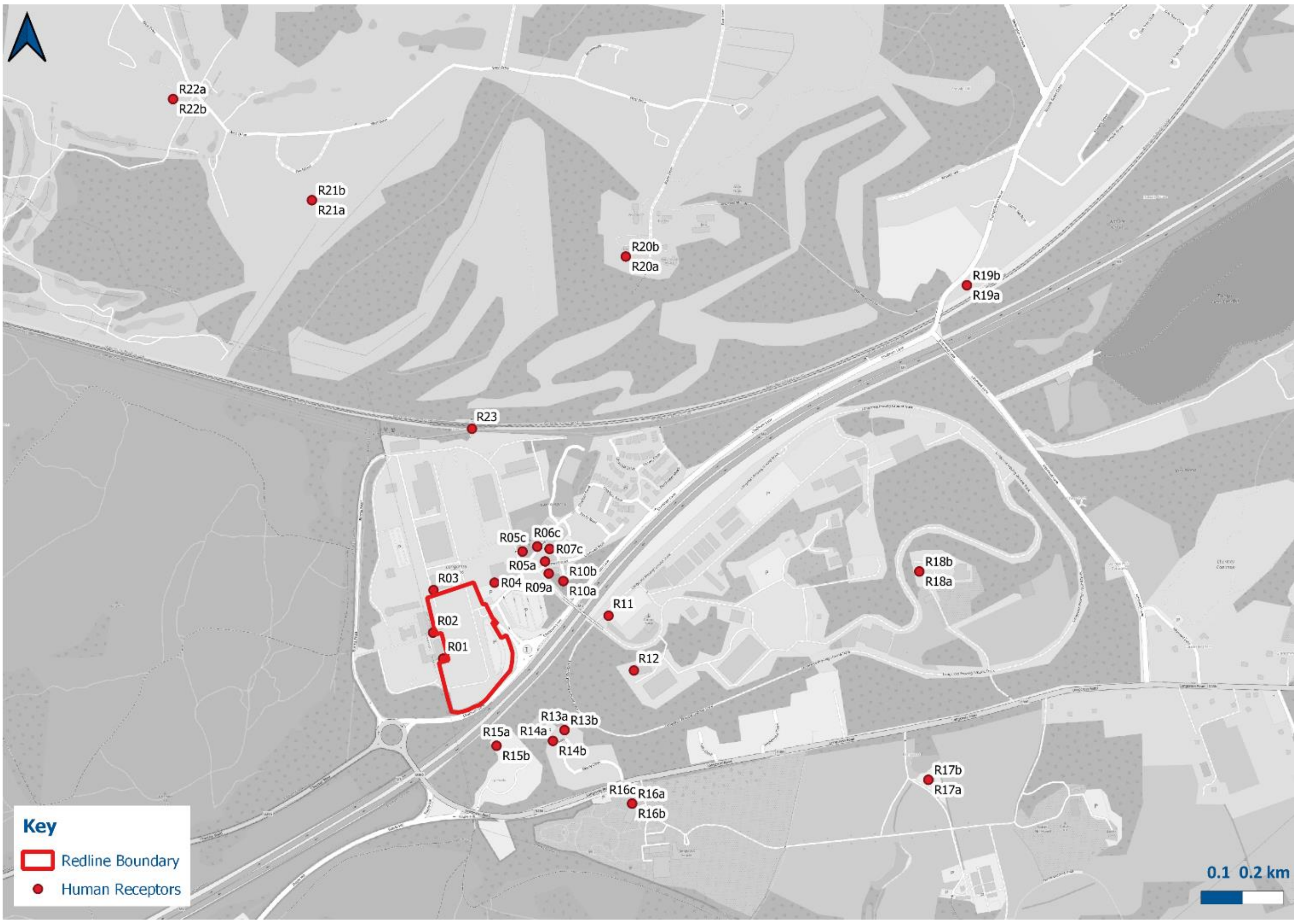

Figure 3: Human Receptor Locations

3.3.2.2 Ecological receptors

Ecological sites are sensitive to ambient NO_x, deposition of acid and/or nutrient nitrogen. Combustion sources can impact these sensitive ecological features, as such effects from the Proposed Development must be considered.

A desktop study using 'Nature on the map', an online tool managed by Natural England, was undertaken to identify designated ecological sites and local nature sites within 10km of the Proposed Development. As the most significant impacts occur within a 2km of a point source. Ecological sites within 10km of the Proposed Development include;

- Chobham Common SSSI located approximately 165m to the west;
- Thursley, Ash, Pirbright & Chobham SAC approximately 165m to the west;
- Thames Basin Heaths SPA approximately 165m to the west; and
- Ancient Woodlands located to the north, north west, east and south east.

Habitat information obtained from APIS for the ecological receptors included in the dispersion model are shown in Table 5.

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Table 5: Ecological Receptors Included in Dispersion Model

ID	Ecological Site	Sensitive Habitats	Background NO_x (µg/m³)	Background N Dep (kg/ha/yr)	N Critical Load (kg/ha/yr)	Background Acid Dep (keq/ha/yr)	Acid Critical Load (keq/ha/yr)
E01 - E08	Thursley, Ash, Pirbright and Chobham SAC	Depressions on peat substrates of the Rhynchosporion	20.5	12.9	10 – 15	1	0.321 – 0.676
		Northern Atlantic wet heaths with Erica tetralix	20.5	12.9	10 - 15	1	0.642 – 2.404
		European Dry Heaths	20.5	12.9	10 - 15	1	0.642 – 2.404
		Atlantic acidophilous beech forests with Ilex	20.5	12.9	10 – 15	1	0.142 – 3.477
E01 - E08, E17 – E20	Thames Basin Heaths SPA	Dwarf shrub heath	20.5	12.9	10 – 15	1	0.499 – 2.344
		Coniferous Woodland	20.5	12.9	3 – 15	1	0.142 – 2.89
E01 - E08	Chobbam Common SSSI	Narthecium Ossifragum - Sphagnum Papillosum Mire (Bogs)	20.5	12.9	10 – 15	1	0.321 – 0.542
		Dwarf shrub heath	20.5	12.9	10 – 15	1	0.642 – 1.604
		Coniferous Woodland	20.5	12.9	3 – 15	1	0.285 – 1.89
E21 – E22	Windsor Forest and Great Park SAC	Broadleaved deciduous woodland	15.9	11.5	10 – 15	0.9	0.142 – 2.763
E09	Ancient Woodlands (AWs) (x497488, y166172)	Coniferous Woodland	15.9	22.6	5 - 15	1.7	0.285 – 1.06
E10	Ancient Woodlands (x497858, y166214)	Coniferous Woodland	15.9	22.6	5 - 15	1.7	0.285 – 1.06

ID	Ecological Site	Sensitive Habitats	Background NO_x (µg/m³)	Background N Dep (kg/ha/yr)	N Critical Load (kg/ha/yr)	Background Acid Dep (keq/ha/yr)	Acid Critical Load (keq/ha/yr)
E11	Ancient Woodlands (x498154, y166306)	Coniferous Woodland	19.3	22.6	5 - 15	1.7	0.285 – 1.06
E12	Ancient Woodlands (x498905, y166624)	Coniferous Woodland	19.3	22.6	5 - 15	1.7	0.285 – 1.06
E13	Ancient Woodlands (x499188, y166373)	Coniferous Woodland	25.0	22.6	5 - 15	1.7	0.285 – 1.06
E14	Ancient Woodlands (x499292, y166294)	Coniferous Woodland	25.0	22.6	5 - 15	1.7	0.285 – 1.06
E15	Ancient Woodlands (x497315, y166982)	Coniferous Woodland	15.9	22.6	5 - 15	1.7	0.285 – 1.06
E16	Ancient Woodlands (x499884, y165477)	Coniferous Woodland	17.5	22.6	5 - 15	1.7	0.357 – 1.886

For assessment within the dispersion model the closest points of the above ecological sites were modelled at ground level (0m). These are shown in Figure 4 below. **The South West London Waterbodies SPA and Ramsar located north east of the Site have not been included within the assessment as the site has been designated based on waterbody features; *a series of embanked water supply reservoirs and former gravel pits that support a range of man-made and semi-natural open-water habitats*[28].**

[28] https://publications.naturalengland.org.uk/publication/4901473695563776

Figure 4: Ecological Receptors Locations

3.4 Model Scenarios and Operating Hours

Back-up generators have the potential to impact both short-term air quality and long-term air quality due to their operation. The standby generators are only likely to operate when tested or in the event of a grid failure.

For the purpose of modelling, it has been assumed that the back-up generators will emit 24/7 to ensure all meteorological conditions are covered, in accordance with LAQM.TG(22) guidance. This ensures a worst-case, conservative approach to the assessment to ensure that impacts coincide with the worst-case meteorological conditions.

The following information has been used to determine likely hours of operation:

- **Scenario 1 - Testing scenario** – The Client have provided information on the testing regime for the generators;
  - Monthly - All generators will be tested monthly for 15 minutes
  - Quarterly - All generators will be tested quarterly for 1 hour; and
  - Annually - Each generator will be tested singly for 2 hours at maximum load capacity.
  - As there are 28 generators, this amounts to a total of 63 hours of testing per year (out of the 63 hours there are only 7 hours of concurrent SBG running in any one year period and it will not be 7 hours of continuous running).
- **Scenario 2 -Emergency running Scenario** – The Client have confirmed that 24 of the generators are to be used during a emergency running. Whilst it is difficult to predict the required running time of the generators during power failure, in line with EA guidance and to assess worst case impacts, it has been assumed that the generators are used for 72 hours of continuous, concurrent running at 100% load out of a year for power failure purposes. This is a conservative estimate as during an outage it is likely there will be 24 generators running at less than 80% load at any one time leaving 4 generators available for use to cover any generator failures.

3.5 Model Results Processing

3.5.1 NO_x to NO_2 Chemistry

Environment Agency guidance[13] has been followed when estimating NO_2 concentrations from modelled NO_X concentrations. The following ambient ratios of NO_2: NO_X have been applied:

- For short-term, assumed 35% NO_x conversion to NO_2; and
- For long-term, assumed 70% NO_x conversion to NO_2.

3.5.2 NO_x to NO Chemistry

As a conservative assessment, it has been assumed that when estimating NO concentrations from modelled NO_x concentrations the following ambient ratios of NO: NO_x have been applied:

- For short-term, assumed 70% of NO_x is NO; and
- For long-term, assumed 90% of NO_x is NO.

3.5.3 Annual Means

To calculate the representative annual mean, the process contribution can be scaled by the ratio of the number of hours of operation to the total number of hours modelled (i.e., a full year of 8,760 hours). For the purposes of this assessment, as a worst-case, the generator has been assumed to operate for 63 hours per year for maintenance / testing. Therefore, the predicted annual mean concentration at each receptor has been scaled down by a factor of **0.0072** (i.e., 63/8,760) in accordance with EA / Defra guidance.

3.5.4 Short-term Means

Short-term impacts are complex to assess, given that the AQALs are based on the maximum number of hours that a threshold concentration can be exceeded in a year. For NO_2, the 1-hour mean AQAL is 18 allowable exceedances of 200µg/m^3, which is often assessed by considering the 99.79th percentile of 1-hour concentrations. This represents the 19th highest hourly concentration in a year. If the 99.79th percentile exceeds 200µg/m^3 then the AQAL is likely to be breached.

For PM_{10}, the 24-hour mean AQAL is 35 allowable exceedances of 50µg/m^3, which is often assessed by considering the 90.41th percentile of 24-hour concentrations. This represents the 36th highest 24-hour concentrations in a year. If the 90.41th percentile exceeds 50µg/m^3 then the AQAL is likely to be breached.

However, where specific operating hours are not defined, and the operation of the plant is not continuous this approach is too conservative. Instead, an approach using hypergeometric distribution can be adopted. A hypergeometric distribution is a discrete probability distribution which can be used to determine the probability that the operation of a source such as a standby generator for a limited number of hours in a year will cause an exceedance of a given threshold condition. APS have provided an online tool[29] to calculate representative percentiles based on the short-term operation within a year.

In the case of the 1-hour mean AQAL for NO_2, the hypergeometric distribution is used to determine the probability that there will be 19 1-hour mean concentrations which exceed 200µg/m^3 from a set of mutually exclusive randomly selected hourly values from an annual dataset. The probability is dependent on the number of proposed hours of operation, such that the lower the number of operating hours, the lower the probability that 19 or more of the randomly selected hours will exceed the threshold.

