HEMEL HEMPSTEAD DATA CENTRES: ENVIRONMENTAL PERMIT VARIATION APPLICATION HH4 PHASE 2

Air Emissions Risk Assessment

Prepared for: NTT Global Data Centers EMEA UK Limited

SLR Ref: 410.05391.00011
Version No: v0.1
April 2022

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CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1.0 Introduction

SLR Consulting Limited (SLR) has been retained by NTT Global Data Centers EAMA UK Limited (NTT) to prepare an application for an Environmental Permit (EP) variation in accordance with the Environmental Permitting (England and Wales) Regulations for the Hemel Hempstead data centre sites known as Maylands, Centro, Campus, and Hemel Hempstead 4 (HH4). The EP Variation seeks the expansion of HH4, known as 'Phase 2'.

This report presents the Air Emissions Risk Assessment (AERA) undertaken to support the EP variation application.

1.1 Background

The supporting statement to the permit application should be referred to for a comprehensive background and description of the installation; this report is concerned with emissions to air only.

The four data centres have a number of diesel-fired Stand-by Generators (SBGs) as follows:

- Maylands: 14 SBGs;
- Centro: 4 SBGs;
- Campus: 30 SBGs; and
- HH4: Phase 1 - 15 SBGs. Phase 2 - 13 SBGs.

The primary purpose of the SBGs is to provide emergency back-up electrical power to the data centres in the event that electricity is not available from the local transmission network (e.g. brown- or black-out) or if there is an internal failure of power supply.

1.2 Scope

The scope of the assessment has been defined on the basis of the previous EP application for the site (which was informed by pre-application discussions with the Environment Agency (EA)) and with reference to relevant EA guidance documentation.

The scope of the assessment is limited to the point source combustion emissions to air from the SBGs at the installation. Consistent with EA guidance, for SBGs fired on gas oil (diesel), the principal release of nitrogen oxides (NO_x) typically only require assessment. However, following Schedule 5 requests from the EA on the original EP application, emissions of carbon monoxide (CO) and particulate matter (PM_{10} and $PM_{2.5}$)[1] have been included although impacts were previously demonstrated to be insignificant.

The objective of the study is to assess the impact of the aforementioned emissions against the relevant Air Quality Standards for the protection of human health and the relevant Critical Levels (for NO_x) and Critical Loads (for nitrogen and acid deposition) for the protection of designated ecological receptors.

[1] Particulate matter with an aerodynamic diameter of less than 10 and 2.5 micrometres respectively (PM_{10} and $PM_{2.5}$).

2.0 Relevant Guidance and Environmental Benchmarks

2.1 Environmental Permitting Regulations

The installation is regulated under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EPR). The EPR implements European Union Directives including 2010/75/EU (the Industrial Emissions Directive (IED)). EPR prescribes emission limit values for certain pollutants into the air from certain plant as a result. Guidance produced by the EA in relation to EPR that is of relevance to this assessment is discussed below.

2.1.1 AERA Guidance

The 'Air emissions risk assessment for your environmental permit'[2] guidance (termed the 'AERA guidance' throughout the remainder of the report) produced by the EA is intended to assist operators in assessing risks to air when applying for a permit under the EPR. This is part of the 'Risk assessments for specific activities: environmental permits' collection.

2.1.2 Data centre FAQ Guidance

The EA have released draft provisional guidance for data centres[3] which sets out their approach to the permitting and regulatory aspects for data centres within the context of the IED and EPR for 1.1A Combustion Activities 'Chapter II' sites aggregated to >50MWth input. It is also of relevance for data centres with plant aggregated to <50MWth which come under the Medium Combustion Plant Directive (MCPD) and Specified Generators.

Also considered of relevance is the EA's 'Guidance on dispersion modelling for oxides of nitrogen assessment from specified generator'[4]. The guidance proposes methods for statistical analysis of impacts from short-term emergency (outage) operation (e.g. using hypergeometric probability distribution) and a framework for acceptable probabilities of impact. The methodology is detailed further in Section 3.0 below.

2.2 National Air Quality Legislation and Guidance

2.2.1 Air Quality Standards

The Air Quality Standards Regulations 2010 (the AQSR) transpose the Air Quality Directive (2008/50/EC) and Fourth Daughter Directive (2004/107/EC) into UK legislation. The regulations include Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report).

2.2.2 National Air Quality Policy

The United Kingdom Air Quality Strategy (AQS) 2007 for England, Scotland, Wales and Northern Ireland[5] sets out a comprehensive strategic framework within which air quality policy will be taken forward in the short to medium term, and the roles that Government, industry, the EA, local government, business, individuals and transport have in protecting and improving air quality. The AQS contains air quality objectives based on the protection of both human health and vegetation (ecosystems).

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[2] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit (accessed 28th January 2022)

[3] Environment Agency, 'Data Centre FAQ Headline Approach', Data Centre FAQ DRAFT version 10.0 H.Tee 01/06/18 – Release to Industry

[4] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

[5] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra. July 2007.

The Clean Air Strategy (CAS)[2], published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and also indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

2.2.3 Local Air Quality Management

Section 82 of the Environment Act 1995 (Part IV) requires local authorities to periodically review and assess the quality of air within their administrative area. The reviews have to consider the present and future air quality and whether any AQALs prescribed in regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed AQALs are not likely to be achieved the authority concerned must designate an Air Quality Management Area (AQMA). For each AQMA the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the AQAL. As such, local authorities have formal powers to control air quality through a combination of Local Air Quality Management (LAQM) and by use of their wider planning policies.

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their LAQM work[6]. This guidance, referred to in this report as LAQM.TG(16), has been used where appropriate in the assessment presented here.

The EA's role in relation to LAQM is as follows[7]:

> *"The Environment Agency is committed to ensuring that any industrial installation or waste operation we regulate will not contribute significantly to breaches of an AQS objective.*
>
> *It is a mandatory requirement of EPR legislation that we ensure that no single industrial installation or waste operation we regulate will be the sole cause of a breach of an EU air quality limit value. Additionally we have committed that no installation or waste operation will contribute significantly to a breach of an EU air quality limit value."*

2.3 Air Quality Assessment Levels

The AQALs applied in this assessment are taken from the 'AERA guidance' which in turn are taken from the AQS[5] and Air Quality Standards Regulations 2010 (Statutory Instrument 2010 No. 1001, 11th June 2010). In addition, consistent with the original EP application Schedule 5 responses, 1-hour maximum impacts have been evaluated against the US Acute Exposure Guideline Level 1 (US AEGL-1).

The AQALs that apply to this assessment are provided in Table 2-1.

Table 2-1
Applied AQALs

Pollutant		Annual AQAL (µg/m^3)	Short Term AQAL (µg/m^3)	Ref
NO_2	NO_2	40	200 (1-hour) not to be exceeded more than 18 times per year	AQSR
			956 (1-hour)	US AEGL-1

[6] Defra, Local Air Quality Management Technical Guidance (TG16), April 2021.

[7] Regulating to Improve Air Quality. AQPG3, version 1, Environment Agency, 14 July 2008.

Pollutant		Annual AQAL ($\mu g/m^3$)	Short Term AQAL ($\mu g/m^3$)	Ref
Particulates	(PM_{10})	40	50 (24-hour) not to be exceeded more than 35 times per year	AQSR
Particulates	($PM_{2.5}$)	25	---	AQSR
Carbon monoxide	(CO)	---	10,000 (8-hour daily mean)	AQSR
			30,000 (1-hour)	AERA

According to LAQM.TG(16), AQALs should only apply to locations where 'members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Authorities should not consider exceedances of the objectives at any location where relevant public exposure would not be realistic' (examples are provided in Table 2-2). This is emphasised in the EA Specified Generator modelling guidance that states the 1-hour mean should apply (but may not be limited to) 'residential properties, schools, hospitals, care homes, hotels, gardens, busy shopping streets, bus stations and railway stations that are not fully enclosed, and car parks where the public are reasonably expected to spend an hour or more'.

Longer term standards, such as annual means, should apply at houses or other locations which the public can be expected to occupy on a continuous basis. These standards do not apply to exposure at the workplace.

Table 2-2
Public Exposure

Averaging Period	AQALs should apply at:	AQALs should not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades 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 locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour and 8-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	All of the above, plus any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where public would not be expected to have regular access

2.4 Standards for Protection of Ecological Receptors

Standards for the protection of ecological receptors are known as Critical Levels (C_{Le}) (for airborne concentrations) and Critical Loads (C_{Lo}) (for deposition rates).

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, according to present knowledge. The C_{Le} for the protection of vegetation and ecosystems is specified within the AQSR and AERA guidance (see Table 2-3), as such the annual mean C_{Le} has statutory basis and the daily mean is an EA guidance value.

Table 2-3
Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	Concentration (µg/m^3)	Habitat and Averaging Period	Ref
Nitrogen oxides	30	Annual mean (all ecosystems)	AQSR
	75	Daily mean (all ecosystems)	AERA

2.4.2 Critical Loads (C_{Lo})

C_{Lo} 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, according to present knowledge. C_{Lo} are set for the deposition of various substances to sensitive ecosystems. In relation to combustion emissions C_{Lo} for acidification are relevant which can occur via both wet and dry deposition; however, on a local scale only dry (direct deposition) is considered significant.

Deposition of nitrogen can cause eutrophication and can cause acidification; the relevant C_{Lo} are presented in Section 4.0.

3.0 Assessment Methodology

The assessment methodology comprises dispersion modelling (see Appendix D for EA modelling checklist), with statistical analysis of the probability of short-term impacts occurring, and deposition calculations for assessment of impacts on ecological receptors.

The modelling approach is consistent with that presented for the original EP application.

3.1 Dispersion Modelling

3.1.1 Dispersion Model

For this assessment the United States (US) American Meteorological Society and Environmental Protection Agency Regulatory Model (AERMOD v10) dispersion model has been applied; this model is widely used and accepted by the EA for undertaking such assessments and its predictions have been validated against real-time monitoring data by the US Environmental Protection Agency (EPA).

3.1.2 Model Sensitivity

Model validation studies for AERMOD generally suggest that for the vast majority of cases it is able to predict maximum short-term high percentiles concentrations well within a factor of two; the latest evaluation study for AERMOD[8] shows the composite (geometric mean) ratio of predicted to observed short-term averages from 'test sites' (where real-time monitoring data has been undertaken to validate model performance) to be between 0.96 and 1.2.

3.1.3 Model Domain / Receptors

The modelling has been undertaken using discrete sensitive receptor locations representing relevant human and ecological exposure locations for the averaging periods of interest, as described in Section 4.5.

In addition, the modelling has been undertaken using a receptor grid across an Ordnance Survey map of the study area. Pollutant exposure isopleths are generated by interpolation between receptor points and superimposed onto the map. This method allows the maximum ground level concentration outside the site boundary to be assessed. A receptor grid was applied as follows:

- 1500m x 1500m at 50m grid resolution;
- 2500m x 2500m at 100m grid resolution; and
- 3500m x 3500m at 200m grid resolution.

3.1.4 Topography

The presence of elevated terrain can significantly affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

AERMOD utilises digital elevation data to determine the impact of topography on dispersion from a source. Topography was incorporated within the modelling using 30m resolution Shuttle Radar Topography Mission (SRTM) terrain data files. Data was processed by the AERMAP function within AERMOD to calculate terrain heights (see Figure 4-2).

[8] U.S. Environmental Protection Agency AERMOD Model Formulation and Evaluation EPA-454/ R-18-003 (April, 2018).

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 which are within a distance defined as five times the lesser of the height or maximum projected width of the building.

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Buildings input to the model are represented in Figure 3-1.