This approach can be used so that when assessing a limited number of hourly values which correspond with operational hours, there is a less than 1% chance that there would be more than 18 exceedances of the 1-hour mean AQAL for the case of NO_2. This is done by calculating the number of hourly values from an annual dataset which can exceed the 1-hour/24-hour threshold in order for there to be a less than 1% chance. The number of hours that exceed the threshold in the full dataset can be used to calculate representative percentiles for the operational scenario.

The calculated percentile, which has utilised the operational hours as discussed in Section 3.7 is shown in Table 6.

Table 6: Hypergeometric Distribution Percentiles

Scenario	AQAL	Hours of Operation (per annum)	No. of Annual Exceedances Allowed	Percentile
1- Testing	1-hour NO_2 (200µg/m^3 not to be exceeded more than 18 times)	63	18	82.41
	24-hour PM_{10} (50µg/m^3 not to be exceeded more than 35 times)	63	35	56.99
2 - Emergency running	1-hour NO_2 (200µg/m^3 not to be exceeded more than 18 times)	72	18	84.74

29 APS, "Hypergeometric Distribution Tool," n.d., http://www.airpollutionservices.co.uk/hypergeometric-distribution/.

Scenario	AQAL	Hours of Operation (per annum)	No. of Annual Exceedances Allowed	Percentile
	24-hour PM_{10} (50µg/m^3 not to be exceeded more than 35 times)	72	35	62.74

As requested by the EA, the 100th percentile was also modelled to obtain the maximum off-site NO_2 predictions for both operating scenarios for comparison against the US AEGLs. It should be noted this is the maximum predicted hourly concentration over five years of met data assuming continuous operation of the generators and is thereby not representative of actual generator operation during testing/maintenance or power failure.

3.5.4.1 Calculating Short Term Averaging Periods

The US AEGLs are measured using a different time periods (10- and 30-minutes minutes). As such, the following factors were applied to the hourly PC concentrations which are based on EA guidance:

- 1.65 to convert to a 10-minute average; and
- 1.3 to convert to a 30-minute average.

3.6 Assessment of Significance

3.6.1 Human Receptors

The significance of impacts from the Proposed Development has been determined against the criteria in the EA / Defra's risk assessment for environmental permitting joint guidance[18]. The significance of impacts is considered both in terms of the:

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

3.6.2 Initial Screening Stage (Step 1)

The EA / Defra joint guidance[19] states the significance of impacts should be assessed in a multi-stepped approach. In the first instance, the impact of the PC for a particular pollutant is not considered significant if:

- the long-term PC is <1% of the long-term environmental standard (i.e. annual mean AQALs); and
- the short-term PC is <10% of the short-term environmental standard (i.e., 1-hour or 24-hour mean AQALs).

With the exception of short-term NO_x and PM_{10} impacts, which have been assessed using the hypergeometric distribution approach, the above screening criteria have been applied.

3.6.3 Second Screening Stage (Step 2)

Secondly, if the PC exceeds the initial screening stage thresholds, the assessment should proceed to the following second stage screening thresholds, below:

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

With the exception of short-term NO_x and PM_{10} impacts, which have been assessed using the hypergeometric distribution approach, the above screening criteria have been applied.

3.6.4 Ecological Receptors

The magnitude of impacts from the Proposed Development has been determined against the EA criteria, whereby if the emissions affect SPAs, SACs, Ramsar sites or SSSIs meet both of the following criteria, they're insignificant and no further assessment is required:

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

If these requirements are not met, then the PEC must be calculated and compared against the standard for protected conservation areas. The PEC does not need to be calculated for short term targets.

If the long-term PC is greater than 1% and the PEC is less than 70% of the long-term environmental standard, the emissions are insignificant. However, if the PEC is greater than 70%, further detailed modelling is required and an ecologist must determine the significance.

With regard to local nature sites, if the emissions meet both of the following criteria, they're insignificant and no further assessment is required:

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

3.7 Model Limitations

The ADMS 6 point source dispersion model used in the assessment is dependent upon process emission rates, exhaust parameters (ex. flow rates and temperatures) and various other source parameters which are variable. There are additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms. These uncertainties cannot be easily quantified and it is not possible to verify the point-source model outputs. Where these parameters have been estimated the approach has been to use reasonable worst-case assumptions.

When taking into account the actual number of generator operating hours in comparison to the model assumptions (24 hours per day 7 days per year); the approach taken to meteorological conditions (i.e., 5 years of data used); and the assumed NO_x to NO_2 relationship, the assessment is considered to provide a robust assessment.

4. Baseline Environment

4.1 Local Emission Sources

The main source of air pollution in the surrounding Site locale are vehicles using the local road network, predominantly the M3 to the south of the Site.

A review of the NAEI[21] EA[22] and Defra's PRTR[23] data indicates that there are no industrial pollution sources in the immediate vicinity of the Site that will influence the local air quality.

4.2 Defra Background Concentrations

Mapped background concentrations of NO_x, NO_2, PM_{10} and $PM_{2.5}$ were downloaded for the grid square containing the Site. Background pollutant concentrations for 2018 (the base year), 2023 (the assessment year), and 2024 (the full completion year of the Proposed Development) are displayed in Table 7.

Table 7: Defra Mapped Background Concentrations

Grid Square (x,y)	Pollutant	AQAL / C_{Le} (µg/m³)	Annual Mean Concentration (µg/m³)		
			2018	2023	2024
497500, 16500	NO_2	40	18.2	14.5	13.8
	PM_{10}	40	15.5	14.4	14.3
	$PM_{2.5}$	20	10.4	9.7	9.6
	NO_x	30	25.5	19.8	18.7

The data show that annual mean background concentrations of NO_x, NO_2, PM_{10} and $PM_{2.5}$ at the grid square within which the Site is located are below the AQALs in all years.

Concentrations of all pollutants are predicted to decline incrementally each year. These reductions are principally due to the forecast effect of the roll out of cleaner vehicles and strategies to reduce emissions across all sectors.

4.3 Air Quality Monitoring Data

4.3.1 Automatic Monitoring

The closest automatic analyser to the Site is the Castle Road, Camberley (monitored by SHBC) roadside monitor, situated approximately 10km south west. Due to the distance, measured concentrations at this monitor are unlikely to be representative of conditions at the Site and therefore results have not been presented.

4.3.2 Passive Monitoring

Passive NO_2 diffusion tube monitoring is currently undertaken by RBC at numerous locations throughout the Council's area. The closest tubes to the Site are shown in Figure 6 and the data presented in Table 8.

Figure 5: Diffusion Tube Monitoring

Table 8: Passive Diffusion Tube Monitoring Concentrations

Site ID	Site Name	Site Type	X (m)	Y (m)	Distance from Site (km)	Annual Mean NO_2 Concentration (µg/m³)				
						2017	2018	2019	2020	2021
RY39	Chobham Lane, Longcross	R	498859	166225	1 – NE	23.9	28.4	26.0	22.5	20.8
SH8	M3 Brickhill 150m back	UB	496170	164472	1.9 – SW	25.0	28.5	25.1	19.2	20.2
SH7	M3 Brickhill Roadside	O	496191	164418	1.9 – SW	**40.9**	**42.8**	39.5	34.2	32.4

Notes:

Bold denotes an exceedance of the annual mean NO_2 AQAL

R = Roadside, UB = Urban Background, O = Other

The data in Table 8 shows there have been exceedances of the NO_2 annual mean AQAL at monitoring site SH7 during 2017 and 2018. Measured concentrations have since reduced and remained below the objective from 2019 to 2021. However, measured concentrations during 2019 were within 10% of the AQAL and therefore are at risk of exceeding in accordance with LAQM.TG(22).

The diffusion tube closest to the Site, RY39, shows that annual mean NO_2 concentrations are below the AQAL in recent years. However, the 2020 and 2021 measured concentrations should be treated with caution due to the potential effects associated with the COVID-19 pandemic.

4.4 Summary

With regard to background data used in the assessment, it is important that the choice of background site captures all pollutant sources that are not included in the dispersion model. Background concentrations are derived from the relevant grid square(s) within which the model domain sits from the Defra Background Maps. All pollutants of concern are below the relevant AQALs in recent years.

In accordance with EA guidance, short term background concentrations were doubled.

For the ecological assessment, backgrounds from APIS were used. Full details are presented in Appendix D.

5. Results

5.1 Impacts on Human Receptors

5.1.1 Scenario 1 - Testing

For the Testing scenario, all generators were modelled for all five years of met data, and the results reported show the worst-case modelled concentrations at each of the receptor locations.

5.1.1.1 NO_2

Annual Mean

Predicted annual mean NO_2 concentrations were assessed against the AQAL of 40µg/m³ as presented in Table 9.

Table 9: Modelled Annual Mean NO_2 Concentrations - Testing

Receptor ID	Annual Mean PC (µg/m³)	PC % of AQAL*	Background Concentration (µg/m³)	Annual Mean PEC (µg/m³)	PEC as % of AQAL*	EA Significance
R01	2.6	**6%**	16.7	19.3	48%	Insignificant
R02	0.5	**1%**	16.7	17.3	43%	Insignificant
R03	0.4	**1%**	16.7	17.2	43%	Insignificant
R04	0.9	**2%**	16.7	17.6	44%	Insignificant
R05a, b, c	0.6	**1%**	17.7	18.2	46%	Insignificant
R06a - e	0.5	**1%**	17.7	18.2	46%	Insignificant
R07a - e	0.5	**1%**	17.7	18.2	45%	Insignificant
R08a, b	0.6	**1%**	17.7	18.2	46%	Insignificant
R09a, b	0.6	**1%**	17.7	18.3	46%	Insignificant
R10a, b	0.6	**1%**	17.7	18.2	46%	Insignificant
R11	0.4	**1%**	17.7	18.0	45%	Insignificant
R12	0.2	**1%**	17.7	17.9	45%	Insignificant
R13a, b	0.2	**1%**	17.7	17.9	45%	Insignificant
R14a, b	0.2	**1%**	17.7	17.9	45%	Insignificant
R15a, b	0.3	**1%**	16.7	17.0	43%	Insignificant
R16a, b, c	0.1	0%	17.7	17.8	44%	Insignificant
R17a, b	0.1	0%	14.1	14.2	35%	Insignificant
R18a, b	0.1	0%	17.7	17.7	44%	Insignificant
R19a, b	0.1	0%	20.0	20.1	50%	Insignificant
R20a, b	0.1	0%	15.0	15.1	38%	Insignificant

Receptor ID	Annual Mean PC (µg/m³)	PC % of AQAL*	Background Concentration (µg/m³)	Annual Mean PEC (µg/m³)	PEC as % of AQAL*	EA Significance
R21a, b	0.1	0%	12.1	12.2	30%	Insignificant
R22a, b	0.0	0%	12.1	12.1	30%	Insignificant
R23	0.2	**1%**	12.1	12.3	31%	Insignificant

Notes:

The concentrations presented for receptors with varying heights is the maximum concentration at that location.

* Percentages have been rounded to the nearest whole number in line with guidance.

Table 9 shows the max PC exceeds 1% of the AQAL at the majority of modelled receptors. However, the max PEC as a % of the AQAL does not exceed 70%. As such the long-term impact is predicted to be negligible and therefore 'not significant' at all relevant modelled receptor locations.

Short-Term

Comparison to AQSRs

Predicted 1-hour mean NO_2 concentrations were assessed against the AQAL of 200µg/m³ (82.41st percentile) as presented in Table 10.