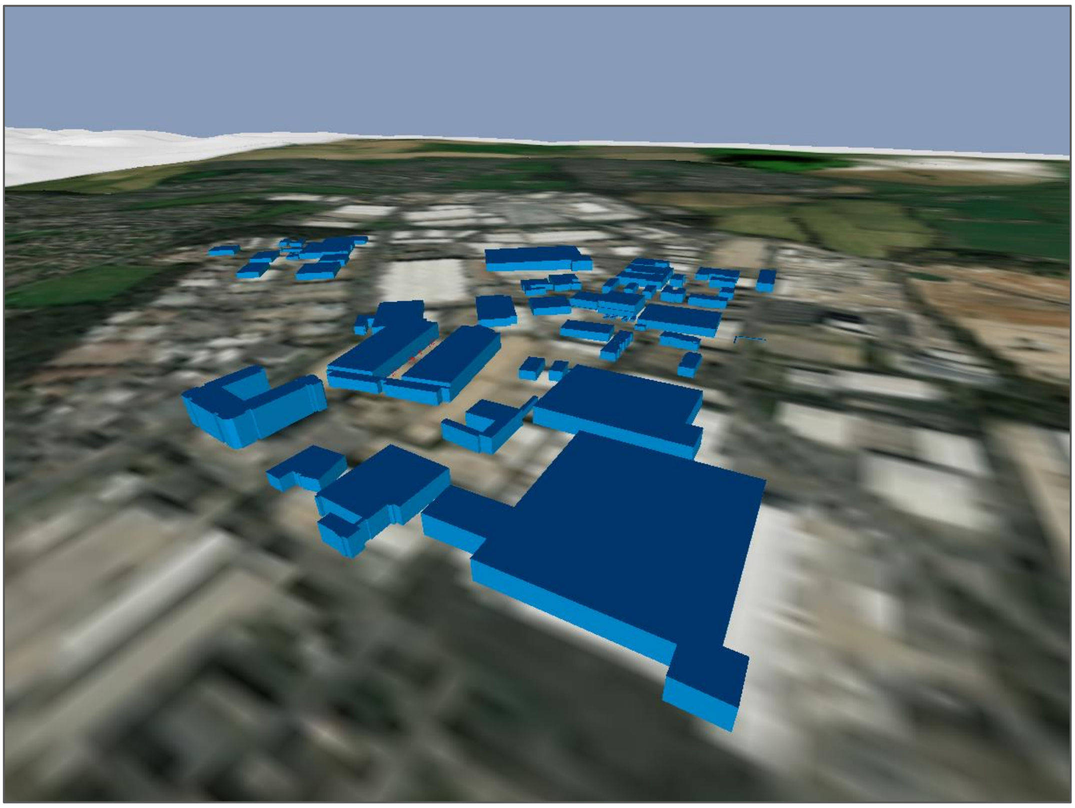

Figure 3-1
Modelled Buildings

3.1.6 Dispersion Coefficients

The 'rural' option for dispersion coefficients was selected in accordance with AERMOD guidance[9].

3.1.7 Meteorological Data and Preparation

Following consultation with the meteorological data provider, it was concluded that Luton Airport, located approximately 13km to the north-east of the site, would provide the most complete and representative data set for purposes of this assessment. A 5-year data set for this station, covering the period 2015 – 2019 (inclusive) has been used for this assessment. This accounts for inter-year variability in meteorological conditions. A windrose is presented in Figure 4-3.

[9] EPA, AERMOD Implementation Workgroup, Aermod Implementation Guide (August 3, 2015).

The meteorological data was obtained in .met format from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET View meteorological pre-processor. Details specific to the site location were used to define surface roughness, albedo and bowen ratio in the conversion (see Table 3-1).

Table 3-1
Applied Surface Characteristics

Zone (Start)	Zone (End)	Albedo	Bowen Ratio	Surface Roughness (m)
0	255	0.28	0.75	0.300
255	360	0.21	1.63	1.000

3.2 Assessment of Impacts on Air Quality

3.2.1 NO_x to NO_2

With respect to NO_x emissions, the EA Air Quality Modelling and Assessment Unit (AQMAU) guidance[10] on conversion ratio for NO_x and NO_2 has been followed, i.e. a worst-case scenario has been applied in that 70% of NO_x is present as NO_2 in relation to long-term impacts and 35% of NO_x is present as NO_2 in relation to short-term impacts.

3.2.2 Particle Size

In air quality terms particulate matter (PM) is classified in terms of its aerodynamic diameter; with PM_{10} relating to particles with an aerodynamic diameter of less than 10µm. Other smaller relevant fractions of particulate matter such as $PM_{2.5}$ (aerodynamic diameter less than 2.5µm) are a sub-fraction of the PM_{10} fraction i.e. PM_{10} includes $PM_{2.5}$.

For the purposes of this assessment 100% of PM has been assumed to be PM_{10} and 100% to be $PM_{2.5}$. This approach ensures that a worst-case scenario has been considered for the smallest particles.

3.2.3 Statistical Analysis of Short-Term Impacts

The approach to assessment of short-term impacts adopted is consistent with AQMAU's approach defined in the 'Guidance on dispersion modelling for oxides of nitrogen assessment from generators'. The approach requires modelling the impact of the generator plant for 8,760 hours of the year in order to ensure that the operating hours coincide with the worst-case dispersal conditions.

In order to determine the probability of an exceedance of the hourly standard for a short-term infrequent operation, the cumulative hypergeometric distribution has been used (with the 2.5 factor applied for consecutive operating time periods) to assess the likelihood of exceedance hours coinciding with the operational hours. The EA guidance provides the following framework to apply to the calculated probability:

- probabilities of 1% or less indicate exceedances are highly unlikely;
- probabilities of less than 5% indicate exceedances are unlikely; and
- probabilities of 5% or more indicate there is potential for exceedances and this may not be considered acceptable on a case-by-case basis.

[10] Environment Agency, Air Quality Modelling and Assessment Unit, 'Conversion Ratios for NO_x and NO_2' (no date).

3.2.4 Treatment of Model Output Summary

The assessment of impacts against the AQALs as defined in Section 2.2 was undertaken using model output as described in Table 3-2 below.

Table 3-2
Model Outputs

AQAL being assessed	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
NO_2 1 Hour Mean. Not to be exceeded more than 18 times a calendar year	99.79%ile of 1-hour means. PC factored for 35% of NO_x present as NO_2. Threshold violation file (threshold set at 200µg/m^3 minus 2x annual mean background, converted to NO_x assuming 35% of NO_x present as NO_2) counts number of hours per annum exceeding threshold.	Probability of exceedance calculated using hypergeometric distribution.
NO_2, PM_{10} and $PM_{2.5}$ Annual Mean	Annual mean from 5 met. years (factored for operational hours). PC factored for 70% of NO_x present as NO_2	PC + annual mean background
CO 8-hour rolling mean	Maximum 8-hour mean	PC + 2 x annual mean background
CO and NO_2 1-hour maximum[(a)]	Maximum 1-hour mean	PC + 2 x annual mean background
PM_{10} 24-hour mean. Not to be exceeded more than 35 times a calendar year	90.4%ile of 24 hour means for PM_{10}	PC + annual mean background
NO_x Daily Critical Level	24-hour maximum.	PC + 2 x annual mean background
NO_x Annual Mean Critical Level	Annual mean from 5 met. years (factored for operational hours)	PC + annual mean background

Table note: (a) As per the EA's guidance the peak 1-hour NO_2 concentration has also been presented; although there is no AQAL to compare this with.

3.2.5 Assessment of Annual Mean Impact and Significance

In accordance with the EA's AERA guidance, the impact is considered to be insignificant or negligible if the long-term process contribution (PC) is <1% of the long-term AQAL. For PCs that cannot be considered insignificant further assessment has been undertaken and the Predicted Environmental Concentration (PEC: PC + existing background pollutant concentration) determined for comparison as a percentage of the relevant AQAL.

3.3 Assessment of Impacts on Vegetation and Ecosystems

3.3.1 Calculation of Contribution to Critical Loads

Deposition rates were calculated using empirical methods recommended by the EA AQTAG06[11]. Dry deposition flux was calculated using the following equation:

Dry deposition flux (µg/m^2/s) = ground level concentration (µg/m^3) x deposition velocity (m/s)

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow, and is not considered significant over short distances (AQTAG06) compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered consistent with AQTAG06.

The applied deposition velocities for the relevant chemical species are as shown in Table 3-3.

Table 3-3
Applied Deposition Velocities

Chemical Species	Recommended Deposition Velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030

The predicted deposition rates were converted from µg/m^2/s to units of nitrogen deposition and acid equivalent deposition as detailed in Table 3-4.

Table 3-4
Applied Deposition Conversion Factors

	Conversion from NO_2 µg/m^2/s to:	Factor
N deposition	N kg/ha/year	95.9
Acid deposition	kg_{eq}/ha/year	6.84

Calculation of PC as a percentage of Acid Critical Load Function

The calculation of the process contribution of N to the acid C_{Lo} function has been carried out according to the guidance on the Air Pollution Information System (APIS), which is as follows:

'The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less that CLminN only the acidifying effects of sulphur from the process need to be considered:

Where PEC N Deposition < CLminN

*PC as % CL function = (PC S deposition/CLmaxS)*100*

Where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.

[11] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

Where PEC N Deposition > CLminN

*PC as %CL function = ((PC of S+N deposition)/CLmaxN)*100'*

3.3.2 Assessment of Impact and Significance

In addition to the AERA guidance, the EA's Operational Instruction 66_12[12] details how the air quality impacts on ecological sites should be assessed. This guidance provides risk based screening criteria to determine whether impacts will have 'no likely significant effects (alone and in-combination)' for European sites, 'no likely damage' for Sites of Special Scientific Interest (SSSI) and 'no significant pollution' for other sites, as follows:

- PC <1% long-term C_{Le} and/or C_{Lo} or that the PEC <70% long-term C_{Le} and/or C_{Lo} for European sites and SSSIs;
- PC <10% short-term C_{Le} for NO_x (if applicable) for European sites and SSSIs;
- PC <100% long-term C_{Le} and/or C_{Lo} other conservation sites; and
- PC <100% short-term C_{Le} for NO_x (if applicable) for other conservation sites.

Where impacts cannot be classified as resulting in 'no likely significant effect', more detailed assessment may be required depending on the sensitivity of the feature in accordance with EA's Operational Instruction 67_12[13]. This can require the consideration of the potential for in-combination effects, the actual distribution of sensitive features within the site, and local factors (such as the water table).

The guidance provides the following further criteria:

- if the PEC does not exceed 100% of the appropriate limit it can be assumed there will be no adverse effect;
- if the background is below the limit, but a small PC leads to an exceedance – decision based on local considerations;
- if the background is currently above the limit and the additional PC will cause a small increase – decision based on local considerations;
- if the background is below the limit, but a significant PC leads to an exceedance – cannot conclude no adverse effect; and
- if the background is currently above the limit and the additional PC is large – cannot conclude no adverse effect.

[12] EA Operational Instruction 66_12 - Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation.
[13] EA Operational Instruction 67_12 - Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation.

4.0 Baseline Environment

4.1 Site Location

The 4 sites that make up the installation are located within the Maylands Business Park, Hemel Hempstead. The approximate National Grid References (NGR) are:

- Maylands: x507400, y208465;
- Centro: x507990, y208410;
- Campus: x507865, y208165; and
- HH4: x508490, y207675.

The surrounding area is predominately in commercial use (as manufacturing, storage depots, stores serving building trades, etc.) with residential uses beyond on the edge of the industrial estate. The site location is illustrated in Figure 4-1.

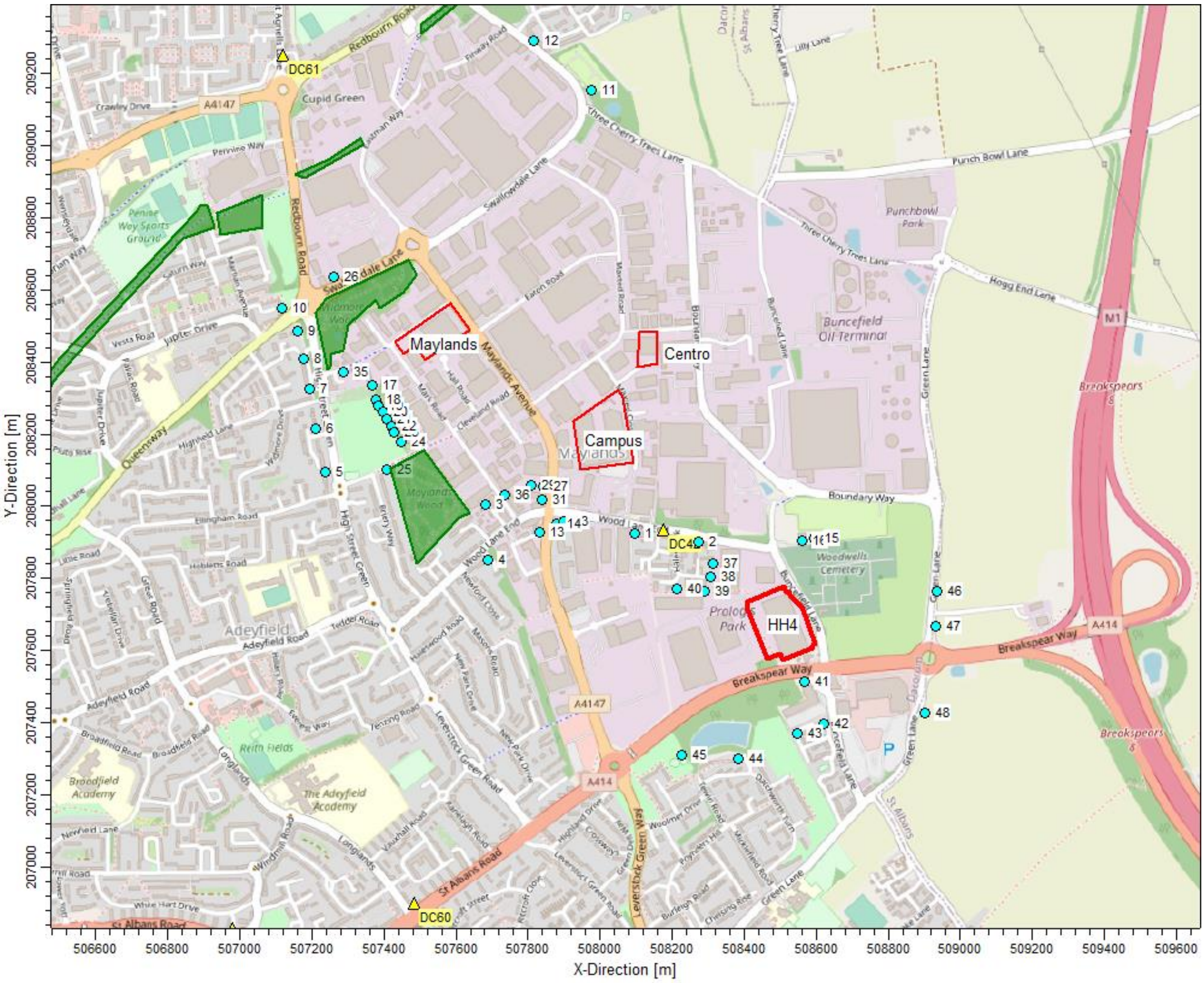

Figure 4-1
Site Setting

4.2 Local Air Quality Management

The installation is located within the administrative boundary of Dacorum Borough Council (DBC) for LAQM and close to the boundary with St Albans Council. Both councils have declared AQMAs due to exceedances of the annual mean AQAL for NO_2. None of the AQMAs are within 2km of the installation.

4.3 Background Air Quality

4.3.1 Defra Background Air Quality Maps

Defra provide modelled background pollutant concentration data on a 1km x 1km spatial resolution across the UK that is routinely used to support LAQM and Air Quality Assessments[14]. The background pollutant concentrations are based upon the 2018 base year and can be projected to future years. The 2022 projected backgrounds for the study area are presented in Table 4-1.

Table 4-1
Defra Modelled Annual Mean Background Concentrations

X-OSGR / Y-OSGR	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	CO (µg/m^3)
508500, 207500	14.9	14.60	9.75	188
507500, 208500	15.0	14.18	9.53	192
507500, 207500	13.2	14.32	9.70	193
507500, 209500	12.5	13.79	9.32	182

4.3.2 Air Quality Monitoring

A review of the Automatic Urban and Rural Network (AURN) operated by Defra and Local Authority monitoring sites has been undertaken for locations that could be used to assign baseline concentrations for the assessment.

The closest sites are passive diffusion tube monitoring sites operated by DBC including a site classified as 'background'. Details and results from the closest monitoring locations are presented in Table 4-2 (and locations presented in Figure 4-1). The monitoring data shows that baseline concentrations (this incorporates current operations across the 4 data centre sites) are well below the annual mean AQAL for NO_2 for the period presented 2015-2019.

Table 4-2
Diffusion Tube Annual Mean Results

ID	Type	Distance to Kerb of Nearest Road	2015 (µg/m^3)	2016 (µg/m^3)	2017 (µg/m^3)	2018 (µg/m^3)	2019 (µg/m^3)
DC 42	Background	1m	21.0	21.5	19.4	20.8	19.6
DC 60	Background	17m	20.9	22.4	19.2	20.3	20.8
DC 61	Roadside	1m	26.3	27.0	26.0	24.5	26.1

[14] Defra, UK Air Information Resource (UK-AIR) website, http://uk-air.defra.gov.uk/.

4.3.3 Background Applied in Assessment

On the basis of the review of monitoring data and Defra backgrounds a value of 26.1µg/m^3 has been applied in the assessment of impact at relevant human exposure locations which represents a precautionary approach (i.e. the highest value has been applied).

4.4 Sensitive Receptors

Discrete sensitive receptors (shown in Figure 4-1) comprising the closest relevant exposure locations (considering the guidance in Section 2.3) have been selected. These comprise residential locations, cafes, and other short-term exposure locations (e.g. allotments and parks). The future residential development within the planning system to the east off Green Lane has also been included. The residential locations include high rise residential blocks which have been modelled across a range of floors.

Table 4-3
Discrete Receptor Locations Assessed

Receptors	Type	Relevant Exposure Averaging Period
DR1 – DR12	Residential	Annual, 24-hour, 8-hour and 1-hour
DR13	Café	1-hour
DR14	Café/Residential	Annual, 24-hour, 8-hour and 1-hour
DR15 – 16	Day Care Centre and Garden	Annual, 24-hour, 8-hour and 1-hour
DR17	Allotments	8-hour and 1-hour
DR18 – DR24	Park	1-hour
DR25 – DR26	Residential	Annual, 24-hour, 8-hour and 1-hour
DR27 – DR34	Residential High Rise (1.5m and 20m)	Annual, 24-hour, 8-hour and 1-hour
DR35	Residential	Annual, 24-hour, 8-hour and 1-hour
DR36	Café	1-hour
DR37 – DR40	Residential	Annual, 24-hour, 8-hour and 1-hour
DR41	Hotel	24-hour, 8-hour and 1-hour
DR42 – DR44	Residential	Annual, 24-hour, 8-hour and 1-hour
DR45	Park	1-hour
DR46 – DR47	(Proposed) Residential	Annual, 24-hour, 8-hour and 1-hour

4.5 Ecological Receptors

The AERA guidance requires that ecological habitats should be assessed against relevant standards if they are located within the following set distances from the installation:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10km of the installation; and
- SSSIs, National Nature Reserves (NNR), Local Nature Reserves (LNR), Local Wildlife Sites (LWS) and Ancient Woodland (AW) within 2km of the installation.

Designated sites within the set screening distances are presented in Table 4-4.

Table 4-4
Ecological Receptors

Interest Status	Site (Designation)	Ref
European	Chilterns Beechwoods (SAC) Asperulo-Fagetum beech forests and Beech forests on neutral to rich soils	ER1
Local	Howe Grove Wood (LNR)	ER2
	Disused Railway Line, Hemel Hempstead (LWS)	ER3
	Nicky Way Dismantled Railway (LWS)	ER4
	High Wood (LWS)	ER5
	Woodhall Wood (LWS)	ER6
	Widmore Wood (LWS)	ER7
	Maylands Wood (LWS)	ER8
	Paradise Fields Central (LWS)	ER9
	Rant Meadow Wood/Bennets End Pit (LWS)	ER10
	Holy Trinity Church, Leverstock Green (LWS)	ER11
	Unnamed Ancient Woodland (AW)	ER12

The APIS is a support tool for assessment of potential effects of air pollutants on habitats and species developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology. APIS has been used to provide information on:

- identification of whether the habitats present are sensitive to effects caused by potential emissions;
- current baseline concentrations (Table 4-5); and
- C_{Lo} and current deposition rates (Table 4-5 and Table 4-6).

Table 4-5
NO_x, Nitrogen Critical Loads and Current Loads

ID	Habitat Critical Load Class (most sensitive)	APIS NO_x Background ($\mu g/m^3$)	Critical Load Range (kg N/ha/yr)	Current Load (kg N/ha/yr)
ER1	Fagus woodland	13.03	10 - 20	34.60
ER2	Broadleaved deciduous woodland	20.44	10 - 20	34.44
ER3	Broadleaved deciduous woodland	20.44	10 - 20	34.44
ER4	Broadleaved deciduous woodland	20.44	10 - 20	34.44
ER5	Broadleaved deciduous woodland	17.56	10 - 20	35.84
ER6	Broadleaved deciduous woodland	20.71	10 - 20	34.44
ER7	Broadleaved deciduous woodland	25.48	10 - 20	34.44

ID	Habitat Critical Load Class (most sensitive)	APIS NO_x Background (μg/m^3)	Critical Load Range (kg N/ha/yr)	Current Load (kg N/ha/yr)
ER8	Broadleaved deciduous woodland	25.48	10 - 20	34.44
ER9	Broadleaved deciduous woodland	23.28	10 - 20	34.44
ER10	Broadleaved deciduous woodland	21.98	10 - 20	34.44
ER11	Broadleaved deciduous woodland	21.54	10 - 20	34.44
ER12	Broadleaved deciduous woodland	25.48	10 - 20	34.44

Table 4-6
Acid Critical Load Functions and Current Loads

ID	Habitat Critical Load Class (most sensitive)	Critical Load Function (kg_{eq}/ha/yr)			Current Load (kg_{eq}/ha/yr)	
		CLmaxS	CLminN	CLmaxN	N	S
ER1	Unmanaged Broadleafed/Coniferous Woodland	1.505	0.142	1.647	2.56	0.23
ER2	Broadleafed/Coniferous unmanaged woodland	1.839	0.142	1.981	2.46	0.21
ER3	Broadleafed/Coniferous unmanaged woodland	1.839	0.142	1.981	2.46	0.21
ER4	Broadleafed/Coniferous unmanaged woodland	1.839	0.142	1.981	2.46	0.21
ER5	Broadleafed/Coniferous unmanaged woodland	1.831	0.142	1.973	2.56	0.20
ER6	Broadleafed/Coniferous unmanaged woodland	1.843	0.142	1.985	2.46	0.21
ER7	Broadleafed/Coniferous unmanaged woodland	1.840	0.142	1.982	2.46	0.21
ER8	Broadleafed/Coniferous unmanaged woodland	1.840	0.142	1.982	2.46	0.21
ER9	Broadleafed/Coniferous unmanaged woodland	1.835	0.142	1.977	2.46	0.21
ER10	Broadleafed/Coniferous unmanaged woodland	1.836	0.142	1.978	2.46	0.21
ER11	Broadleafed/Coniferous unmanaged woodland	1.836	0.142	1.978	2.46	0.21
ER12	Broadleafed/Coniferous unmanaged woodland	1.840	0.142	1.982	2.46	0.21

4.6 Topography

The installation lies at approximately 140m above ordnance datum (AOD) and the topography in the surrounding area within a 2km radius is relatively flat with some small rises in the landscape to the north-west to approximately 150mAOD. To the west the land falls to 90mAOD toward the River Gade. The topography is considered unlikely to have a significant effect on the dispersion of emissions from the stacks; however, it has been included within the dispersion model for receptor heights.