Table 10: Modelled Hourly Mean NO_2 Concentrations – Testing

Receptor ID	82.41st %tile PC (µg/m³)	PC % of AQAL*	Background (µg/m³)	PEC (µg/m³)	PEC as % of AQAL	Hypergeometric Screening
R01	258.4	129%	33.5	291.9	**146%**	Chance of Exceedance
R02	1.6	1%	33.5	35.1	18%	<1% Chance of Exceedance
R03	2.8	1%	33.5	36.3	18%	<1% Chance of Exceedance
R04	105.6	53%	33.5	139.1	70%	<1% Chance of Exceedance
R05a, b, c	93.0	47%	35.3	128.3	64%	<1% Chance of Exceedance
R06a - e	91.8	46%	35.3	127.1	64%	<1% Chance of Exceedance
R07a - e	87.4	44%	35.3	122.7	61%	<1% Chance of Exceedance
R08a, b	96.8	48%	35.3	132.1	66%	<1% Chance of Exceedance
R09a, b	104.5	52%	35.3	139.8	70%	<1% Chance of Exceedance
R10a, b	97.6	49%	35.3	132.9	66%	<1% Chance of Exceedance
R11	61.6	31%	35.3	96.9	48%	<1% Chance of Exceedance
R12	16.0	8%	35.3	51.3	26%	<1% Chance of Exceedance
R13a, b	2.2	1%	35.3	37.5	19%	<1% Chance of Exceedance
R14a, b	0.5	0%	35.3	35.8	18%	<1% Chance of Exceedance

Receptor ID	82.41st %tile PC (µg/m³)	PC % of AQAL*	Background (µg/m³)	PEC (µg/m³)	PEC as % of AQAL	Hypergeometric Screening
R15a, b	<0.1	0%	33.5	33.5	17%	<1% Chance of Exceedance
R16a, b, c	<0.1	0%	35.3	35.3	18%	<1% Chance of Exceedance
R17a, b	0.8	0%	28.2	29.0	15%	<1% Chance of Exceedance
R18a, b	9.7	5%	35.3	45.0	23%	<1% Chance of Exceedance
R19a, b	8.6	4%	40.1	48.7	24%	<1% Chance of Exceedance
R20a, b	12.5	6%	30.0	42.5	21%	<1% Chance of Exceedance
R21a, b	0.2	0%	24.2	24.4	12%	<1% Chance of Exceedance
R22a, b	<0.1	0%	24.2	24.2	12%	<1% Chance of Exceedance
R23	14.2	7%	24.2	38.4	19%	<1% Chance of Exceedance

Table 10 shows that the 82.41st hourly mean percentile returned one potential exceedances of 200µg/m³ across the study area. The highest PEC was 291.9µg/m³ at R01 and as such, there is a chance of exceedance of the hourly NO_2 AQAL at this location. All remaining receptors predicted a <1% chance of exceeding the 1-hour mean AQAL across the study area owing to the operation of the backup generator.

The data in Table 10 is calculated on the basis that the generators will run concurrently for 63 hours of testing, which is a conservative approach given the generators will only run concurrently for 7 out of the 63 hours. During the remaining 56 hours, the generators will run consecutively. The maximum 82.41st hourly mean percentile data has been analysed per generator, which predicts <1% chance of Exceedance at all modelled receptors. Full results are presented in Appendix E.

On this basis, impacts are considered 'not significant'. Figure 6 shows the modelled short-term contours across the study area at 100% load (ie. worst case scenario).

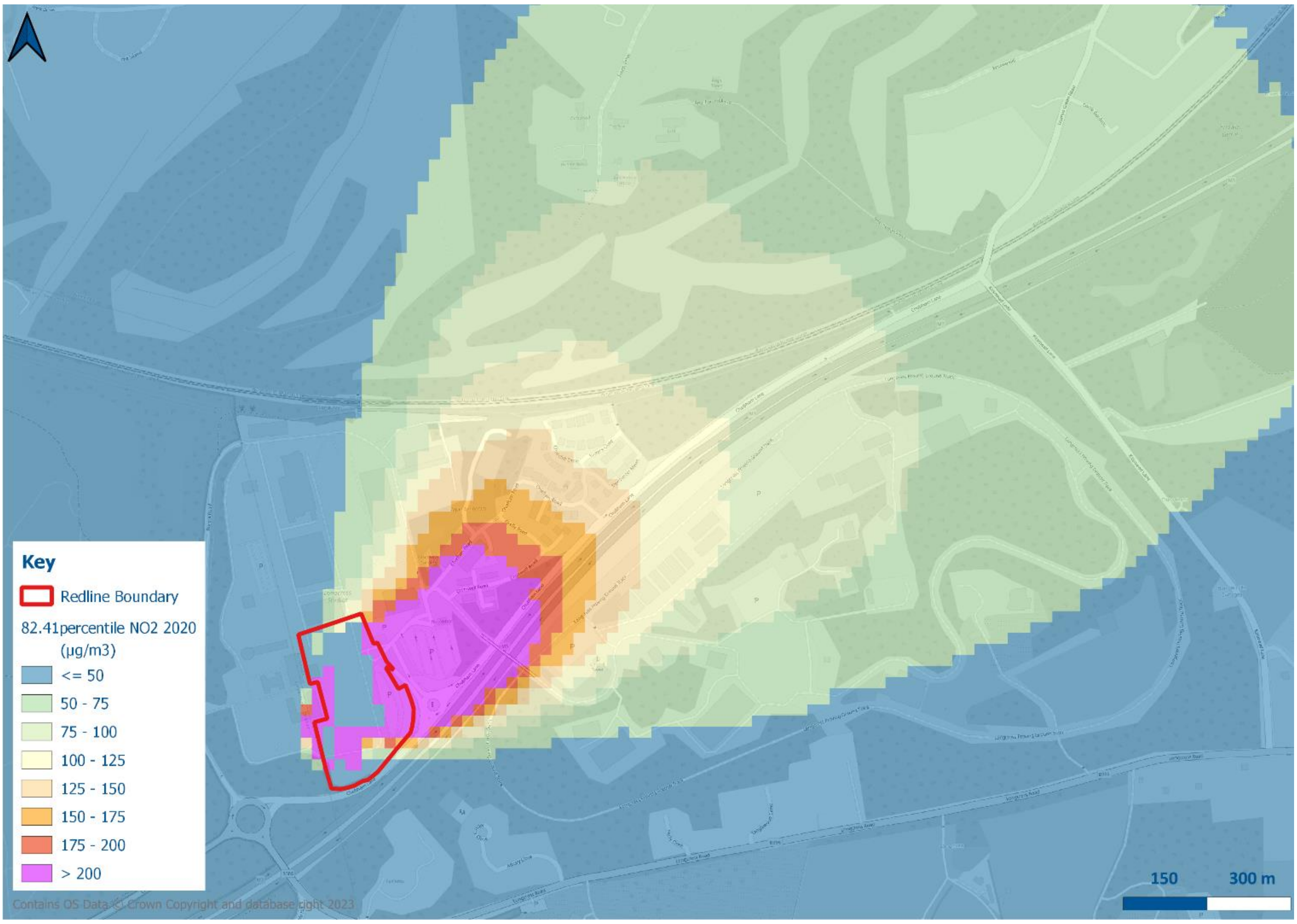

Figure 6: 82.41st Percentile Contour Plot

Comparison to US AEGLs

Predicted 1-hour, 30 minute and 10-minute mean NO_2 concentrations were assessed against the AQAL of 940µg/m^3 as presented in Table 11. The results presented in Table 11 are based on the maximum predicted concentration per generator given that the majority of generators during testing hours will operate individually.

Full results for all generators are presented in Appendix E. It should be noted that the 100th percentile concentrations based on all generators operating, is the maximum hour in five years of data assuming continuous operation and therefore it is not a realistic scenario.

Table 11: Modelled Short Term NO_2 Concentrations for Individual Generators – US AEGLs

Receptor ID	Hourly Mean Results			10-Minute Mean Results			30-Minute Mean Results		
	Max Hourly Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 10-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 30-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?
R01	111.0	**12%**	Below	183.2	**19%**	Exceeds	144.3	**15%**	Below
R02	65.3	7%	Below	107.8	**11%**	Below	84.9	9%	Below
R03	24.9	3%	Below	41.1	4%	Below	32.4	3%	Below
R04	111.0	**12%**	Below	183.2	**19%**	Exceeds	144.3	**15%**	Below
R05	17.1	2%	Below	28.2	3%	Below	22.2	2%	Below
R06	15.3	2%	Below	25.3	3%	Below	19.9	2%	Below
R07	13.8	1%	Below	22.8	2%	Below	18.0	2%	Below
R08	14.0	1%	Below	23.2	2%	Below	18.2	2%	Below
R09	14.1	2%	Below	23.3	2%	Below	18.4	2%	Below
R10	13.0	1%	Below	21.5	2%	Below	16.9	2%	Below
R11	11.4	1%	Below	18.8	2%	Below	14.8	2%	Below
R12	10.5	1%	Below	17.3	2%	Below	13.6	1%	Below
R13	17.3	2%	Below	28.5	3%	Below	22.4	2%	Below
R14	18.9	2%	Below	31.2	3%	Below	24.6	3%	Below
R15	30.9	3%	Below	51.0	5%	Below	40.2	4%	Below
R16	11.1	1%	Below	18.3	2%	Below	14.4	2%	Below
R17	5.6	1%	Below	9.2	1%	Below	7.3	1%	Below
R18	4.7	1%	Below	7.8	1%	Below	6.1	1%	Below

Receptor ID	Hourly Mean Results			10-Minute Mean Results			30-Minute Mean Results		
	Max Hourly Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 10-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 30-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?
R19	4.9	1%	Below	8.0	1%	Below	6.3	1%	Below
R20	8.2	1%	Below	13.5	1%	Below	10.6	1%	Below
R21	4.7	1%	Below	7.8	1%	Below	6.1	1%	Below
R22	5.2	1%	Below	8.6	1%	Below	6.8	1%	Below
R23	12.4	1%	Below	20.4	2%	Below	16.1	2%	Below

Table 11 shows the hourly mean PC exceeds 10% of the hourly mean NO_2 AQAL at the receptors R01 and R04. However, the PC is below the second screening. Furthermore, all remaining receptors are below the criteria and therefore the impact is insignificant.

The 10-minute mean PC exceeds 10% of the 10-minute mean NO_2 AQAL at receptors R01, R02 and R04. The PC also exceeds the second screening at receptors R01 and R04, with all remaining receptors are below the criteria.

The 30-minute mean PC exceeds 10% of the 30-minute mean NO_2 AQAL at receptors R01 and R04. However, the PC is below the second screening at these receptors. Furthermore, all remaining receptors are below the criteria and therefore the impact is insignificant.

5.1.1.2 PM_{10}

Annual Mean

Predicted annual mean PM_{10} concentrations were assessed against the AQAL of 40µg/m^3 as presented in Table 12.

Table 12: Modelled Annual Mean PM_{10} Concentrations - Testing

Receptor ID	Annual Mean PC (µg/m³)	PC % of AQAL*	Background Concentration (µg/m³)	Annual Mean PEC (µg/m³)	PEC as % of AQAL	EA Significance
R01	0.2	0%	14.9	15.1	38%	Insignificant
R02	<0.1	0%	14.9	14.9	37%	Insignificant
R03	<0.1	0%	14.9	14.9	37%	Insignificant
R04	<0.1	0%	14.9	15.0	37%	Insignificant
R05a, b, c	<0.1	0%	15.2	15.2	38%	Insignificant
R06a - e	<0.1	0%	15.2	15.2	38%	Insignificant
R07a - e	<0.1	0%	15.2	15.2	38%	Insignificant
R08a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R09a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R10a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R11	<0.1	0%	15.2	15.2	38%	Insignificant
R12	<0.1	0%	15.2	15.2	38%	Insignificant
R13a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R14a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R15a, b	<0.1	0%	14.9	14.9	37%	Insignificant
R16a, b, c	<0.1	0%	15.2	15.2	38%	Insignificant
R17a, b	<0.1	0%	13.8	13.8	35%	Insignificant
R18a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R19a, b	<0.1	0%	15.8	15.8	40%	Insignificant
R20a, b	<0.1	0%	14.3	14.3	36%	Insignificant
R21a, b	<0.1	0%	13.3	13.3	33%	Insignificant
R22a, b	<0.1	0%	13.3	13.3	33%	Insignificant
R23	<0.1	0%	13.3	13.3	33%	Insignificant

Notes:

The concentrations presented for receptors with varying heights is the maximum concentration at that location.

* Percentages have been rounded to the nearest whole number in line with guidance.

Table 12 shows the PC as a % of the AQAL is less than 1%. As such, the impact is predicted to be insignificant' at all modelled receptor locations.

Short-Term

Predicted 24-hour mean PM_{10} concentrations were assessed against the AQAL of 50µg/m^3 (56.99th percentile) as presented in Table 13.

Table 13: Modelled 24-hour Mean PM_{10} Concentrations – Testing

Receptor ID	56.99th %tile PC (µg/m^3)	PC % of AQAL*	Background (µg/m^3)	PEC (µg/m^3)	PEC as % of AQAL	Hypergeometric Screening
R01	14.1	**28%**	29.9	43.9	88%	<1% Chance of Exceedance
R02	1.0	2%	29.9	30.8	62%	<1% Chance of Exceedance
R03	0.9	2%	29.9	30.7	61%	<1% Chance of Exceedance
R04	3.4	7%	29.9	33.3	67%	<1% Chance of Exceedance
R05a, b, c	3.0	6%	30.4	33.3	67%	<1% Chance of Exceedance
R06a - e	3.0	6%	30.4	33.4	67%	<1% Chance of Exceedance
R07a - e	3.0	6%	30.4	33.3	67%	<1% Chance of Exceedance
R08a, b	3.6	7%	30.4	34.0	68%	<1% Chance of Exceedance
R09a, b	3.9	8%	30.4	34.3	69%	<1% Chance of Exceedance
R10a, b	4.1	8%	30.4	34.5	69%	<1% Chance of Exceedance
R11	2.7	5%	30.4	33.1	66%	<1% Chance of Exceedance
R12	1.0	2%	30.4	31.4	63%	<1% Chance of Exceedance
R13a, b	0.1	0%	30.4	30.5	61%	<1% Chance of Exceedance
R14a, b	<0.1	0%	30.4	30.4	61%	<1% Chance of Exceedance
R15a, b	<0.1	0%	29.9	29.9	60%	<1% Chance of Exceedance
R16a, b, c	<0.1	0%	30.4	30.4	61%	<1% Chance of Exceedance
R17a, b	0.1	0%	27.6	27.7	55%	<1% Chance of Exceedance
R18a, b	0.6	1%	30.4	31.0	62%	<1% Chance of Exceedance
R19a, b	0.5	1%	31.7	32.2	64%	<1% Chance of Exceedance
R20a, b	0.8	2%	28.6	29.4	59%	<1% Chance of Exceedance
R21a, b	0.3	1%	26.6	26.9	54%	<1% Chance of Exceedance
R22a, b	0.1	0%	26.6	26.7	53%	<1% Chance of Exceedance
R23	0.8	2%	26.6	27.5	55%	<1% Chance of Exceedance

The data in Table 13 show that the 56.99th 24-hour mean percentile returned no exceedances of 50µg/m³ across the study area. The highest concentration was 43.9µg/m³ at R01. As such, it is unlikely the 24-hour mean AQAL would be exceeded across the study area owing to the operation of the backup generators.

5.1.1.3 NO

Annual Mean

Predicted annual mean NO concentrations were assessed against the AQAL of 310µg/m³ as presented in Table 14.

Table 14: Modelled Annual Mean NO Concentrations - Testing

Receptor ID	Annual Mean PC (µg/m³)	PC % of AQAL*	Background Concentration (µg/m³)	Annual Mean PEC (µg/m³)	PEC as % of AQAL*	EA Significance
R01	3.3	**1%**	12.1	15.4	5%	Insignificant
R02	0.7	0%	12.1	12.7	4%	Insignificant
R03	0.5	0%	12.1	12.6	4%	Insignificant
R04	1.1	0%	12.1	13.2	4%	Insignificant
R05a, b, c	0.7	0%	12.1	12.8	4%	Insignificant
R06a - e	0.7	0%	12.1	12.8	4%	Insignificant
R07a - e	0.7	0%	12.1	12.7	4%	Insignificant
R08a, b	0.7	0%	12.1	12.8	4%	Insignificant
R09a, b	0.8	0%	12.1	12.8	4%	Insignificant
R10a, b	0.7	0%	12.1	12.8	4%	Insignificant
R11	0.5	0%	12.1	12.6	4%	Insignificant
R12	0.3	0%	12.1	12.4	4%	Insignificant
R13a, b	0.3	0%	12.1	12.4	4%	Insignificant
R14a, b	0.3	0%	12.1	12.4	4%	Insignificant
R15a, b	0.3	0%	12.1	12.4	4%	Insignificant
R16a, b, c	0.1	0%	12.1	12.2	4%	Insignificant
R17a, b	0.1	0%	12.1	12.2	4%	Insignificant
R18a, b	0.1	0%	12.1	12.2	4%	Insignificant
R19a, b	0.1	0%	12.1	12.2	4%	Insignificant
R20a, b	0.2	0%	12.1	12.3	4%	Insignificant
R21a, b	0.1	0%	12.1	12.2	4%	Insignificant
R22a, b	<0.1	0%	12.1	12.1	4%	Insignificant
R23	0.3	0%	12.1	12.3	4%	Insignificant

Notes:

The concentrations presented for receptors with varying heights is the maximum concentration at that location.

* Percentages have been rounded to the nearest whole number in line with guidance.

Table 14 shows the PC as a % of the AQAL is less than 1%. As such, the impact is predicted to be insignificant' at all modelled receptor locations.

Short-Term

Predicted 1-hour mean NO concentrations were assessed against the AQAL of 4,400µg/m³ (100th percentile) as presented in Table 15.

Table 15: Modelled Hourly Mean NO Concentrations – Testing

Receptor ID	Max PC (µg/m³)	PC % of AQAL	Background Concentration (µg/m³)	PC Below 2nd Screening Stage?
R01	2436.5	55%	24.2	Exceeds
R02	1259.3	29%	24.2	Exceeds
R03	877.3	20%	24.2	Exceeds
R04	809.2	18%	24.2	Below
R05	533.7	12%	24.2	Below
R06	503.0	11%	24.2	Below
R07	469.8	11%	24.2	Below
R08	477.1	11%	24.2	Below
R09	485.6	11%	24.2	Below
R10	462.5	11%	24.2	Below
R11	441.6	10%	24.2	Below
R12	378.1	9%	24.2	Below
R13	600.4	14%	24.2	Below
R14	678.5	15%	24.2	Below
R15	981.5	22%	24.2	Exceeds
R16	396.4	9%	24.2	Below
R17	203.2	5%	24.2	Below
R18	186.2	4%	24.2	Below
R19	172.3	4%	24.2	Below
R20	284.4	6%	24.2	Below
R21	182.0	4%	24.2	Below
R22	187.3	4%	24.2	Below

Receptor ID	Max PC (µg/m³)	PC % of AQAL	Background Concentration (µg/m³)	PC Below 2nd Screening Stage?
R23	374.6	9%	24.2	Below

Table 15 shows the PC exceeds 10% of the short term NO AQAL at the majority of receptors. The PC also exceeds the second screening criteria. However, for all receptors other than R1, the concentrations are below the AQAL. The assumptions around the release of NO have been conservative (i.e. maximum peak concentrations over five years of met data assuming continuous operation of all the generators), in reality most of the NO will be converted to NO_2, as such it is unlikely concentrations of NO would be at the levels shown in Table 15.

5.1.2 Scenario 2 - Emergency Running

For the Emergency running scenario, 24 out of 28 generators were modelled for 72 hours for all five years of met data, and the results reported show the worst-case modelled concentrations at each of the receptor locations.

5.1.2.1 NO_2

Annual Mean

Predicted annual mean NO_2 concentrations were assessed against the AQAL of 40µg/m³ as presented in Table 16.

Table 16: Modelled Annual Mean NO_2 Concentrations- Emergency running

Receptor ID	Annual Mean PC (µg/m³)	PC % of AQAL*	Background Concentration (µg/m³)	Annual Mean PEC (µg/m³)	PEC as % of AQAL*	EA Significance
R01	5.7	**14%**	16.7	22.5	56%	Insignificant
R02	0.8	**2%**	16.7	17.5	44%	Insignificant
R03	0.8	**2%**	16.7	17.6	44%	Insignificant
R04	1.8	**5%**	16.7	18.6	46%	Insignificant
R05a, b, c	1.3	**3%**	17.7	18.9	47%	Insignificant
R06a - e	1.2	**3%**	17.7	18.9	47%	Insignificant
R07a - e	1.2	**3%**	17.7	18.9	47%	Insignificant
R08a, b	1.3	**3%**	17.7	19.0	47%	Insignificant
R09a, b	1.4	**4%**	17.7	19.1	48%	Insignificant
R10a, b	1.3	**3%**	17.7	19.0	47%	Insignificant
R11	0.9	**2%**	17.7	18.6	46%	Insignificant
R12	0.5	**1%**	17.7	18.2	45%	Insignificant
R13a, b	0.5	**1%**	17.7	18.2	45%	Insignificant
R14a, b	0.5	**1%**	17.7	18.1	45%	Insignificant

Receptor ID	Annual Mean PC (µg/m^3)	PC % of AQAL*	Background Concentration (µg/m^3)	Annual Mean PEC (µg/m^3)	PEC as % of AQAL*	EA Significance
R15a, b	0.5	**1%**	16.7	17.2	43%	Insignificant
R16a, b, c	0.2	<1%	17.7	17.9	45%	Insignificant
R17a, b	0.1	0%	14.1	14.3	36%	Insignificant
R18a, b	0.2	<1%	17.7	17.9	45%	Insignificant
R19a, b	0.2	<1%	20.0	20.2	51%	Insignificant
R20a, b	0.3	<1%	15.0	15.3	38%	Insignificant
R21a, b	0.1	0%	12.1	12.2	31%	Insignificant
R22a, b	0.1	0%	12.1	12.2	30%	Insignificant
R23	0.4	**1%**	12.1	12.5	31%	Insignificant

Notes:

The concentrations presented for receptors with varying heights is the maximum concentration at that location.

*** Percentages have been rounded to the nearest whole number in line with guidance.**

Table 16 shows the max PC exceeds 1% of the AQAL at the majority of modelled receptors. However, the max PEC as a % of the AQAL does not exceed 70%. As such the long-term impact is predicted to be negligible and therefore 'not significant' at all relevant modelled receptor locations.

Short-Term

Comparison to AQSRs

Predicted 1-hour mean NO_2 concentrations were assessed against the AQAL of 200µg/m^3 (82.41st percentile) as presented in Table 17.

Table 17: Modelled Hourly Mean NO_2 Concentrations - Emergency Running

Receptor ID	84.74th %tile PC (µg/m^3)	PC % of AQAL*	Background (µg/m^3)	PEC (µg/m^3)	PEC as % of AQAL	Hypergeometric Screening
R01	668.5	**334%**	33.5	702.0	**351%**	Chance of Exceedance
R02	1.9	1%	33.5	35.4	18%	<1% Chance of Exceedance
R03	7.0	3%	33.5	40.5	20%	<1% Chance of Exceedance
R04	224.0	**112%**	33.5	257.5	**129%**	Chance of Exceedance
R05a, b, c	211.7	**106%**	35.3	247.1	**124%**	Chance of Exceedance
R06a - e	233.4	**117%**	35.3	268.8	**134%**	Chance of Exceedance
R07a - e	228.5	**114%**	35.3	263.8	**132%**	Chance of Exceedance
R08a, b	246.3	**123%**	35.3	281.6	**141%**	Chance of Exceedance

Receptor ID	84.74th %tile PC (µg/m³)	PC % of AQAL*	Background (µg/m³)	PEC (µg/m³)	PEC as % of AQAL	Hypergeometric Screening
R09a, b	278.4	**139%**	35.3	313.8	**157%**	Chance of Exceedance
R10a, b	264.8	**132%**	35.3	300.1	**150%**	Chance of Exceedance
R11	171.2	86%	35.3	206.5	**103%**	Chance of Exceedance
R12	34.9	17%	35.3	70.2	35%	<1% Chance of Exceedance
R13a, b	4.1	2%	35.3	39.4	20%	<1% Chance of Exceedance
R14a, b	1.6	1%	35.3	36.9	18%	<1% Chance of Exceedance
R15a, b	0.0	0%	33.5	33.5	17%	<1% Chance of Exceedance
R16a, b, c	0.2	0%	35.3	35.5	18%	<1% Chance of Exceedance
R17a, b	4.2	2%	28.2	32.4	16%	<1% Chance of Exceedance
R18a, b	36.8	18%	35.3	72.1	36%	<1% Chance of Exceedance
R19a, b	32.8	16%	40.1	72.9	36%	<1% Chance of Exceedance
R20a, b	49.3	25%	30.0	79.3	40%	<1% Chance of Exceedance
R21a, b	1.8	1%	24.2	25.9	13%	<1% Chance of Exceedance
R22a, b	0.1	0%	24.2	24.3	12%	<1% Chance of Exceedance
R23	36.7	18%	24.2	60.8	30%	<1% Chance of Exceedance

The data in Table 17 shows that the 82.74th hourly mean percentile returned several potential exceedances of 200µg/m³ across the study area. The highest PEC was 702µg/m³ at R01, with concentrations also above 200µg/m³ predicted at R04 – R10. As such, there is a chance of exceedance of the hourly NO_2 AQAL at these locations. All remaining receptors predicted a <1% chance of exceeding the 1-hour mean AQAL across the study area owing to the operation of the backup generator.