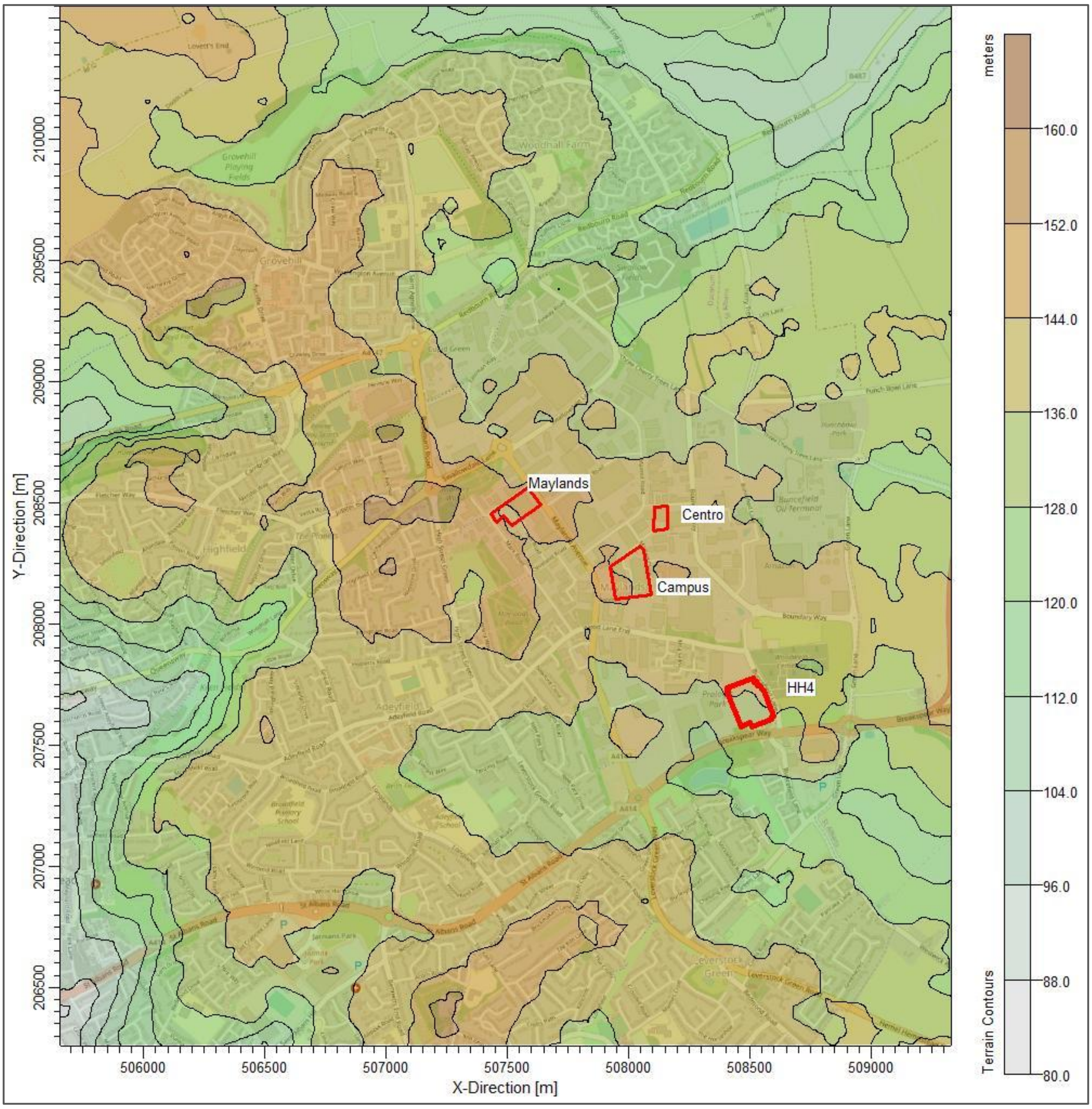

Figure 4-2
Surrounding Topography

4.7 Meteorological Conditions

A windrose for Luton Airport observing station for a 5-year period (2015 to 2019), providing the frequency of wind speed and direction, is presented in Figure 4-3 below. The windrose shows winds from the south-west are most frequent with winds from the south-east least frequent.

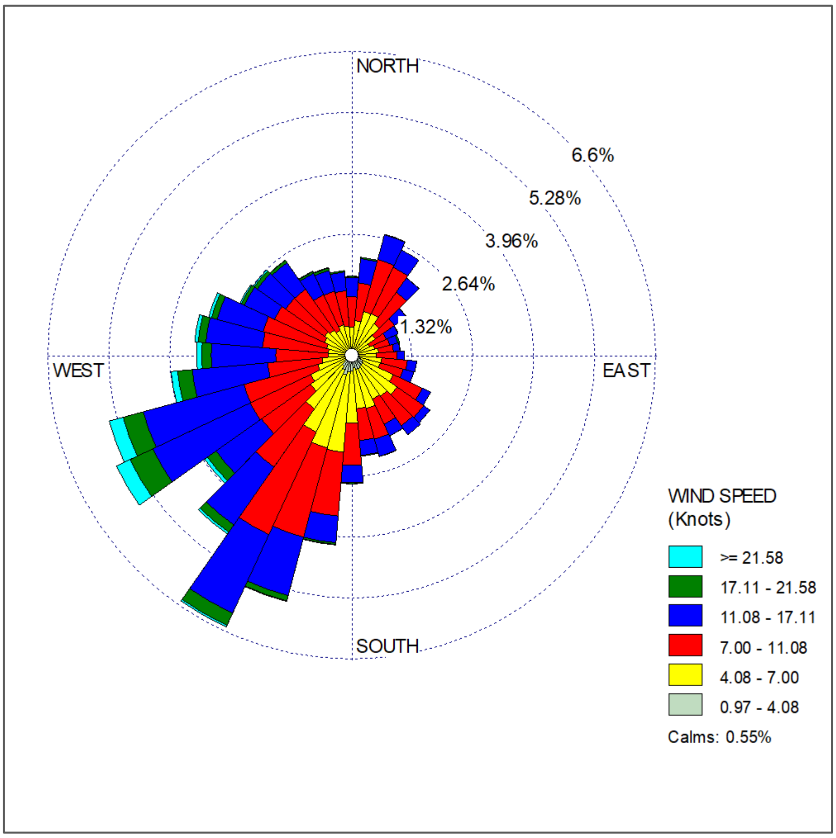

Figure 4-3
Windrose (Luton Airport 2015 -2019)

5.0 Emissions to Atmosphere

5.1 Emissions Sources

Across the sites 4 different SBG models are in use. The HH4 Phase 2 SBGs will be Kohler SDMO T2500C's (2,000KW$_e$ output) with NOx emissions optimised to 2,000mg/Nm^3 at 5% O_2 (equivalent to 750mg/Nm^3 at 15% O_2), these are the same as the HH4 Phase 1 SBGs. The emission parameters applied in the modelling and emission rates are provided in Table 5-1, the parameters are consistent with the original EP application. The T2500C proposed for HH4 Phase 2, according to the Manufacturers Specification sheet, are emission optimised for NOx to 750mg/Nm^3 at 15% oxygen. The SBG configuration (and stack height) at each site is presented in Table 5-3.

Table 5-1
Emission Characteristics by SBG Model

Parameter	Generator Model				
	X1000	X2200	KD1800	X1850	T2500C
Number of stacks per SBG	1	1	1	2	1
Stack Internal Diameter (m)	0.40	0.50	0.35	0.30	0.56
Volume Flow[(a)] (Nm^3/s) per SBG	2.2	4.9	2.7	3.4	5.3
Emission Temperature (°C)	495	480	504	470	500
Oxygen Content (% O_2 dry gas)	9.5	9.5	9.5	9.5	9.5
Moisture content (% H_2O)	8	8	8	8	8
Actual Flow Rate (Am^3/s) per SBG	3.5	7.6	4.4	5.2	8.4
Emission velocity (m/s) per stack	27.9	38.7	45.5	36.8	34.5
NOx Concentration (mg/Nm^3)[(b)]	750	750	750	750	750
NOx Emission (g/s) per SBG	1.65	3.65	2.04	2.53	3.94
CO Concentration (mg/Nm^3)	650	650	650	650	650
CO Emission (g/s) per SBG	1.43	3.16	1.77	2.19	3.42
PM Concentration (mg/Nm^3)	130	130	130	130	50
PM Emission (g/s) per SBG	0.29	0.63	0.35	0.44	0.26

Table Note:

a) Normalised to 273K, 15% O_2, dry, 101.3kpa

b) Equivalent to 2,000mg/Nm^3 at 5%O_2

5.2 Operating Scenarios

The operating scenarios at the sites include the following:

1. Routine Maintenance Schedule Operations - the predictable, managed testing and maintenance activity for the standby plant (Maintenance Schedule Model); and
2. Emergency Outage Operations - the unpredictable emergency grid outage any time during the year

requiring the maximum plant to operate for the required outage duration (Outage Model). The following have been investigated consistent with the original EP Application:

- a realistic emergency scenario of 1-hour; and
- a highly precautionary hypothetical scenario of 36 hours outage.

The approach to modelling each maintenance scenario and the assumptions made are as presented in Table 5-2 and Table 5-3.

The testing and maintenance routine has been modelled according to whether the maintenance 'event' requires SBGs to be tested individually (annual UPS, annual load test) or on a suite by suite basis (monthly maintenance, black building test). The assessment is precautionary in that:

- all SBGs are modelled at full load (which is not the case for UPS wrap around maintenance); and
- the suite configuration that leads to the highest mass emission rate at each site has been modelled.

Table 5-2
Assessment Scenarios

Operational Scenarios		Model Scenarios
Routine Maintenance Schedule Operations	**Monthly maintenance (1 hour per month, i.e. 12 hours per year).** SBGs at partial load or load. SBGs tested on a suite by suite basis.	**Maintenance Schedule Model 1 (MSM1)** 1 suite at Maylands (comprising 2 X2200 SBGs), 1 suite at Centro (all 4 SBGs), 1 suite at Campus (comprising 3 X1850 SBGs), and 1 suite at HH4 (comprising 5 T2500C SBGs) modelled operating continuously. Annual mean impacts assessed to account for 13 hours (monthly maintenance 12hr + black building test 1hr) of simultaneous operation per suite per year: • Centro 13 hours (1 suite) • Maylands 78 hours (6 suites) • Campus 169 hours (13 suites) • HH4 78 hours (6 suites) Maximum daily mean NO_x factored for 1 hour of operation per day. MSM1 and MSM2 (see below) impacts for each site are combined with hypergeometric mean analysis based upon the site operational hours above.
	Black Building Test (20mins to 1-hour per year). SBGs at load tested on a suite by suite basis.	
	Annual UPS wrap around maintenance (6 to 12 hours on one day per year). SBGs are tested one at a time with the exception of Centro. SBGs off-load so lower emissions.	**Maintenance Schedule Model 2 (MSM2)** 1 SBG at Maylands (comprising 1 X2200), 4 SBGs at Centro, 1 SBG at Campus (comprising 1 KD1800), 1 SBG at HH4 (comprising 1 T2500C) modelled operating continuously at the same time. Annual mean impacts assessed to account for 16 hours (annual UPS 12hrs + Annual Load 4hrs) of operation per generator per year for each site: • Centro 64 hours (4 SBGs)
	Annual load tests (4 hours on 1 day per year).	

<table>
<tr><th colspan="2">Operational Scenarios</th><th>Model Scenarios</th></tr>
<tr><td></td><td>SBGs are tested one at a time with the exception of Centro. SBG on load.</td><td>• Maylands 224 hours (14 SBGs)
• Campus 496 hours (31 SBGs)
• HH4 448 hours (28 SBGs)
Maximum daily mean NO_x factored for 12 hours of operation per day.
MSM1 and MSM2 impacts for each site are combined with hypergeometric mean analysis based upon the site operational hours above.</td></tr>
<tr><td colspan="2">Emergency Outage Operations
All SBGs operate (minus redundancy). Event could affect sites individually or simultaneously.</td><td>Outage Model (OM)
All SBGs operate (minus redundancy) simultaneously across all 4 sites. Two scenarios have been investigated:
- realistic 1-hour outage
- hypothetical highly precautionary 36-hour outage
1-hour mean impacts subject to statistical analysis for operational hours per year.
Annual mean factored to account for operational hours per year.
Maximum daily mean NO_x factored for operational hours.</td></tr>
</table>

Table 5-3
SBG List

Site		Model ID	SBG Model Specification	Stack Height (mAGL)	SBGs 'on' in assessment scenarios		
					MSM1[(a)]	MSM2[(a)]	OM
Maylands	Suite 1	ML1	X1000	2.70	-	-	Y
		ML2	X1000	2.70	-	-	-
		ML3	X1000	2.70	-	-	Y
		ML4	X1000	2.70	-	-	-
	Suite 2	ML5	X2200	6.60	-	-	Y
		ML6	X2200	6.60	-	-	-
	Suite 3	ML7	X2200	6.60	-	-	Y
		ML8	X2200	6.60	-	-	-
	Suite 4	ML9	X2200	6.60	-	-	Y

Site		Model ID	SBG Model Specification	Stack Height (mAGL)	SBGs 'on' in assessment scenarios		
					MSM1[(a)]	MSM2[(a)]	OM
		ML10	X2200	6.60	-	-	-
	Suite 5	ML11	X2200	6.60	-	-	Y
		ML12	X2200	6.60	-	-	-
	Suite 6	ML13	X2200	6.60	Y	-	Y
		ML14	X2200	6.60	Y	Y	-
Centro	Suite 1	CENT1	X1000	2.70	Y	Y	Y
		CENT2	X1000	2.70	Y	Y	Y
		CENT3	X1000	2.70	Y	Y	Y
		CENT4	X1000	2.70	Y	Y	-
Campus	Suite 1	CP1	X1850	8.34	-	-	Y
		CP2	X1850	8.34	-	-	Y
		CP3	X1850	8.34	-	-	-
	Suite 3	CP4	X1850	8.34	-	-	Y
		CP5	X1850	8.34	-	-	Y
		CP6	X1850	8.34	-	-	-
	Suite 5	CP7	X1850	8.34	-	-	Y
		CP8	X1850	8.34	-	-	-
	Suite 6	CP9	X1850	8.34	Y	-	Y
		CP10	X1850	8.34	Y	Y	Y
		CP11	X1850	8.34	Y	-	-
	Suite 8	CP12	X1850	8.34	-	-	Y
		CP13	X1850	8.34	-	-	Y
		CP14	X1850	8.34	-	-	-
	Suite 10	CP15	X1850	8.34	-	-	Y
		CP16	X1850	8.34	-	-	-
	Failover 1	CP17	KD1800	8.34	-	-	-