The data in Table 17 is calculated on the basis that 24 of the generators will run concurrently for 72 hours at 100% load during emergency running, which is a highly conservative approach.

Comparison to US AEGLs

Predicted 1-hour, 30 minute and 10-minute mean NO_2 concentrations were assessed against the AQAL of 940µg/m³. The predicted concentrations exceed the EA screening criteria (Stage 1 and 2) for the 1-hour, 30-minute and 10-minute AEGLs. Again, it is highlighted that the 100th percentile concentrations based on 24 generators operating, is the maximum hour in five years of data assuming continuous operation and therefore it is not a realistic emergency running scenario.

5.1.2.2 PM_{10}

Annual Mean

Predicted annual mean PM_{10} concentrations were assessed against the AQAL of 40µg/m³ as presented in Table 18.

Table 18: Modelled Annual Mean PM_{10} Concentrations - Emergency Running

Receptor ID	Annual Mean PC (µg/m³)	PC % of AQAL*	Background Concentration (µg/m³)	Annual Mean PEC (µg/m³)	PEC as % of AQAL	EA Significance
R01	0.1	0%	14.9	15.0	37%	Insignificant
R02	<0.1	0%	14.9	14.9	37%	Insignificant
R03	<0.1	0%	14.9	14.9	37%	Insignificant
R04	<0.1	0%	14.9	15.0	37%	Insignificant
R05a, b, c	<0.1	0%	15.2	15.2	38%	Insignificant
R06a - e	<0.1	0%	15.2	15.2	38%	Insignificant
R07a - e	<0.1	0%	15.2	15.2	38%	Insignificant
R08a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R09a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R10a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R11	<0.1	0%	15.2	15.2	38%	Insignificant
R12	<0.1	0%	15.2	15.2	38%	Insignificant
R13a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R14a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R15a, b	<0.1	0%	14.9	14.9	37%	Insignificant
R16a, b, c	<0.1	0%	15.2	15.2	38%	Insignificant
R17a, b	<0.1	0%	13.8	13.8	35%	Insignificant
R18a, b	<0.1	0%	15.2	15.2	38%	Insignificant
R19a, b	<0.1	0%	15.8	15.8	40%	Insignificant
R20a, b	<0.1	0%	14.3	14.3	36%	Insignificant
R21a, b	<0.1	0%	13.3	13.3	33%	Insignificant
R22a, b	<0.1	0%	13.3	13.3	33%	Insignificant
R23	<0.1	0%	13.3	13.3	33%	Insignificant

Notes:

The concentrations presented for receptors with varying heights is the maximum concentration at that location.

* Percentages have been rounded to the nearest whole number in line with guidance.

Table 18 shows the PC as a % of the AQAL is less than 1%. As such, the impact is predicted to be insignificant' at all modelled receptor locations.

Short-Term

Predicted 24-hour mean PM_{10} concentrations were assessed against the AQAL of 50µg/m³ (62.74th percentile) as presented in Table 19.

Hydrock

Table 19: Modelled 24-hour Mean PM_{10} Concentrations - Emergency Running

Receptor ID	62.74th %tile PC (µg/m³)	PC % of AQAL*	Background (µg/m³)	PEC (µg/m³)	PEC as % of AQAL	Hypergeometric Screening
R01	5.8	**12%**	29.9	35.6	71%	<1% Chance of Exceedance
R02	0.4	1%	29.9	30.2	60%	<1% Chance of Exceedance
R03	0.3	1%	29.9	30.2	60%	<1% Chance of Exceedance
R04	1.8	4%	29.9	31.7	63%	<1% Chance of Exceedance
R05a, b, c	1.5	3%	30.4	31.9	64%	<1% Chance of Exceedance
R06a - e	1.6	3%	30.4	31.9	64%	<1% Chance of Exceedance
R07a - e	1.7	3%	30.4	32.0	64%	<1% Chance of Exceedance
R08a, b	1.7	3%	30.4	32.1	64%	<1% Chance of Exceedance
R09a, b	1.9	4%	30.4	32.3	65%	<1% Chance of Exceedance
R10a, b	1.9	4%	30.4	32.3	65%	<1% Chance of Exceedance
R11	1.4	3%	30.4	31.8	64%	<1% Chance of Exceedance
R12	0.6	1%	30.4	30.9	62%	<1% Chance of Exceedance
R13a, b	0.1	0%	30.4	30.4	61%	<1% Chance of Exceedance
R14a, b	<0.1	0%	30.4	30.4	61%	<1% Chance of Exceedance
R15a, b	<0.1	0%	29.9	29.9	60%	<1% Chance of Exceedance
R16a, b, c	<0.1	0%	30.4	30.4	61%	<1% Chance of Exceedance
R17a, b	0.1	0%	27.6	27.7	55%	<1% Chance of Exceedance
R18a, b	0.3	1%	30.4	30.7	61%	<1% Chance of Exceedance
R19a, b	0.3	1%	31.7	32.0	64%	<1% Chance of Exceedance
R20a, b	0.5	1%	28.6	29.1	58%	<1% Chance of Exceedance
R21a, b	0.1	0%	26.6	26.8	54%	<1% Chance of Exceedance
R22a, b	<0.1	0%	26.6	26.7	53%	<1% Chance of Exceedance
R23	0.3	1%	26.6	27.0	54%	<1% Chance of Exceedance

The data in Table 19 show that the 62.74th 24 hour mean percentile returned no exceedances of 50µg/m³ across the study area. The highest concentration was 35.6µg/m³ at R01. As such, it is unlikely the 24-hour mean AQAL would be exceeded across the study area owing to the operation of the backup generators.

5.1.2.3 NO

Annual Mean

Predicted annual mean NO concentrations were assessed against the AQAL of 310µg/m³ as presented in Table 14.

Table 20: Modelled Annual Mean NO Concentrations - Emergency Running

Receptor ID	Annual Mean PC (µg/m³)	PC % of AQAL*	Background Concentration (µg/m³)	Annual Mean PEC (µg/m³)	PEC as % of AQAL*	EA Significance
R01	7.3	2%	12.1	19.4	6%	Insignificant
R02	1.0	0%	12.1	13.0	4%	Insignificant
R03	1.1	0%	12.1	13.2	4%	Insignificant
R04	2.3	1%	12.1	14.4	5%	Insignificant
R05a, b, c	1.6	1%	12.1	13.7	4%	Insignificant
R06a - e	1.6	1%	12.1	13.7	4%	Insignificant
R07a - e	1.6	1%	12.1	13.6	4%	Insignificant
R08a, b	1.7	1%	12.1	13.8	4%	Insignificant
R09a, b	1.8	1%	12.1	13.9	4%	Insignificant
R10a, b	1.7	1%	12.1	13.8	4%	Insignificant
R11	1.2	0%	12.1	13.2	4%	Insignificant
R12	0.6	0%	12.1	12.7	4%	Insignificant
R13a, b	0.6	0%	12.1	12.7	4%	Insignificant
R14a, b	0.6	0%	12.1	12.7	4%	Insignificant
R15a, b	0.6	0%	12.1	12.7	4%	Insignificant
R16a, b, c	0.3	0%	12.1	12.4	4%	Insignificant
R17a, b	0.2	0%	12.1	12.3	4%	Insignificant
R18a, b	0.3	0%	12.1	12.4	4%	Insignificant
R19a, b	0.3	0%	12.1	12.3	4%	Insignificant
R20a, b	0.4	0%	12.1	12.5	4%	Insignificant
R21a, b	0.2	0%	12.1	12.2	4%	Insignificant
R22a, b	0.1	0%	12.1	12.2	4%	Insignificant
R23	0.5	0%	12.1	12.6	4%	Insignificant

Notes:

The concentrations presented for receptors with varying heights is the maximum concentration at that location.

* Percentages have been rounded to the nearest whole number in line with guidance.

Table 14 shows the PC as a % of the AQAL is less than 1%. As such, the impact is predicted to be insignificant' at all modelled receptor locations.

Short-Term

Predicted 1-hour mean NO concentrations were assessed against the AQAL of 4,400µg/m³ (100th percentile) as presented in Table 21.

Table 21: Modelled Hourly Mean NO Concentrations – Emergency Running

Receptor ID	Max PC (µg/m³)	PC % of AQAL	Background Concentration (µg/m³)	PC Below 2nd Screening Stage?
R01	6208.7	**141%**	24.2	Exceeds
R02	3045.9	**69%**	24.2	Exceeds
R03	2128.7	**48%**	24.2	Exceeds
R04	2042.4	**46%**	24.2	Exceeds
R05	1257.4	**29%**	24.2	Exceeds
R06	1152.9	**26%**	24.2	Exceeds
R07	1110.6	**25%**	24.2	Exceeds
R08	1157.2	**26%**	24.2	Exceeds
R09	1189.8	**27%**	24.2	Exceeds
R10	1129.0	**26%**	24.2	Exceeds
R11	835.6	**19%**	24.2	Below
R12	774.6	**18%**	24.2	Below
R13	1455.0	**33%**	24.2	Exceeds
R14	1591.9	**36%**	24.2	Exceeds
R15	2336.0	**53%**	24.2	Exceeds
R16	829.4	**19%**	24.2	Below
R17	451.9	**10%**	24.2	Below
R18	489.8	**11%**	24.2	Below
R19	382.7	9%	24.2	Below

Receptor ID	Max PC (µg/m³)	PC % of AQAL	Background Concentration (µg/m³)	PC Below 2nd Screening Stage?
R20	719.8	**16%**	24.2	Below
R21	488.4	**11%**	24.2	Below
R22	378.2	9%	24.2	Below
R23	754.7	**17%**	24.2	Below

Table 21 shows the PC exceeds 10% of the short term NO AQAL at the majority of receptors. The PC also exceeds the second screening criteria. However, for all receptors other than R1, the concentrations are below the AQAL. The assumptions around the release of NO have been conservative (i.e. maximum peak concentrations over five years of met data assuming continuous operation of generators), in reality most of the NO will be converted to NO_2, as such it is unlikely concentrations of NO would be at the levels shown in Table 21.

5.2 Impacts on Ecological Receptors

5.2.1 Testing Scenario

The results presented are based on worst case locations within the designated sites. The annual PC and PEC for NO_x, Nitrogen Deposition and Acid Deposition have been assessed for each designated site. The PC and PEC for the NO_x short term (24-hour) mean has also been calculated. The results for the testing scenario are presented below in the following tables.

5.2.1.1 NO_x Critical Levels

Table 22: Annual Mean NOx Results at Ecological Sites - Testing

Receptor	NO_x Annual Mean PC (µg/m³)	PC as % of C_{Le}	NO_x Annual Mean PEC (µg/m³)	PEC as % of C_{Le}	Impact Descriptor
Thursley, Ash, Pirbright & Chobham SAC	1.1	**4%**	21.6	**72%**	Ecologist to Determine Significance
Thames Basin Heaths SPA	1.1	**4%**	21.6	**72%**	Ecologist to Determine Significance
Chobbam Common SSSI	1.1	**4%**	21.6	**72%**	Ecologist to Determine Significance
Windsor Forest and Great Park SAC	<0.1	0%	-	**-**	Insignificant
AWs (E09)	0.1	0%	-	**-**	Insignificant
AWs (E10)	0.2	1%	-	**-**	Insignificant

Receptor	NO_x Annual Mean PC (µg/m³)	PC as % of C_{Le}	NO_x Annual Mean PEC (µg/m³)	PEC as % of C_{Le}	Impact Descriptor
AWs (E11)	0.3	1%	-	-	Insignificant
AWs (E12)	0.1	0%	-	-	Insignificant
AWs (E13)	0.1	0%	-	-	Insignificant
AWs (E14)	0.1	0%	-	-	Insignificant
AWs (E15)	0.1	0%	-	-	Insignificant
AWs (E16)	0.1	0%	-	-	Insignificant

Table 22 shows that modelled PC at the Ancient Woodland sites are below the 100% criteria for Local designations and Windsor Forest and Great Park SAC PC is below 1%. As such, impacts are considered to be negligible at these designated sites.