Site		Model ID	SBG Model Specification	Stack Height (mAGL)	SBGs 'on' in assessment scenarios		
					MSM1[(a)]	MSM2[(a)]	OM
	Suite 11	CP18	KD1800	8.34	-	-	Y
		CP19	KD1800	8.34	-	-	-
	Suite 13	CP20	KD1800	8.34	-	-	Y
		CP21	KD1800	8.34	-	-	-
	Suite 15	CP22	KD1800	8.34	-	-	Y
	Suite 16	CP23	KD1800	8.34	-	-	Y
		CP24	KD1800	8.34	-	-	-
	Suite 18	CP25	KD1800	8.34	-	-	Y
		CP26	KD1800	8.34	-	-	-
	Suite 20	CP27	KD1800	8.34	-	-	Y
	Failover 2	CP28	KD1800	8.34	-	-	-
	House	CP29	X1000	8.32	-	-	Y
		CP30	X1000	8.32	-	-	-
	Cooling	CP31	KD1800	19.10	-	-	Y
HH4	Suite 1	HH4_1	T2500C	12.00	-	-	Y
		HH4_2	T2500C	12.00	-	-	Y
		HH4_3	T2500C	12.00	-	-	Y
		HH4_4	T2500C	12.00	-	-	Y
	Suite 2	HH4_6	T2500C	12.00	-	-	Y
		HH4_7	T2500C	12.00	-	-	Y
		HH4_8	T2500C	12.00	-	-	Y
		HH4_9	T2500C	12.00	-	-	Y
		HH4_10	T2500C	12.00	-	-	-
	Suite 3	HH4_11	T2500C	12.00	Y	-	Y
		HH4_12	T2500C	12.00	Y	-	Y
		HH4_13	T2500C	12.00	Y	-	Y

Site		Model ID	SBG Model Specification	Stack Height (mAGL)	SBGs 'on' in assessment scenarios		
					MSM1[(a)]	MSM2[(a)]	OM
		HH4_14	T2500C	12.00	Y	-	Y
		HH4_15	T2500C	12.00	Y	Y	-
	Suite 4	HH4_16	T2500C	12.00	-	-	Y
		HH4_17	T2500C	12.00	-	-	Y
		HH4_18	T2500C	12.00	-	-	Y
		HH4_19	T2500C	12.00	-	-	Y
		HH4_20	T2500C	12.00	-	-	-
	Suite 5	HH4_21	T2500C	12.00	-	-	Y
		HH4_22	T2500C	12.00	-	-	Y
		HH4_23	T2500C	12.00	-	-	Y
		HH4_24	T2500C	12.00	-	-	Y
	Suite 6	HH4_26	T2500C	12.00	-	-	Y
		HH4_27	T2500C	12.00	-	-	Y
		HH4_28	T2500C	12.00	-	-	Y
		HH4_29	T2500C	12.00	-	-	Y
	Suite 3	HH4_30	T2500C	12.00	-	-	Y

Table note: (a) A suite or SBG situated centrally has been selected in order that impacts are representative of the entirety of suite by suite or SBG by SBG testing throughout the year.

5.2.1 Commissioning Scenario

In addition to the above, consideration has been given to the commissioning of the Phase 2. The commissioning tests are summarised below:

- SBGs tested on a suite by suite basis (24 hours per suite), referred to as 'CSM1':
  - IST Testing – 2 x 12-hour tests (24 hours cumulative);
- Each SBG tested individually (total 260 hours for 13 SBGs combined), referred to as 'CSM2':
  - Temporary Loadbank – 12 hours;
  - Busbars – 5 hours;
  - UPS Commissioning – 3 hours.

The commissioning is assumed to take approximately 3 months, as a precautionary approach it has been assumed that there will be a full 9 months of routine testing also taking place within the same year including repeats of annual load and black building tests, however depending upon when commissioning starts this may be less. Table 5-4 provides a summary of the total testing hours for Phase 2 during the year of commissioning.

Table 5-4
Total SBG Run Hours During Commissioning Year

Scenario	Modelling test type	No. SBGs / Suites	Hours per SBG per test type	Total Hours per test type
Phase 2 Commissioning Testing	CSM1	13 / 3	24	72
	CSM2	13 / 3	20	260
9 months of Routine testing of Phase 2 after Commissioning	MSM1	15 / 3	10	30
	MSM2	15 / 3	16	240
Total hours for Year	CSM1 + MSM1	28 / 6	34	102
	CMS2 + MSM2	28 / 6	36	500

6.0 Results

6.1 Maintenance Schedule Model

6.1.1 Annual Mean NO_2 Impacts

The predicted annual mean NO_2 impacts, combined for MSM1 and MSM2 from all sites, at receptor locations relevant for ‘annual mean’ exposure, are presented in Table 6-1. The PEC is not predicted to exceed the AQAL at any of the selected receptors.

Table 6-1
Impacts on Annual Mean NO_2 AQAL

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR1	0.7	1.7%	26.8	67.0%
DR2	0.7	1.8%	26.8	67.0%
DR3	0.4	1.1%	26.5	66.4%
DR4	0.4	1.0%	26.5	66.3%
DR5	0.2	0.5%	26.3	65.8%
DR6	0.2	0.5%	26.3	65.7%
DR7	0.2	0.5%	26.3	65.7%
DR8	0.2	0.4%	26.3	65.7%
DR9	0.2	0.5%	26.3	65.7%
DR10	0.2	0.4%	26.3	65.7%
DR11	0.3	0.7%	26.4	65.9%
DR12	0.2	0.5%	26.3	65.8%
DR14	0.9	2.2%	27.0	67.5%
DR16	1.5	3.7%	27.6	68.9%
DR25	0.3	0.8%	26.4	66.1%
DR26	0.3	0.6%	26.4	65.9%
DR27	1.0	2.6%	27.1	67.8%
DR28	0.9	2.2%	27.0	67.4%
DR29	0.8	2.1%	26.9	67.3%
DR30	0.7	1.8%	26.8	67.0%
DR31	0.9	2.4%	27.0	67.6%
DR32	0.8	2.1%	26.9	67.3%
DR33	0.9	2.3%	27.0	67.6%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR34	0.8	2.1%	26.9	67.3%
DR35	0.2	0.6%	26.3	65.8%
DR37	0.7	1.8%	26.8	67.0%
DR38	0.7	1.8%	26.8	67.1%
DR39	0.7	1.7%	26.8	67.0%
DR40	0.5	1.4%	26.6	66.6%
DR42	0.4	0.9%	26.5	66.2%
DR43	0.3	0.8%	26.4	66.0%
DR44	0.4	0.9%	26.5	66.1%
DR45	0.3	0.7%	26.4	66.0%
DR46	0.5	1.2%	26.6	66.5%
DR47	0.4	1.0%	26.5	66.3%
DR48	0.3	0.8%	26.4	66.0%

6.1.2 1-hour Mean NO_2 Impacts

The risks of exceedances of the 1-hour mean NO_2 AQAL at receptor locations are presented in Table 6-2. The table presents the number of hours that the PEC potentially exceeds 200µg/m³ (based on 8,760 hours operation), and the probability of there being more than the allowance (of 18 exceedances) given the number of planned testing hours at each site. The findings are that the risk of exceedances is less than 1% and therefore 'highly unlikely'. Furthermore, the AEGL-1 is not exceeded at any receptor location.

Table 6-2
Risk of Exceedance of 1-hour Mean NO_2 AQAL

Receptors	Maximum Potential 1 hour mean (100%ile) NO_2 PC ($\mu g/m^3$)	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	Summed Probability of exceedance
		Centro				Maylands				Campus				HH4				
DR1	578	39	0.0%	39	0.0%	0	0.0%	0	0.0%	33	0.0%	0	0.0%	76	0.0%	0	0.0%	0.0%
DR2	782	31	0.0%	31	0.0%	0	0.0%	0	0.0%	25	0.0%	0	0.0%	122	0.0%	0	0.0%	0.0%
DR3	560	27	0.0%	27	0.0%	0	0.0%	0	0.0%	41	0.0%	1	0.0%	23	0.0%	0	0.0%	0.0%
DR4	483	28	0.0%	28	0.0%	0	0.0%	0	0.0%	29	0.0%	0	0.0%	19	0.0%	0	0.0%	0.0%
DR5	428	20	0.0%	20	0.0%	0	0.0%	0	0.0%	18	0.0%	0	0.0%	8	0.0%	0	0.0%	0.0%
DR6	421	23	0.0%	23	0.0%	0	0.0%	0	0.0%	14	0.0%	0	0.0%	5	0.0%	0	0.0%	0.0%
DR7	410	14	0.0%	14	0.0%	0	0.0%	0	0.0%	15	0.0%	0	0.0%	8	0.0%	0	0.0%	0.0%
DR8	378	15	0.0%	15	0.0%	0	0.0%	0	0.0%	12	0.0%	0	0.0%	5	0.0%	0	0.0%	0.0%
DR9	387	23	0.0%	23	0.0%	5	0.0%	0	0.0%	12	0.0%	0	0.0%	1	0.0%	0	0.0%	0.0%
DR10	450	18	0.0%	18	0.0%	0	0.0%	0	0.0%	8	0.0%	0	0.0%	0	0.0%	0	0.0%	0.0%
DR11	527	52	0.0%	52	0.0%	0	0.0%	0	0.0%	19	0.0%	0	0.0%	0	0.0%	0	0.0%	0.0%
DR12	500	50	0.0%	50	0.0%	0	0.0%	0	0.0%	8	0.0%	0	0.0%	0	0.0%	0	0.0%	0.0%
DR13	507	50	0.0%	50	0.0%	0	0.0%	0	0.0%	62	0.0%	1	0.0%	27	0.0%	0	0.0%	0.0%
DR14	539	49	0.0%	49	0.0%	0	0.0%	0	0.0%	92	0.0%	1	0.0%	33	0.0%	0	0.0%	0.0%

Receptors	Maximum Potential 1 hour mean (100%ile) NO_2 PC (µg/m^3)	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	Summed Probability of exceedance
DR15	624	23	0.0%	23	0.0%	0	0.0%	0	0.0%	14	0.0%	0	0.0%	733	0.0%	0	0.0%	0.0%
DR16	621	22	0.0%	22	0.0%	0	0.0%	0	0.0%	13	0.0%	0	0.0%	802	0.0%	0	0.0%	0.0%
DR17	470	20	0.0%	20	0.0%	0	0.0%	0	0.0%	19	0.0%	0	0.0%	10	0.0%	0	0.0%	0.0%
DR18	482	29	0.0%	29	0.0%	0	0.0%	0	0.0%	20	0.0%	0	0.0%	15	0.0%	0	0.0%	0.0%
DR19	487	28	0.0%	28	0.0%	5	0.0%	0	0.0%	19	0.0%	0	0.0%	16	0.0%	0	0.0%	0.0%
DR20	490	29	0.0%	29	0.0%	18	0.0%	3	0.0%	24	0.0%	0	0.0%	17	0.0%	0	0.0%	0.0%
DR21	496	25	0.0%	25	0.0%	31	0.0%	9	0.0%	24	0.0%	0	0.0%	17	0.0%	0	0.0%	0.0%
DR22	494	28	0.0%	28	0.0%	41	0.0%	10	0.0%	24	0.0%	0	0.0%	19	0.0%	0	0.0%	0.0%
DR23	490	28	0.0%	28	0.0%	38	0.0%	9	0.0%	24	0.0%	0	0.0%	22	0.0%	0	0.0%	0.0%
DR24	502	24	0.0%	24	0.0%	20	0.0%	3	0.0%	26	0.0%	0	0.0%	17	0.0%	0	0.0%	0.0%
DR25	474	17	0.0%	17	0.0%	25	0.0%	0	0.0%	30	0.0%	0	0.0%	13	0.0%	0	0.0%	0.0%
DR26	500	29	0.0%	29	0.0%	1	0.0%	0	0.0%	11	0.0%	0	0.0%	5	0.0%	0	0.0%	0.0%
DR27	693	50	0.0%	50	0.0%	0	0.0%	0	0.0%	132	0.0%	8	0.0%	31	0.0%	0	0.0%	0.0%
DR28	638	51	0.0%	51	0.0%	0	0.0%	0	0.0%	94	0.0%	5	0.0%	31	0.0%	0	0.0%	0.0%
DR29	673	47	0.0%	47	0.0%	0	0.0%	0	0.0%	91	0.0%	4	0.0%	29	0.0%	0	0.0%	0.0%
DR30	620	47	0.0%	47	0.0%	0	0.0%	0	0.0%	84	0.0%	3	0.0%	30	0.0%	0	0.0%	0.0%
DR31	614	56	0.0%	56	0.0%	0	0.0%	0	0.0%	113	0.0%	4	0.0%	32	0.0%	0	0.0%	0.0%