However, the maximum annual mean NO_x PC at the Thursley Ash SAC, SSSI and SPA exceeds the 1% C_{Le}. Moreover, the PEC exceeds 70% of the C_{Le} and therefore increases in NO_x associated with the Proposed Development could have a potentially significant impact on the ecological sites.

It should be noted that a change of more than 1% does not necessarily indicate a significant effect or adverse effect on integrity will occur. In accordance with IAQM guidance, significance should be determined by a qualified ecologist.

Table 23: 24-hour Mean NO_x Results at Ecological Sites - Testing

Receptor	NO_x 24-hour Mean PC (µg/m³)	PC as % of C_{Le}	Impact Descriptor
Thursley, Ash, Pirbright & Chobham SAC	25.0	**13%**	Ecologist to Determine Significance
Thames Basin Heaths SPA	25.0	**13%**	Ecologist to Determine Significance
Chobbam Common SSSI	25.0	**13%**	Ecologist to Determine Significance
Windsor Forest and Great Park SAC	0.1	0%	Insignificant
AWs (E09)	0.5	0%	Insignificant
AWs (E10)	<0.1	0%	Insignificant
AWs (E11)	<0.1	0%	Insignificant
AWs (E12)	0.1	0%	Insignificant
AWs (E13)	9.7	5%	Insignificant
AWs (E14)	28.7	14%	Insignificant

Receptor	NO_x 24-hour Mean PC (µg/m³)	PC as % of C_{Le}	Impact Descriptor
AWs (E15)	14.3	7%	Insignificant
AWs (E16)	14.1	7%	Insignificant

Table 23 shows that modelled PC is above 10% of the C_{Le} at the SPA, Thursley, Ash, Pirbright & Chobham SAC and SSSI and therefore an ecological is required to determine the significance of impacts.

The short-term PC at the ancient woodlands is below 100% and below 10% at the Windsor Forest and Great Park SAC. Ttherefore, impacts are considered to be negligible and no further assessment is required at these sites.

5.2.1.2 Nitrogen Deposition

Table 24: Nitrogen Deposition - Testing

Receptor	Deposition PC (Kg/ha/yr)	% of C_{Lo} (Min)	Deposition PEC (Kg/ha/yr)	% of C_{Lo} (Min)	% of C_{Lo} (Max)	Impact Descriptor
Thursley, Ash, Pirbright and Chobham SAC	0.3	**3%**	13.0	**130%**	**87%**	Ecologist to Determine Significance
Thames Basin Heaths SPA	0.5	**18%**	13.1	**131%**	**88%**	Ecologist to Determine Significance
Chobbam Common SSSI	0.5	**18%**	13.1	**131%**	**88%**	Ecologist to Determine Significance
Windsor Forest and Great Park SAC	<0.1	0%	-	**-**	**-**	Insignificant
AWs (E09)	<0.1	0%	-	-	**-**	Insignificant
AWs (E10)	<0.1	1%	-	-	**-**	Insignificant
AWs (E11)	0.1	1%	-	-	**-**	Insignificant
AWs (E12)	<0.1	0%	-	-	**-**	Insignificant
AWs (E13)	<0.1	0%	-	-	**-**	Insignificant
AWs (E14)	<0.1	0%	-	-	**-**	Insignificant
AWs (E15)	<0.1	0%	-	-	**-**	Insignificant
AWs (E16)	<0.1	0%	-	-	**-**	Insignificant

Table 24 shows modelled PCs at the Ancient Woodlands are below 100% of the C_{Lo} and Windsor Forest and Great Park SAC PC is below 1% of the C_{Lo}. Therefore, impacts are considerable insignificant at these designated sites.

However, the modelled PC at the Thursley, Ash, Pirbright and Chobham SAC, SPA and SSSI are above the 1% EA screening criteria for nitrogen deposition C_{Lo} and therefore consideration of the PEC is required.

The modelled PECs at the SPA, SAC and SSSI above 70% of the minimum and maximum C_{Lo} and therefore an ecologist is required to determine the significance of impacts.

5.2.1.3 Acid Deposition

Table 25: Acid Deposition - Testing

Receptor	Deposition PC (Keq/ha/yr)	% of C_{Lo} (Min)	Deposition PEC (Keq/ha/yr)	% of C_{Lo} (Min)	% of C_{Lo} (Max)	Impact Descriptor
Thursley, Ash, Pirbright and Chobham SAC	0.01	**2%**	1.02	**314%**	149%	Ecologist to Determine Significance
Thames Basin Heaths SPA	0.02	**11%**	1.04	**715%**	35%	Insignificant
Chobbam Common SSSI	0.02	**6%**	1.04	**356%**	54%	Insignificant
Windsor Forest and Great Park SAC	<0.01	<0%	-	**-**	-	Insignificant
AWs (E09)	<0.01	0%	-	-	-	Insignificant
AWs (E10)	<0.01	0%	-	-	-	Insignificant
AWs (E11)	<0.01	1%	-	-	-	Insignificant
AWs (E12)	<0.01	0%	-	-	-	Insignificant
AWs (E13)	<0.01	0%	-	-	-	Insignificant
AWs (E14)	<0.01	0%	-	-	-	Insignificant
AWs (E15)	<0.01	0%	-	-	-	Insignificant
AWs (E16)	<0.01	0%	-	-	-	Insignificant

Table 25 presents the precited acid deposition concentrations at the ecological sites. The PC exceeds 1% of the minimum C_{Lo} at the Thursley, Ash, Pirbright and Chobham SAC, SPA and SSSI. The SAC, SPA and SSSI PEC also exceed 70% of the minimum $C_{Lo.}$ The SPA and SSSI PEC are less than 70% below the maximum C_{Lo}. However, the Thursley, Ash, Pirbright and Chobham SAC also exceeds the maximum C_{Lo}. Therefore, in accordance with EA guidance, impacts cannot be screened out as negligible and require assessment by a qualified ecologist.

5.2.2 Emergency Running Scenario

The results presented are based on worst case locations within the designated sites. The annual PC and PEC for NO_x, Nitrogen Deposition and Acid Deposition have been assessed for each designated site. The PC and PEC for the NO_x short term (24-hour) mean has also been calculated. The results for the testing scenario are presented below in the following tables.

5.2.2.1 NO_x Critical Levels

Table 26: Annual Mean NOx Results at Ecological Sites - Emergency Running

Receptor	NOx Annual Mean PC (µg/m³)	PC as % of C_{Le}	NOx Annual Mean PEC (µg/m³)	PEC as % of C_{Le}	Impact Descriptor
Thursley, Ash, Pirbright & Chobham SAC	2.1	**7%**	22.7	**76%**	Ecologist to Determine Significance
Thames Basin Heaths SPA	2.1	**7%**	22.7	**76%**	Ecologist to Determine Significance
Chobbam Common SSSI	2.1	**7%**	22.7	**76%**	Ecologist to Determine Significance
Windsor Forest and Great Park SAC	0.1	0%	-	**-**	Insignificant
AWs (E09)	0.2	1%	-	**-**	Insignificant
AWs (E10)	0.4	2%	-	**-**	Insignificant
AWs (E11)	0.6	2%	-	**-**	Insignificant
AWs (E12)	0.3	1%	-	**-**	Insignificant
AWs (E13)	0.3	1%	-	**-**	Insignificant
AWs (E14)	0.3	1%	-	**-**	Insignificant
AWs (E15)	0.1	1%	-	**-**	Insignificant
AWs (E16)	0.1	1%	-	**-**	Insignificant

Table 26 illustrates that modelled PC at the Ancient Woodland sites are below the 100% criteria for Local designations and Windsor Forest and Great Park SAC PC is below 1%. As such, impacts are considered to be negligible at these designated sites.

However, the maximum annual mean NO_x PC at the Thursley Ash SAC, SSSI and SPA exceeds the 1% C_{Le}. Moreover, the PEC exceeds 70% of the C_{Le} and therefore increases in NO_x associated with the Proposed Development could have a potentially significant impact on the ecological sites.

It should be noted that a change of more than 1% does not necessarily indicate a significant effect or adverse effect on integrity will occur. In accordance with IAQM guidance, significance should be determined by a qualified ecologist.

Table 27: 24-hour Mean NO_x Results at Ecological Sites - Emergency Running

Receptor	NOx 24-hour Mean PC ($\mu g/m^3$)	PC as % of C_{Le}	Impact Descriptor
Thursley, Ash, Pirbright & Chobham SAC	79.7	**40%**	Ecologist to Determine Significance
Thames Basin Heaths SPA	79.7	**40%**	Ecologist to Determine Significance
Chobbam Common SSSI	79.7	**40%**	Ecologist to Determine Significance
Windsor Forest and Great Park SAC	0.7	0%	Insignificant
AWs (E09)	5.3	3%	Insignificant
AWs (E10)	0.0	0%	Insignificant
AWs (E11)	0.0	0%	Insignificant
AWs (E12)	0.4	0%	Insignificant
AWs (E13)	34.5	17%	Insignificant
AWs (E14)	102.6	51%	Insignificant
AWs (E15)	55.4	28%	Insignificant
AWs (E16)	54.2	27%	Insignificant

Table 27 shows that modelled PC is above 10% of the C_{Le} at the SPA, Thursley, Ash, Pirbright & Chobham SAC and SSSI and therefore an ecological is required to determine the significance of impacts.

The short-term PC at the ancient woodlands is below 100% and below 10% at the Windsor Forest and Great Park SAC. Therefore, impacts are considered to be negligible and no further assessment is required at these sites.

5.2.2.2 Nitrogen Deposition

Table 28: Nitrogen Deposition - Emergency Running

Receptor	Deposition PC (Kg/ha/yr)	% of C_{Lo} (Min)	Deposition PEC (Kg/ha/yr)	% of C_{Lo} (Min)	% of C_{Lo} (Max)	Impact Descriptor
Thursley, Ash, Pirbright and Chobham SAC	0.2	**2%**	13.1	**131%**	**88%**	Ecologist to Determine Significance
Thames Basin Heaths SPA	0.4	**14%**	13.3	**133%**	**89%**	Ecologist to Determine Significance

Receptor	Deposition PC (Kg/ha/yr)	% of C_{Lo} (Min)	Deposition PEC (Kg/ha/yr)	% of C_{Lo} (Min)	% of C_{Lo} (Max)	Impact Descriptor
Chobbam Common SSSI	0.4	**14%**	13.3	**133%**	**89%**	Ecologist to Determine Significance
Windsor Forest and Great Park SAC	<0.1	0%	-	-	-	Insignificant
AWs (E09)	<0.1	1%	-	-	-	Insignificant
AWs (E10)	0.1	2%	-	-	-	Insignificant
AWs (E11)	0.1	3%	-	-	-	Insignificant
AWs (E12)	0.1	1%	-	-	-	Insignificant
AWs (E13)	0.1	1%	-	-	-	Insignificant
AWs (E14)	0.1	1%	-	-	-	Insignificant
AWs (E15)	<0.1	1%	-	-	-	Insignificant
AWs (E16)	<0.1	1%	-	-	-	Insignificant

Table 28 shows modelled PCs at the Ancient Woodlands are below 100% of the C_{Lo} and Windsor Forest and Great Park SAC PC is below 1% of the C_{Lo}. Therefore, impacts are considerable insignificant at these designated sites.

However, the modelled PC at the Thursley, Ash, Pirbright and Chobham SAC, SPA and SSSI are above the 1% EA screening criteria for nitrogen deposition C_{Lo} and therefore consideration of the PEC is required.

The modelled PECs at the SPA, SAC and SSSI above 70% of the minimum and maximum C_{Lo} and therefore an ecologist is required to determine the significance of impacts.