Receptors	Maximum Potential 1 hour mean (100%ile) NO_2 PC (µg/m³)	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	Summed Probability of exceedance
DR32	617	55	0.0%	55	0.0%	0	0.0%	0	0.0%	94	0.0%	4	0.0%	32	0.0%	0	0.0%	0.0%
DR33	572	54	0.0%	54	0.0%	0	0.0%	0	0.0%	90	0.0%	1	0.0%	39	0.0%	0	0.0%	0.0%
DR34	587	55	0.0%	55	0.0%	0	0.0%	0	0.0%	75	0.0%	1	0.0%	44	0.0%	0	0.0%	0.0%
DR35	436	15	0.0%	15	0.0%	0	0.0%	0	0.0%	19	0.0%	0	0.0%	6	0.0%	0	0.0%	0.0%
DR36	601	36	0.0%	36	0.0%	0	0.0%	0	0.0%	46	0.0%	2	0.0%	28	0.0%	0	0.0%	0.0%
DR37	643	27	0.0%	27	0.0%	0	0.0%	0	0.0%	17	0.0%	0	0.0%	195	0.0%	0	0.0%	0.0%
DR38	675	21	0.0%	21	0.0%	0	0.0%	0	0.0%	13	0.0%	0	0.0%	278	0.0%	0	0.0%	0.0%
DR39	608	15	0.0%	15	0.0%	0	0.0%	0	0.0%	11	0.0%	0	0.0%	299	0.0%	0	0.0%	0.0%
DR40	646	18	0.0%	18	0.0%	0	0.0%	0	0.0%	9	0.0%	0	0.0%	108	0.0%	0	0.0%	0.0%
DR41	580	11	0.0%	11	0.0%	0	0.0%	0	0.0%	9	0.0%	0	0.0%	597	0.0%	0	0.0%	0.0%
DR42	434	8	0.0%	8	0.0%	0	0.0%	0	0.0%	3	0.0%	0	0.0%	41	0.0%	0	0.0%	0.0%
DR43	382	7	0.0%	7	0.0%	0	0.0%	0	0.0%	2	0.0%	0	0.0%	20	0.0%	0	0.0%	0.0%
DR44	402	4	0.0%	4	0.0%	0	0.0%	0	0.0%	3	0.0%	0	0.0%	80	0.0%	0	0.0%	0.0%
DR45	341	4	0.0%	4	0.0%	0	0.0%	0	0.0%	2	0.0%	0	0.0%	58	0.0%	0	0.0%	0.0%
DR46	416	9	0.0%	9	0.0%	0	0.0%	0	0.0%	7	0.0%	0	0.0%	71	0.0%	0	0.0%	0.0%
DR47	457	9	0.0%	9	0.0%	0	0.0%	0	0.0%	8	0.0%	0	0.0%	57	0.0%	0	0.0%	0.0%
DR48	421	2	0.0%	2	0.0%	0	0.0%	0	0.0%	4	0.0%	0	0.0%	35	0.0%	0	0.0%	0.0%

6.1.3 Particulate and CO Impacts

The predicted annual mean PM_{10} and $PM_{2.5}$ impacts, combined for MSM1 and MSM2 from all sites, at receptor locations relevant for 'annual mean' exposure, are presented in Appendix A Table A-1 and Table A-2 respectively. The PEC is not predicted to exceed the AQAL at any of the selected receptors.

The predicted daily average PM_{10} (90.4%ile), CO 8-hour and CO 1-hour impacts, combined for MSM1 and MSM2 from all sites, are presented in Appendix A Table A-3, Table A-4, and Table A-5 respectively. The PEC is not predicted to exceed the AQAL at any of the selected receptors.

6.1.4 Impacts on Ecological Receptors

The impacts on C_{Le} are presented in Table 6-3 below. The findings are that:

- the PC does not exceed 1% of the annual mean C_{Le} or 10% of the daily mean C_{Le} at the European designated SAC (ER1) therefore the impact is considered to cause 'no likely significant effect';
- the PC does not exceed 100% of the annual mean C_{Le} at the LWS's; and
- the potential maximum PC exceeds 100% of the daily mean C_{Le} at a number of LWS, however the probability of exceedance is <5% and therefore 'unlikely'.

Table 6-3
NO_x Impact on Critical Levels

ID	Annual Mean NO_x PC [MSM1+MSM2] (µg/m^3)	% of C_{Le}	Maximum Potential daily mean NO_x PC [(a)] (µg/m^3)	% of C_{Le}	No. of potential exceedances daily mean NO_x PC[(a)]	Probability of exceedance[(a)]
ER1	<0.1	0.1%	5	7%	0	<0.1%
ER2	0.1	0.5%	25	33%	0	<0.1%
ER3	0.6	2.1%	98	131%	1	0.5%
ER4	0.7	2.4%	104	139%	1	0.5%
ER5	0.2	0.8%	38	50%	0	<0.1%
ER6	0.4	1.4%	59	78%	0	<0.1%
ER7	1.5	5.1%	135	180%	5	2.7%
ER8	1.1	3.6%	151	201%	2	1.1%
ER9	0.1	0.3%	12	16%	0	<0.1%
ER10	0.2	0.6%	18	25%	0	<0.1%
ER11	0.1	0.5%	9	12%	0	<0.1%
ER12	0.5	1.6%	71	94%	0	<0.1%

Table note: (a) MSM2 (i.e. Annual UPS wrap around / annual load test) represents the greatest impact on daily mean NO_x C_{Le}. Probability of exceedance based on 2 days per year at a maximum of 12 hours to represent the MSM2 maintenance tests.

The results of the assessment of impact on nitrogen and acid C_{Lo} are presented in Table 6-4 and Table 6-5 below. The findings are that:

- the nitrogen (N) and acid PC do not exceed 1% of the C_{Lo} for the European designated SAC (ER1) and therefore the impacts are considered to cause 'no likely significant effect'; and
- the N and acid PC do not exceed 100% of the C_{Lo} at any locally designated LWS and therefore it can be concluded there is 'no significant pollution'.

Table 6-4
Impact on Nitrogen Critical Load

Site	Applied C_{Lo} (kg N/ha/yr)	PC (kg N/ha/yr)	PC as % of C_{Lo}
ER1	10	0.004	<0.1%
ER2	10	0.030	0.3%
ER3	10	0.128	1.3%
ER4	10	0.147	1.5%
ER5	10	0.050	0.5%
ER6	10	0.084	0.8%
ER7	10	0.308	3.1%
ER8	10	0.217	2.2%
ER9	10	0.017	0.2%
ER10	10	0.036	0.4%
ER11	10	0.028	0.3%
ER12	10	0.098	1.0%

Table 6-5
Impact on Acid Critical Load

Site	C_{Lo} CLmaxN (kg $_{eq}$ /ha/yr)	N PC (kg $_{eq}$/ha/yr)	PC as % of C_{Lo}
ER1	1.647	<0.001	<0.1%
ER2	1.981	0.002	0.1%
ER3	1.981	0.009	0.5%
ER4	1.981	0.010	0.5%
ER5	1.973	0.004	0.2%
ER6	1.985	0.006	0.3%
ER7	1.982	0.022	1.1%
ER8	1.982	0.015	0.8%
ER9	1.977	0.001	0.1%
ER10	1.978	0.003	0.1%
ER11	1.978	0.002	0.1%

Site	C_{Lo} CLmaxN (kg $_{eq}$ /ha/yr)	N PC (kg $_{eq}$/ha/yr)	PC as % of C_{Lo}
ER12	1.982	0.007	0.4%

6.2 Electrical Grid Outage Model

6.2.1 Annual Mean NO_2 Impacts

The predicted annual mean NO_2 impacts at receptor locations (relevant for 'annual mean' exposure) are presented in Table 6-6 for the 36-hour and 1-hour outage scenarios. The PC does not cause the PEC to exceed the AQAL at any of the selected receptors.

Table 6-6
Impacts on Annual Mean NO_2 AQAL

Receptors	PC (µg/m^3) – based on 36 hours outage	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL	PC (µg/m^3) – based on 1 hour outage	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
	36-hour outage				1-hour outage			
DR1	0.5	1.2%	26.6	66.4%	<0.1	0.0%	26.1	65.3%
DR2	0.5	1.2%	26.6	66.5%	<0.1	0.0%	26.1	65.3%
DR3	0.3	0.7%	26.4	66.0%	<0.1	0.0%	26.1	65.3%
DR4	0.3	0.6%	26.4	65.9%	<0.1	0.0%	26.1	65.3%
DR5	0.1	0.4%	26.2	65.6%	<0.1	0.0%	26.1	65.3%
DR6	0.1	0.3%	26.2	65.6%	<0.1	0.0%	26.1	65.3%
DR7	0.1	0.3%	26.2	65.6%	<0.1	0.0%	26.1	65.3%
DR8	0.1	0.3%	26.2	65.6%	<0.1	0.0%	26.1	65.3%
DR9	0.1	0.3%	26.2	65.6%	<0.1	0.0%	26.1	65.3%
DR10	0.1	0.3%	26.2	65.6%	<0.1	0.0%	26.1	65.3%
DR11	0.2	0.4%	26.3	65.7%	<0.1	0.0%	26.1	65.3%
DR12	0.1	0.4%	26.2	65.6%	<0.1	0.0%	26.1	65.3%
DR14	0.6	1.4%	26.7	66.7%	<0.1	0.0%	26.1	65.3%
DR16	1.3	3.3%	27.4	68.6%	<0.1	0.1%	26.1	65.3%
DR25	0.2	0.5%	26.3	65.8%	<0.1	0.0%	26.1	65.3%
DR26	0.2	0.5%	26.3	65.8%	<0.1	0.0%	26.1	65.3%
DR27	0.6	1.4%	26.7	66.6%	<0.1	0.0%	26.1	65.3%
DR28	0.5	1.2%	26.6	66.5%	<0.1	0.0%	26.1	65.3%

Receptors	PC (µg/m^3) – based on 36 hours outage	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL	PC (µg/m^3) – based on 1 hour outage	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR29	0.5	1.2%	26.6	66.4%	<0.1	0.0%	26.1	65.3%
DR30	0.4	1.0%	26.5	66.3%	<0.1	0.0%	26.1	65.3%
DR31	0.5	1.3%	26.6	66.6%	<0.1	0.0%	26.1	65.3%
DR32	0.5	1.2%	26.6	66.4%	<0.1	0.0%	26.1	65.3%
DR33	0.6	1.5%	26.7	66.7%	<0.1	0.0%	26.1	65.3%
DR34	0.5	1.3%	26.6	66.6%	<0.1	0.0%	26.1	65.3%
DR35	0.2	0.4%	26.3	65.6%	<0.1	0.0%	26.1	65.3%
DR37	0.5	1.3%	26.6	66.5%	<0.1	0.0%	26.1	65.3%
DR38	0.6	1.4%	26.7	66.6%	<0.1	0.0%	26.1	65.3%
DR39	0.5	1.4%	26.6	66.6%	<0.1	0.0%	26.1	65.3%
DR40	0.4	1.1%	26.5	66.3%	<0.1	0.0%	26.1	65.3%
DR42	0.3	0.9%	26.4	66.1%	<0.1	0.0%	26.1	65.3%
DR43	0.3	0.7%	26.4	65.9%	<0.1	0.0%	26.1	65.3%
DR44	0.3	0.8%	26.4	66.0%	<0.1	0.0%	26.1	65.3%
DR45	0.3	0.6%	26.4	65.9%	<0.1	0.0%	26.1	65.3%
DR46	0.5	1.1%	26.6	66.4%	<0.1	0.0%	26.1	65.3%
DR47	0.4	1.0%	26.5	66.2%	<0.1	0.0%	26.1	65.3%
DR48	0.3	0.7%	26.4	66.0%	<0.1	0.0%	26.1	65.3%

6.2.2 1-hour Mean NO_2 Impacts

The risks of exceedances of the 1-hour mean NO_2 AQAL at receptor locations are presented in Table 6-7. The table presents the number of hours that the PEC potentially exceeds 200µg/m^3 (based on 8,760 hours operation), and the probability of there being more than the allowance (of 18 exceedances) given the 36-hour (hypothetical) and 1-hour (realistic) outage scenarios. The results demonstrate that for both outage scenarios the probability of an exceedance of the AQAL, at less than 1%, can be considered 'highly unlikely'.