5.2.2.3 Acid Deposition

Table 29: Acid Deposition - Emergency Running

Receptor	Deposition PC (Keq/ha/yr)	% of C_{Lo} (Min)	Deposition PEC (Keq/ha/yr)	% of C_{Lo} (Min)	% of C_{Lo} (Max)	Impact Descriptor
Thursley, Ash, Pirbright and Chobham SAC	0.02	**5%**	1.02	**316%**	150%	Ecologist to Determine Significance
Thames Basin Heaths SPA	0.03	**22%**	1.03	**726%**	36%	Insignificant
Chobbam Common SSSI	0.03	**11%**	1.03	**362%**	55%	Insignificant

Receptor	Deposition PC (Keq/ha/yr)	% of C_{Lo} (Min)	Deposition PEC (Keq/ha/yr)	% of C_{Lo} (Min)	% of C_{Lo} (Max)	Impact Descriptor
Windsor Forest and Great Park SAC	<0.01	<1%	-	-	-	Insignificant
AWs (E09)	<0.01	0%	-	-	-	Insignificant
AWs (E10)	<0.01	1%	-	-	-	Insignificant
AWs (E11)	<0.01	1%	-	-	-	Insignificant
AWs (E12)	<0.01	0%	-	-	-	Insignificant
AWs (E13)	<0.01	0%	-	-	-	Insignificant
AWs (E14)	<0.01	0%	-	-	-	Insignificant
AWs (E15)	<0.01	0%	-	-	-	Insignificant
AWs (E16)	<0.01	0%	-	-	-	Insignificant

Table 29 presents the precited acid deposition concentrations at the ecological sites. The PC exceeds 1% of the minimum C_{Lo} at the Thursley, Ash, Pirbright and Chobham SAC, SPA and SSSI. The SAC, SPA and SSSI PEC also exceed 70% of the minimum $C_{Lo.}$ The SPA and SSSI PEC are less than 70% below the maximum C_{Lo}. However, the Thursley, Ash, Pirbright and Chobham SAC also exceeds the maximum C_{Lo}. Therefore, in accordance with EA guidance, impacts cannot be screened out as negligible

6. Discussion and Conclusion

Hydrock were commissioned by Ark Data Centres UK Ltd to prepare an AQA for the Proposed Data Centres at Longcross Park, Chertsey.

Detailed dispersion modelling using ADMS-6 has been performed to assess the significance of potential impacts of the Proposed Development on local air quality. The modelling assessment has shown that the impact of the Proposed Development on human health within the Site locale is insignificant for annual mean NO_2, NO and PM_{10}.

The modelling assessment has shown that the long term impact of the Proposed Development on human health within the Site locale is insignificant for annual mean NO_2, NO and PM_{10}.

In Scenario 1, exceedances of the short-term Air Quality Assessment Levels (AQALs) were predicted at one short-term location (R01), where it was predicted there is a chance of exceeding the hourly mean NO_2 AQAL (AQSR). At all remaining receptors, the model predicted a <1% chance of exceedance. It should be noted, this was calculated on the basis that the generators will run concurrently for 63 hours, which is a conservative approach given the generators will only run concurrently for 7 out of the 63 hours. During the remaining 56 hours, the generators will run one at a time. When analysing the maximum hourly mean percentile data per generator, a <1% chance of exceedance at all modelled receptors.

Comparison against the short-term US AEGLs for NO_2 illustrated all receptors were below the EA screening stages, with the exception of the 10-minute mean at R01 and R04. It should be noted comparison against the 100th percentile is considered highly conservative as this is the highest concentrations predicted over five years of meteorological data and assuming all SBGs are running continuously for 63 hours.

A <1% chance of exceeding the short term PM_{10} was also predicted at all modelled receptors within the study area.

The short-term NO concentrations exceeded the EA screening stages at four receptors within the study area (R01 – R03 and R15). However, concentrations are based on the 100th percentile and 63 hours of concurrent SBGs running, which is highly conservative.

Scenario 2 operational impacts on annual mean NO_2 concentrations were deemed not significant; however, short term impacts (the 82.74th hourly mean percentile) returned several potential exceedances of 200µg/m³ across the study area. The highest PEC was 702µg/m³ at R01, with concentrations also above 200µg/m³ predicted at R04 – R10. As such, there is a chance of exceedance of the hourly NO2 AQAL at these locations. All remaining receptors predicted a less than 1% chance of exceedance. It should be emphasised this scenario is highly conservative and unlikely to occur as a sustained 72 hour outage is highly unlikely and represents a worst case scenario as grid outages are highly rare events occurring less than 1 in 10 years and last less than 2 hours. Additionally it is unlikely that all generators would operate and the realistic load would be 30-50%.

On this basis, the overall effect on human health is considered 'not significant'.

A detailed assessment has also been undertaken to assess the impacts of the Proposed Development on the most sensitive habitat types at the nearby ecological designated sites; Thursley, Ash, Pirbright & Chobham SAC, Thames Basin Heaths SPA, Chobham Common SSSI and Windsor Forest and Great Park SAC. The modelling has shown that there were exceedances of the annual and daily mean NO_x critical level in both the testing or emergency running scenario at Thursley, Ash, Pirbright & Chobham SAC, Thames Basin Heaths SPA, Chobham Common SSSI.

With regard to nitrogen deposition, the Thames Basin Heaths SPA, Thursley, Ash, Pirbright & Chobham SAC and Chobbam Common SSSI exceeded both the minimum and maximum critical load criteria in both the testing and emergency running scenarios. Exceedances of the acid deposition critical loads were predicted in the testing and emergency running scenarios at Thursley, Ash, Pirbright & Chobham SAC only.

Appendix A Emission Data

A Rolls-Royce solution

Engine data

	Genset	Marine	O & G	Rail	C & I
Application	X				
Engine model	20V4000G94LF				
Application Group	3D				
Legislative body	NEA Singapore for ORDE				
Test cycle	D2				
Fuel sulphur content [ppm]	7				
mg/mN³ values base on residual oxygen value of [%]	5				

Engine raw emissions*

		100% Load	75% Load	50% Load	25% Load	10% Load
Cycle point	[-]	n1	n2	n3	n4	n5
Power	kW	3307	2480	1653	827	331
Power relative	[-]	1	0.75	0.5	0.25	0.1
Engine speed	1/min	1500	1499	1499	1500	1499
Engine speed relative	[-]	1	1	1	1	1
Filter smoke number	Bosch	0.2	0.23	0.62	0.97	0.07
Exhaust temperature after ETC	grdC	474.5	420.2	420.8	386.2	264
Exhaust back pressure after ETC (static)	mbar	39	23	9	6	2
Exhaust back pressure after ETC (total)	mbar	52	32	14	5	0
Exhaust mass flow wet	kg/h	19195.7	15929.6	12082.7	7484.8	5323.4
NOX-Emissions specific	g/kWh	6.6	5.94	4.79	4.41	9.06
SO2-Emissions specific	g/kWh	0.003	0.003	0.003	0.003	0.004
CO-Emissions specific	g/kWh	0.32	0.39	1.02	1.45	2.79
HC1-Emissions specific	g/kWh	0.05	0.07	0.09	0.16	0.72
NMHC-Emissions specific	g/kWh	0.05	0.06	0.08	0.16	0.71

PDF	Name
Configurator	Lenhof, Torsten (TATP)
Approver1	Knefel, Alexander (TSLE)
Approver2	Breuer, Joerg (TVA)
Approver3	
Approver4	
User	FN7/00042812
Project no.	0
Order no.	0
Size	A4
EDS-ID	841-01.11.2021
Engine model	20V4000G94LF
Title	Emission data sheet
Description of Revision	Data generated by EDS Creator version 1.0 and uniplot. Ref.-dataset: 420122_364_NEA_G94LF_D2.nc for 295 in EDS platfrom.
Frequency	
Emissionstage	NEA Singapore for ORDE
Emissionstage basis	NEA Singapore for ORDE
Sheet	3 of 7
Configuration-ID	295
Documentation	AVK - Project request

NOX+HC1-Emissions specific	g/kWh	6.65	6.01	4.88	4.57	9.78
NOX+NMHC-Emissions specific	g/kWh	6.65	6.01	4.88	4.57	9.76
CO2-Emissions specific	g/kWh	645.7	632.1	669.3	721.6	844.5
PM-Emissions specific (Meas.)	g/kWh	0.02	0.029	0.098	0.178	0.052
NOX-Emissions (based on 5% O2)	mg/m3N	2362	2172	1639	1375	2411
NOX+HC1-Emissions (based on 5% O2)	mg/m3N	2381	2195	1668	1426	2598
NOX+NMHC-Emissions (based on 5% O2)	mg/m3N	2381	2195	1667	1425	2594
CO2-Emissions (based on 5% O2)	mg/m3N	223605	223062	222523	222036	219217
CO-Emissions (based on 5% O2)	mg/m3N	111.4	138.5	339.2	444.6	723
HC1-Emissions (based on 5% O2)	mg/m3N	18.5	23.1	28.8	50.4	186.9
SO2-Emissions (based on 5% O2)	mg/m3N	1	1	1	1	1
PM-Emissions (calculated) (based on 5% O2)	mg/m3N	16.9	20	34.2	52.1	31.8
PM-Emissions (based on 5% O2)	mg/m3N	6.9	10.3	32.7	54.6	13.5
Oxygen (O2)	%	9.9	11.2	11.9	13.1	15.8

PDF	Name	Project no. 0
Configurator	Lenhof, Torsten (TATP)	Order no. 0
Approver1	Kneifel, Alexander (TSLE)	EDS-ID
Approver2	Breuer, Joerg (TVA)	841-01.11.2021
Approver3		
Approver4		
User	FN2\00042812	

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Ref.-dataset: 420122_364_NEA_G94LF_D2.nc for 295 in EDS platfrom.

Engine model **20V4000G94LF**

Title **Emission data sheet**

Emissionstage **NEA Singapore for ORDE**

Emissionstage basis **NEA Singapore for ORDE**

Sheet **4** of **7**

Configuration-ID **295**

Documentation AVK - Project request

Appendix B Dispersion Model Inputs

The parameters employed in the dispersion modelling are shown in Table 30 and Figure 7.

Table 30: Generator Model Parameters

Model Input	Testing Scenario (25% Load)	Emergency running Scenario (100% Load)
Stack Diameter	0.65m	0.65m
Stack Height	20.5m (all generators have the same stack height)	20.5m (all generators have the same stack height)
Efflux Velocity	18.1m/s	35.86m/s
Volume Flux (Actual)	6.0Am^3/s	11.9Am^3/s
Actual O_2 %	13.1	9.9
Exit Temperature	386˚C	520˚C
NO_2 Emission Rate	1.687g/s	6.713g/s
PM Emission Rate *	0.067g/s	0.048g/s
*** Assumed to be PM_{10}**		

Table 31: Generator Parameters

Generator ID	X (m)	Y (m)	Height (m)
Gen_2	497848	165493	20.5
Gen_3	497849	165489	20.5
Gen_4	497849	165488	20.5
Gen_5	497851	165482	20.5
Gen_6	497851	165481	20.5
Gen_7	497852	165477	20.5
Gen_8	497852	165476	20.5
Gen_9	497854	165470	20.5
Gen_10	497854	165469	20.5
Gen_11	497855	165466	20.5
Gen_12	497855	165464	20.5
Gen_13	497857	165459	20.5
Gen_14	497857	165457	20.5
Gen_15	497858	165454	20.5
Gen_16	497858	165453	20.5

Generator ID	X (m)	Y (m)	Height (m)
Gen_17	497860	165447	20.5
Gen_18	497860	165446	20.5
Gen_19	497861	165442	20.5
Gen_20	497861	165441	20.5
Gen_21	497863	165435	20.5
Gen_22	497863	165434	20.5
Gen_23	497864	165431	20.5
Gen_24	497865	165429	20.5
Gen_25	497866	165424	20.5
Gen_26	497866	165422	20.5
Gen_27	497867	165419	20.5
Gen_28	497868	165418	20.5

Table 32: Building Parameters

Building Name	X (m)	Y (m)	Height (m)	Length (m)	Width (m)	Angle (°)
Ancillary Block	497904.95	165591.22	29.9	45.57	23.19	75.73
DC01	497909.62	165534.35	17.76	69.5	89.39	75.78
DC02	497884.46	165630.32	29.9	71.36	61.63	75.96
DC03	497830.66	165612.03	18.5	21.2	73.33	74.54
Generator Case 1	497856.94	165493.06	20	22	10.6	75.89
Generator Case 2	497860.06	165481.41	20	22	10.6	75.68
Generator Case 3	497863.06	165469.55	20	22	10.6	76.2
Generator Case 4	497866.23	165457.79	20	22	10.6	75.98
Generator Case 5	497869.21	165446.23	20	22	10.6	75.85
Generator Case 6	497872.66	165434.28	20	22	10.6	75.48
Generator Case 7	497875.57	165422.78	20	22	10.6	76.5