Table 6-7
Risk of Exceedance of 1-hour Mean NO_2 AQAL

Receptors	NO_2 1-hour (100%ile) (µg/m³)	NO_2 1-hour PC (99.79%ile) (µg/m³)	NO_2 1-hour PEC (99.79%ile) (µg/m³)	PEC as % of AQAL	No. of potential exceedances of AQAL	Probability of exceedance (36-hour outage)	Probability of exceedance (1-hour outage)
Max. at a receptor	3138	2116	2169	1084%	2264	0.1%	<0.1%
DR1	1706	1340	1393	696%	1139	<0.1%	<0.1%
DR2	1717	1317	1369	684%	1198	<0.1%	<0.1%
DR3	2082	1129	1181	590%	575	<0.1%	<0.1%
DR4	1722	1210	1262	631%	570	<0.1%	<0.1%
DR5	1297	753	805	403%	222	<0.1%	<0.1%
DR6	1042	687	740	370%	210	<0.1%	<0.1%
DR7	935	691	743	371%	244	<0.1%	<0.1%
DR8	937	717	770	385%	280	<0.1%	<0.1%
DR9	1033	791	844	422%	338	<0.1%	<0.1%
DR10	1140	847	899	450%	304	<0.1%	<0.1%
DR11	871	727	779	390%	323	<0.1%	<0.1%
DR12	901	588	640	320%	271	<0.1%	<0.1%
DR13	2301	1359	1411	706%	1171	<0.1%	<0.1%
DR14	2585	1443	1495	747%	1502	<0.1%	<0.1%
DR15	2404	2094	2146	1073%	2264	0.1%	<0.1%
DR16	2413	2116	2169	1084%	2256	0.1%	<0.1%
DR17	1063	798	851	425%	368	<0.1%	<0.1%
DR18	1056	777	829	415%	399	<0.1%	<0.1%
DR19	1074	778	831	415%	417	<0.1%	<0.1%
DR20	1146	815	867	434%	483	<0.1%	<0.1%
DR21	1212	844	896	448%	505	<0.1%	<0.1%
DR22	1206	872	924	462%	553	<0.1%	<0.1%
DR23	1221	874	926	463%	527	<0.1%	<0.1%
DR24	1221	877	930	465%	531	<0.1%	<0.1%
DR25	1406	869	921	461%	357	<0.1%	<0.1%

Receptors	NO_2 1-hour (100%ile) (µg/m^3)	NO_2 1-hour PC (99.79%ile) (µg/m^3)	NO_2 1-hour PEC (99.79%ile) (µg/m^3)	PEC as % of AQAL	No. of potential exceedances of AQAL	Probability of exceedance (36-hour outage)	Probability of exceedance (1-hour outage)
DR26	1892	1526	1578	789%	486	<0.1%	<0.1%
DR27	2815	1600	1652	826%	1218	<0.1%	<0.1%
DR28	2734	1572	1624	812%	1193	<0.1%	<0.1%
DR29	2587	1386	1438	719%	1018	<0.1%	<0.1%
DR30	2522	1317	1369	685%	1003	<0.1%	<0.1%
DR31	2522	1588	1640	820%	1263	<0.1%	<0.1%
DR32	2461	1537	1589	795%	1230	<0.1%	<0.1%
DR33	2604	1439	1492	746%	1500	<0.1%	<0.1%
DR34	2682	1444	1496	748%	1442	<0.1%	<0.1%
DR35	1007	754	806	403%	320	<0.1%	<0.1%
DR36	2206	1214	1266	633%	698	<0.1%	<0.1%
DR37	1705	1421	1474	737%	1126	<0.1%	<0.1%
DR38	1834	1519	1571	786%	1137	<0.1%	<0.1%
DR39	1758	1481	1534	767%	1091	<0.1%	<0.1%
DR40	1720	1350	1403	701%	969	<0.1%	<0.1%
DR41	3138	2096	2148	1074%	1425	<0.1%	<0.1%
DR42	2595	1044	1096	548%	901	<0.1%	<0.1%
DR43	1108	569	621	311%	769	<0.1%	<0.1%
DR44	1679	1222	1274	637%	861	<0.1%	<0.1%
DR45	1331	1023	1075	538%	773	<0.1%	<0.1%
DR46	1768	982	1034	517%	1367	<0.1%	<0.1%
DR47	1861	953	1005	502%	1214	<0.1%	<0.1%
DR48	1881	1186	1239	619%	876	<0.1%	<0.1%

The risks of exceedances of the 1-hour mean NO_2 AEGL-1 at receptor locations are presented in Table 6-8 for the 36-hour (hypothetical) and 1-hour (realistic) outage scenarios. The results demonstrate that for the realistic 1-hour outage scenario the probability of an exceedance of the AEGL-1, at less than 1%, can be considered 'highly unlikely'. The results for the hypothetical 36-hour outage scenario indicates a probability of an exceedance above 5%.

Table 6-8
Risk of Exceedance of 1-hour Mean NO_2 AEGL-1

Receptor	PC 1-hour (100%ile) maximum (µg/m³)	PEC (100%ile) (µg/m³)	PEC as % of AEGL-1	No. of potential exceedances of AEGL-1	Probability of exceedance based on 36-hours operation	Probability of exceedance based on 1-hour operation
Max at a receptor	3138	3190	334%	396	203%	4.5%
DR1	1706	1759	184%	55	51%	0.6%
DR2	1717	1769	185%	58	53%	0.7%
DR3	2082	2134	223%	46	43%	0.5%
DR4	1722	1774	186%	37	35%	0.4%
DR5	1297	1349	141%	6	6%	0.1%
DR6	1042	1094	114%	4	4%	<0.1%
DR7	935	988	103%	2	2%	<0.1%
DR8	937	989	103%	3	3%	<0.1%
DR9	1033	1085	113%	8	8%	0.1%
DR10	1140	1192	125%	14	14%	0.2%
DR11	871	923	97%	0	0%	<0.1%
DR12	901	953	100%	0	0%	<0.1%
DR13	2301	2353	246%	65	59%	0.7%
DR14	2585	2638	276%	84	73%	1.0%
DR15	2404	2456	257%	350	193%	4.0%
DR16	2413	2466	258%	396	203%	4.5%
DR17	1063	1116	117%	7	7%	0.1%
DR18	1056	1108	116%	6	6%	0.1%
DR19	1074	1126	118%	9	9%	0.1%
DR20	1146	1199	125%	11	11%	0.1%
DR21	1212	1265	132%	9	9%	0.1%
DR22	1206	1258	132%	13	13%	0.1%
DR23	1221	1274	133%	14	14%	0.2%
DR24	1221	1274	133%	15	15%	0.2%
DR25	1406	1458	152%	15	15%	0.2%

Receptor	PC 1-hour (100%ile) maximum (µg/m³)	PEC (100%ile) (µg/m³)	PEC as % of AEGL-1	No. of potential exceedances of AEGL-1	Probability of exceedance based on 36-hours operation	Probability of exceedance based on 1-hour operation
DR26	1892	1945	203%	45	42%	0.5%
DR27	2815	2867	300%	85	74%	1.0%
DR28	2734	2787	291%	77	68%	0.9%
DR29	2587	2639	276%	73	65%	0.8%
DR30	2522	2575	269%	71	64%	0.8%
DR31	2522	2574	269%	80	70%	0.9%
DR32	2461	2513	263%	73	65%	0.8%
DR33	2604	2656	278%	92	79%	1.1%
DR34	2682	2734	286%	92	79%	1.1%
DR35	1007	1060	111%	4	4%	<0.1%
DR36	2206	2259	236%	54	50%	0.6%
DR37	1705	1757	184%	71	64%	0.8%
DR38	1834	1886	197%	115	95%	1.3%
DR39	1758	1810	189%	113	93%	1.3%
DR40	1720	1773	185%	60	55%	0.7%
DR41	3138	3190	334%	391	202%	4.5%
DR42	2595	2647	277%	29	28%	0.3%
DR43	1108	1160	121%	5	5%	0.1%
DR44	1679	1732	181%	42	40%	0.5%
DR45	1331	1383	145%	28	27%	0.3%
DR46	1768	1820	190%	26	25%	0.3%
DR47	1861	1913	200%	20	20%	0.2%
DR48	1881	1934	202%	28	27%	0.3%

6.2.3 Particulate and CO Impacts

The predicted annual mean PM_{10} and $PM_{2.5}$ impacts, combined for MSM1 and MSM2 from all sites, at receptor locations relevant for 'annual mean' exposure, are presented in Appendix A Table A-6 and Table A-7 respectively. The PEC is not predicted to exceed the AQAL at any of the selected receptors.

The predicted CO 8-hour and CO 1-hour impacts, combined for MSM1 and MSM2 from all sites, are presented in Appendix A Table A-8 and Table A-9 respectively. The PEC is not predicted to exceed the AQAL at any of the selected receptors.

The number of days operation associated with the 1-hour and 36-hour outage scenarios would be below the 35 days exceedance allowance, and therefore have no significant effect on the daily average PM_{10} AQAL.

6.2.4 Impacts on Ecological Receptors

The impact on C_{Le} for the 36-hour outage scenario is presented in Table 6-9. The findings are that:

- at the European designated SAC (ER1) the PC does not exceed 1% of the annual mean C_{Le}, the maximum daily PC exceeds 10% of the daily mean C_{Le} but the PEC does not exceed the C_{Le}, therefore it can be concluded there is 'no likely significant effect'; and
- the PC does not exceed 100% of the annual mean C_{Le} at the LWS but the daily mean PC exceeds the C_{Le} and the risk of exceedance is more than 5%.

These results are absolute worst-case in that they are based upon a total 36-hour outage coinciding with the worst-case daily dispersion conditions. This outage scenario is considered highly unlikely on the basis that there has never been a grid failure at any of the operational NTT Hemel data centres and therefore a typical number of emergency outage hours per year is zero, the probability of this scenario occurring can be considered very low.

The impact on C_{Le} for the 1-hour outage scenario is presented in Table 6-10. The findings are that:

- at the European designated SAC (ER1) the PC does not exceed 1% of the annual mean C_{Le} or 10% of the daily mean C_{Le} and therefore impacts can be considered insignificant; and
- the PC does not exceed 100% of the annual mean or daily C_{Le} at any LWS and therefore impacts can be considered insignificant.

Table 6-9
NO_x Impact on Critical Levels (36-hour outage scenario)

ID	Annual Mean NO_x PC [(a)] ($\mu g/m^3$)	% of C_{Le}	Daily Mean [(a)] NO_x PC ($\mu g/m^3$)	% of C_{Le}	Daily Mean NO_x PEC ($\mu g/m^3$)	% of C_{Le}	No. of potential exceedances daily mean NO_x PC[(a)]	Probability of exceedance[(a)]
ER1	<0.1	<0.1%	46.1	61%	72.1	96%	0	0%
ER2	0.1	0.2%	233.8	312%	274.7	366%	25	6.8%
ER3	0.2	0.5%	328.4	438%	369.3	492%	77	21.1%
ER4	0.2	0.7%	649.0	865%	689.9	920%	93	25.5%
ER5	0.1	0.2%	151.4	202%	186.5	249%	20	5.5%
ER6	0.1	0.4%	273.3	364%	314.7	420%	49	13.4%
ER7	0.6	2.0%	1417.9	1890%	1468.8	1958%	171	46.8%
ER8	0.3	1.2%	834.5	1113%	885.4	1181%	133	36.4%
ER9	<0.1	0.1%	123.0	164%	169.5	226%	7	1.9%
ER10	0.1	0.2%	219.5	293%	263.5	351%	34	9.3%

ID	Annual Mean NO_x PC [(a)] ($\mu g/m^3$)	% of C_{Le}	Daily Mean [(a)] NO_x PC ($\mu g/m^3$)	% of C_{Le}	Daily Mean NO_x PEC ($\mu g/m^3$)	% of C_{Le}	No. of potential exceedances daily mean NO_x PC[(a)]	Probability of exceedance[(a)]
ER11	0.1	0.2%	192.3	256%	235.4	314%	29	7.9%
ER12	0.2	0.5%	679.2	906%	730.2	974%	75	20.5%

Table Note: (a) Daily mean NOx PC and probability of exceedance based upon the 36-hour outage scenario, i.e. maximum 24-hour daily impact.

Table 6-10
NO_x Impact on Critical Levels (1-hour outage scenario)

ID	Annual Mean NO_x PC [(a)] ($\mu g/m^3$)	% of C_{Le}	Daily Mean [(a)] NO_x PC ($\mu g/m^3$)	% of C_{Le}
ER1	<0.1	<0.1%	1.9	3%
ER2	<0.1	<0.1%	9.7	13%
ER3	<0.1	<0.1%	13.7	18%
ER4	<0.1	<0.1%	27.0	36%
ER5	<0.1	<0.1%	6.3	8%
ER6	<0.1	<0.1%	11.4	15%
ER7	<0.1	0.1%	59.1	79%
ER8	<0.1	<0.1%	34.8	46%
ER9	<0.1	<0.1%	5.1	7%
ER10	<0.1	<0.1%	9.1	12%
ER11	<0.1	<0.1%	8.0	11%
ER12	<0.1	<0.1%	28.3	38%

Table Note: (a) Daily mean NOx PC and probability of exceedance based upon the 1-hour outage scenario, i.e. maximum 24-hour daily impact factored for 1-hour.