Figure 7: Model Inputs

Appendix C   Wind Roses

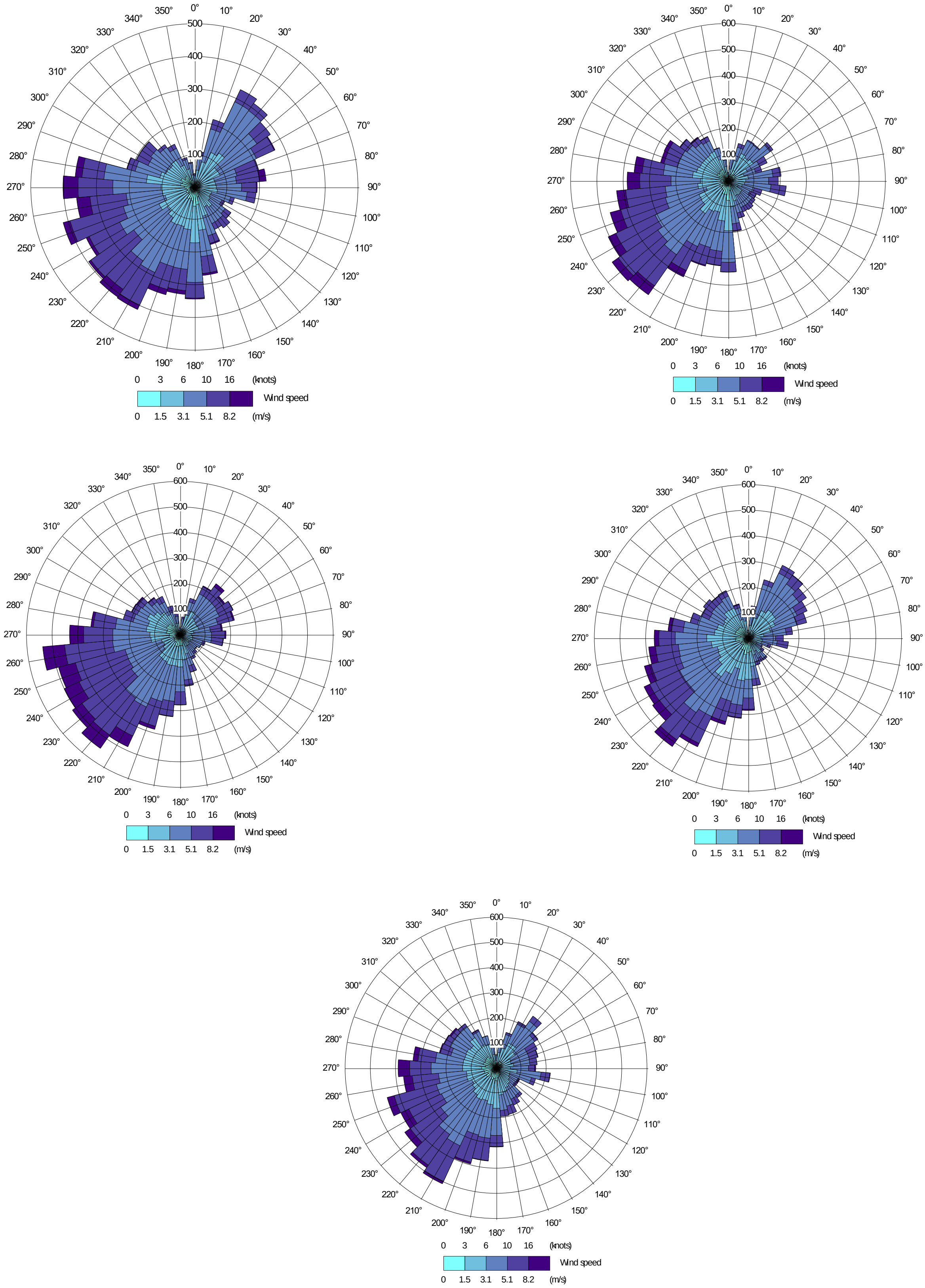

Figure 8: Wind rose Heathrow Airport (2018 – 2022)

Appendix D Background Concentrations

The background concentrations used in the modelling assessment are shown below. For future years as a conservative assumption and in line with APIS data, 2020 concentrations were applied.

Table 33: Background Concentrations

Receptor Name	X(m)	Y(m)	Annual Mean Backgrounds (µg/m₃)			Short Term Backgrounds (µg/m³)		
			NO_2	NO	PM_{10}	NO_2	NO	PM_{10}
R01	497843	165508	16.7	12.1	14.9	33.5	24.2	29.9
R02	497818	165571	16.7	12.1	14.9	33.5	24.2	29.9
R03	497819	165674	16.7	12.1	14.9	33.5	24.2	29.9
R04	497967	165692	16.7	12.1	14.9	33.5	24.2	29.9
R05a, b, c	498035	165767	17.7	12.1	15.2	35.3	24.2	30.4
R06a - e	498070	165779	17.7	12.1	15.2	35.3	24.2	30.4
R07a - e	498100	165773	17.7	12.1	15.2	35.3	24.2	30.4
R08a, b	498089	165743	17.7	12.1	15.2	35.3	24.2	30.4
R09a, b	498098	165714	17.7	12.1	15.2	35.3	24.2	30.4
R10a, b	498133	165696	17.7	12.1	15.2	35.3	24.2	30.4
R11	498243	165612	17.7	12.1	15.2	35.3	24.2	30.4
R12	498304	165480	17.7	12.1	15.2	35.3	24.2	30.4
R13a, b	498136	165336	17.7	12.1	15.2	35.3	24.2	30.4
R14a, b	498108	165310	17.7	12.1	15.2	35.3	24.2	30.4
R15a, b	497972	165298	16.7	12.1	14.9	33.5	24.2	29.9
R16a, b, c	498299	165159	17.7	12.1	15.2	35.3	24.2	30.4
R17a, b	499015	165216	14.1	12.1	13.8	28.2	24.2	27.6
R18a, b	498994	165719	17.7	12.1	15.2	35.3	24.2	30.4
R19a, b	499109	166409	20.0	12.1	15.8	40.1	24.2	31.7
R20a, b	498284	166479	15.0	12.1	14.3	30.0	24.2	28.6
R21a, b	497526	166615	12.1	12.1	13.3	24.2	24.2	26.6
R22a, b	497190	166859	12.1	12.1	13.3	24.2	24.2	26.6
R23	497913	166063	12.1	12.1	13.3	24.2	24.2	26.6
NO concentrations were obtained from the London Hillingdon Urban Background Monitor. This monitoring station is the closest to the Site that monitors NO.[30]								

[30] https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00266

Appendix E NO₂ Short Term Testing Results

Table 34: Modelled Hourly Mean NO2 Concentrations – Testing Per Generator

Receptor ID	Max 82.41st %tile PC (µg/m³)	PC % of AQAL	Background Concentration (µg/m³)	PEC (µg/m³)	PEC as % of AQAL	Hypergeometric Screening
R01	15.2	8%	33.5	48.7	24%	<1% Chance of Exceedance
R02	0.0	0%	33.5	33.5	17%	<1% Chance of Exceedance
R03	0.1	0%	33.5	33.6	17%	<1% Chance of Exceedance
R04	4.7	2%	33.5	38.2	19%	<1% Chance of Exceedance
R05	4.2	2%	35.3	39.6	20%	<1% Chance of Exceedance
R06	4.1	2%	35.3	39.4	20%	<1% Chance of Exceedance
R07	3.9	2%	35.3	39.2	20%	<1% Chance of Exceedance
R08	4.2	2%	35.3	39.6	20%	<1% Chance of Exceedance
R09	4.0	2%	35.3	39.3	20%	<1% Chance of Exceedance
R10	3.6	2%	35.3	38.9	19%	<1% Chance of Exceedance
R11	2.4	1%	35.3	37.8	19%	<1% Chance of Exceedance
R12	0.7	0%	35.3	36.0	18%	<1% Chance of Exceedance
R13	0.1	0%	35.3	35.4	18%	<1% Chance of Exceedance
R14	0.0	0%	35.3	35.4	18%	<1% Chance of Exceedance
R15	0.0	0%	33.5	33.5	17%	<1% Chance of Exceedance
R16	0.0	0%	35.3	35.3	18%	<1% Chance of Exceedance
R17	0.0	0%	28.2	28.3	14%	<1% Chance of Exceedance
R18	0.4	0%	35.3	35.7	18%	<1% Chance of Exceedance
R19	0.3	0%	40.1	40.4	20%	<1% Chance of Exceedance
R20	0.5	0%	30.0	30.4	15%	<1% Chance of Exceedance
R21	0.0	0%	24.2	24.2	12%	<1% Chance of Exceedance
R22	0.0	0%	24.2	24.2	12%	<1% Chance of Exceedance
R23	0.6	0%	24.2	24.8	12%	<1% Chance of Exceedance

Table 35: Modelled Short Term NO_2 Concentrations All Generators – US AEGLs

Receptor ID	Hourly Mean Results			10-Minute Mean Results			30-Minute Mean Results		
	Max Hourly Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 10-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 30-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?
R01	2814.2	**299%**	Exceeds	4643.4	**494%**	Exceeds	3658.4	**389%**	Exceeds
R02	1454.5	**155%**	Exceeds	2399.9	**255%**	Exceeds	1890.9	**201%**	Exceeds
R03	1013.3	**108%**	Exceeds	1672.0	**178%**	Exceeds	1317.3	**140%**	Exceeds
R04	934.7	**99%**	Exceeds	1542.2	**164%**	Exceeds	1215.1	**129%**	Exceeds
R05	616.4	**66%**	Exceeds	1017.1	**108%**	Exceeds	801.4	**85%**	Exceeds
R06	581.0	**62%**	Exceeds	958.6	**102%**	Exceeds	755.2	**80%**	Exceeds
R07	542.6	**58%**	Exceeds	895.3	**95%**	Exceeds	705.4	**75%**	Exceeds
R08	551.0	**59%**	Exceeds	909.2	**97%**	Exceeds	716.3	**76%**	Exceeds
R09	560.9	**60%**	Exceeds	925.4	**98%**	Exceeds	729.1	**78%**	Exceeds
R10	534.2	**57%**	Exceeds	881.4	**94%**	Exceeds	694.4	**74%**	Exceeds
R11	510.0	**54%**	Exceeds	841.5	**90%**	Exceeds	663.0	**71%**	Exceeds
R12	436.7	**46%**	Exceeds	720.6	**77%**	Exceeds	567.8	**60%**	Exceeds
R13	693.5	**74%**	Exceeds	1144.3	**122%**	Exceeds	901.5	**96%**	Exceeds
R14	783.6	**83%**	Exceeds	1293.0	**138%**	Exceeds	1018.7	**108%**	Exceeds
R15	1133.7	**121%**	Exceeds	1870.5	**199%**	Exceeds	1473.8	**157%**	Exceeds
R16	457.8	**49%**	Exceeds	755.4	**80%**	Exceeds	595.2	**63%**	Exceeds
R17	234.7	**25%**	Exceeds	387.3	**41%**	Exceeds	305.2	**32%**	Exceeds

Receptor ID	Hourly Mean Results			10-Minute Mean Results			30-Minute Mean Results		
	Max Hourly Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 10-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?	Max 30-Min Mean PC (µg/m³)	PC % of AQAL	PC Below 2nd Screening Stage?
R18	215.1	**23%**	Exceeds	354.9	**38%**	Exceeds	279.6	**30%**	Exceeds
R19	199.1	**21%**	Exceeds	328.4	**35%**	Exceeds	258.8	**28%**	Exceeds
R20	328.5	**35%**	Exceeds	542.1	**58%**	Exceeds	427.1	**45%**	Exceeds
R21	210.2	**22%**	Exceeds	346.9	**37%**	Exceeds	273.3	**29%**	Exceeds
R22	216.3	**23%**	Exceeds	356.9	**38%**	Exceeds	281.2	**30%**	Exceeds
R23	432.6	**46%**	Exceeds	713.8	**76%**	Exceeds	562.4	**60%**	Exceeds