The results of the assessment of impact on nitrogen and acid C_{Lo} are presented in Table 6-11 and Table 6-12 for 36-hour outage scenario. The findings are that:

- the PC does not exceed 1% of the C_{Lo} for the European designated SAC (ER1), therefore the impact is considered to cause 'no likely significant effect'; and
- the PC does not exceed 100% of the C_{Lo} at any LWS, therefore it can be concluded there is 'no significant pollution'.

Given all impacts for the 36-hour outage are insignificant, the 1-hour outage has not been presented as these impacts will be lower and also insignificant.

Table 6-11
Impact on Nitrogen Critical Load (36-hour outage)

ID	Applied C_{Lo} (kg N/ha/yr)	PC (based on 36 hours per year operation) (kg N/ha/yr)	PC as % of C_{Lo}
ER1	10	0.001	<0.1%
ER2	10	0.010	0.1%
ER3	10	0.031	0.3%
ER4	10	0.040	0.4%
ER5	10	0.013	0.1%
ER6	10	0.021	0.2%
ER7	10	0.121	1.2%
ER8	10	0.070	0.7%
ER9	10	0.005	0.1%
ER10	10	0.013	0.1%
ER11	10	0.013	0.1%
ER12	10	0.033	0.3%

Table 6-12
Impact on Acid Critical Load (36-hour outage)

ID	C_{Lo} CLmaxN (kg eq /ha/yr)	N PC (based on 36 hours per year operation) (kg_{eq}/ha/yr)	PC as % of C_{Lo}
ER1	1.647	<0.001	<0.1%
ER2	1.981	0.001	<0.1%
ER3	1.981	0.002	0.1%
ER4	1.981	0.003	0.1%
ER5	1.973	0.001	<0.1%
ER6	1.985	0.002	0.1%
ER7	1.982	0.009	0.4%
ER8	1.982	0.005	0.3%
ER9	1.977	<0.001	<0.1%
ER10	1.978	0.001	<0.1%
ER11	1.978	0.001	<0.1%
ER12	1.982	0.002	0.1%

6.3 Commissioning Schedule Model

6.3.1 Annual Mean NO_2 Impacts

The predicted annual mean NO_2 impacts, for CSM and MSM (for the remainder of the year) from HH4 combined with MSM from all other sites, are presented in Table 6-1. The PEC is not predicted to exceed the AQAL at any of the selected receptors.

Table 6-13
Impacts on Annual Mean NO_2 AQAL

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR1	0.7	1.9%	26.8	67.1%
DR2	0.8	1.9%	26.9	67.2%
DR3	0.5	1.2%	26.6	66.4%
DR4	0.4	1.1%	26.5	66.3%
DR5	0.2	0.5%	26.3	65.8%
DR6	0.2	0.5%	26.3	65.8%
DR7	0.2	0.5%	26.3	65.7%
DR8	0.2	0.5%	26.3	65.7%
DR9	0.2	0.5%	26.3	65.7%
DR10	0.2	0.4%	26.3	65.7%
DR11	0.3	0.7%	26.4	66.0%
DR12	0.2	0.5%	26.3	65.8%
DR14	0.9	2.3%	27.0	67.5%
DR16	1.7	4.3%	27.8	69.5%
DR25	0.3	0.9%	26.4	66.1%
DR26	0.3	0.6%	26.4	65.9%
DR27	1.0	2.6%	27.1	67.9%
DR28	0.9	2.2%	27.0	67.5%
DR29	0.8	2.1%	26.9	67.4%
DR30	0.7	1.8%	26.8	67.1%
DR31	1.0	2.4%	27.1	67.7%
DR32	0.9	2.1%	27.0	67.4%
DR33	1.0	2.4%	27.1	67.7%
DR34	0.9	2.2%	27.0	67.4%
DR35	0.2	0.6%	26.3	65.8%

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR37	0.8	1.9%	26.9	67.2%
DR38	0.8	2.0%	26.9	67.3%
DR39	0.8	2.0%	26.9	67.2%
DR40	0.6	1.5%	26.7	66.8%
DR42	0.4	1.1%	26.5	66.3%
DR43	0.4	0.9%	26.5	66.2%
DR44	0.4	1.0%	26.5	66.3%
DR45	0.3	0.8%	26.4	66.1%
DR46	0.6	1.4%	26.7	66.7%
DR47	0.5	1.2%	26.6	66.5%
DR48	0.4	0.9%	26.5	66.2%

6.3.2 1-hour Mean NO_2 Impacts

The risks of exceedances of the 1-hour mean NO_2 AQAL at receptor locations are presented in Table 6-2. The table presents the number of hours that the PEC potentially exceeds 200µg/m^3 (based on 8,760 hours operation), and the probability of there being more than the allowance (of 18 exceedances) given the number of planned commissioning and testing hours at HH4 with testing hours at the other sites. The findings are that the risk of exceedances is less than 1% and therefore 'highly unlikely'. Furthermore, the AEGL-1 is not exceeded at any receptor location.

Table 6-14
Risk of Exceedance of 1-hour Mean NO_2 AQAL

Receptors	Maximum Potential 1 hour mean (100%ile) NO_2 PC ($\mu g/m^3$)	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 + CSM1 No. of potential exceedances	MSM1 + CSM1 Probability of exceedance	MSM1 + CSM2 No. of potential exceedances	MSM1 + CSM2 Probability of exceedance	Summed Probability of exceedance
		Centro				Maylands				Campus				HH4				
DR1	578	39	0.0%	39	0.0%	0	0.0%	0	0.0%	33	0.0%	0	0.0%	76	0.0%	0	0.0%	0.0%
DR2	782	31	0.0%	31	0.0%	0	0.0%	0	0.0%	25	0.0%	0	0.0%	122	0.0%	0	0.0%	0.0%
DR3	560	27	0.0%	27	0.0%	0	0.0%	0	0.0%	41	0.0%	1	0.0%	23	0.0%	0	0.0%	0.0%
DR4	483	28	0.0%	28	0.0%	0	0.0%	0	0.0%	29	0.0%	0	0.0%	19	0.0%	0	0.0%	0.0%
DR5	428	20	0.0%	20	0.0%	0	0.0%	0	0.0%	18	0.0%	0	0.0%	8	0.0%	0	0.0%	0.0%
DR6	421	23	0.0%	23	0.0%	0	0.0%	0	0.0%	14	0.0%	0	0.0%	5	0.0%	0	0.0%	0.0%
DR7	410	14	0.0%	14	0.0%	0	0.0%	0	0.0%	15	0.0%	0	0.0%	8	0.0%	0	0.0%	0.0%
DR8	378	15	0.0%	15	0.0%	0	0.0%	0	0.0%	12	0.0%	0	0.0%	5	0.0%	0	0.0%	0.0%
DR9	387	23	0.0%	23	0.0%	5	0.0%	0	0.0%	12	0.0%	0	0.0%	1	0.0%	0	0.0%	0.0%
DR10	450	18	0.0%	18	0.0%	0	0.0%	0	0.0%	8	0.0%	0	0.0%	0	0.0%	0	0.0%	0.0%
DR11	527	52	0.0%	52	0.0%	0	0.0%	0	0.0%	19	0.0%	0	0.0%	0	0.0%	0	0.0%	0.0%
DR12	500	50	0.0%	50	0.0%	0	0.0%	0	0.0%	8	0.0%	0	0.0%	0	0.0%	0	0.0%	0.0%
DR13	507	50	0.0%	50	0.0%	0	0.0%	0	0.0%	62	0.0%	1	0.0%	27	0.0%	0	0.0%	0.0%
DR14	539	49	0.0%	49	0.0%	0	0.0%	0	0.0%	92	0.0%	1	0.0%	33	0.0%	0	0.0%	0.0%

Receptors	Maximum Potential 1 hour mean (100%ile) NO_2 PC (µg/m^3)	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 + CSM1 No. of potential exceedances	MSM1 + CSM1 Probability of exceedance	MSM1 + CSM2 No. of potential exceedances	MSM1 + CSM2 Probability of exceedance	Summed Probability of exceedance
DR15	624	23	0.0%	23	0.0%	0	0.0%	0	0.0%	14	0.0%	0	0.0%	733	0.2%	0	0.0%	0.2%
DR16	621	22	0.0%	22	0.0%	0	0.0%	0	0.0%	13	0.0%	0	0.0%	802	0.5%	0	0.0%	0.5%
DR17	470	20	0.0%	20	0.0%	0	0.0%	0	0.0%	19	0.0%	0	0.0%	10	0.0%	0	0.0%	0.0%
DR18	482	29	0.0%	29	0.0%	0	0.0%	0	0.0%	20	0.0%	0	0.0%	15	0.0%	0	0.0%	0.0%
DR19	487	28	0.0%	28	0.0%	5	0.0%	0	0.0%	19	0.0%	0	0.0%	16	0.0%	0	0.0%	0.0%
DR20	490	29	0.0%	29	0.0%	18	0.0%	3	0.0%	24	0.0%	0	0.0%	17	0.0%	0	0.0%	0.0%
DR21	496	25	0.0%	25	0.0%	31	0.0%	9	0.0%	24	0.0%	0	0.0%	17	0.0%	0	0.0%	0.0%
DR22	494	28	0.0%	28	0.0%	41	0.0%	10	0.0%	24	0.0%	0	0.0%	19	0.0%	0	0.0%	0.0%
DR23	490	28	0.0%	28	0.0%	38	0.0%	9	0.0%	24	0.0%	0	0.0%	22	0.0%	0	0.0%	0.0%
DR24	502	24	0.0%	24	0.0%	20	0.0%	3	0.0%	26	0.0%	0	0.0%	17	0.0%	0	0.0%	0.0%
DR25	474	17	0.0%	17	0.0%	25	0.0%	0	0.0%	30	0.0%	0	0.0%	13	0.0%	0	0.0%	0.0%
DR26	500	29	0.0%	29	0.0%	1	0.0%	0	0.0%	11	0.0%	0	0.0%	5	0.0%	0	0.0%	0.0%
DR27	693	50	0.0%	50	0.0%	0	0.0%	0	0.0%	132	0.0%	8	0.0%	31	0.0%	0	0.0%	0.0%
DR28	638	51	0.0%	51	0.0%	0	0.0%	0	0.0%	94	0.0%	5	0.0%	31	0.0%	0	0.0%	0.0%
DR29	673	47	0.0%	47	0.0%	0	0.0%	0	0.0%	91	0.0%	4	0.0%	29	0.0%	0	0.0%	0.0%
DR30	620	47	0.0%	47	0.0%	0	0.0%	0	0.0%	84	0.0%	3	0.0%	30	0.0%	0	0.0%	0.0%
DR31	614	56	0.0%	56	0.0%	0	0.0%	0	0.0%	113	0.0%	4	0.0%	32	0.0%	0	0.0%	0.0%

Receptors	Maximum Potential 1 hour mean (100%ile) NO_2 PC (µg/m³)	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 No. of potential exceedances	MSM1 Probability of exceedance	MSM2 No. of potential exceedances	MSM2 Probability of exceedance	MSM1 + CSM1 No. of potential exceedances	MSM1 + CSM1 Probability of exceedance	MSM1 + CSM2 No. of potential exceedances	MSM1 + CSM2 Probability of exceedance	Summed Probability of exceedance
DR32	617	55	0.0%	55	0.0%	0	0.0%	0	0.0%	94	0.0%	4	0.0%	32	0.0%	0	0.0%	0.0%
DR33	572	54	0.0%	54	0.0%	0	0.0%	0	0.0%	90	0.0%	1	0.0%	39	0.0%	0	0.0%	0.0%
DR34	587	55	0.0%	55	0.0%	0	0.0%	0	0.0%	75	0.0%	1	0.0%	44	0.0%	0	0.0%	0.0%
DR35	436	15	0.0%	15	0.0%	0	0.0%	0	0.0%	19	0.0%	0	0.0%	6	0.0%	0	0.0%	0.0%
DR36	601	36	0.0%	36	0.0%	0	0.0%	0	0.0%	46	0.0%	2	0.0%	28	0.0%	0	0.0%	0.0%
DR37	643	27	0.0%	27	0.0%	0	0.0%	0	0.0%	17	0.0%	0	0.0%	195	0.0%	0	0.0%	0.0%
DR38	675	21	0.0%	21	0.0%	0	0.0%	0	0.0%	13	0.0%	0	0.0%	278	0.0%	0	0.0%	0.0%
DR39	608	15	0.0%	15	0.0%	0	0.0%	0	0.0%	11	0.0%	0	0.0%	299	0.0%	0	0.0%	0.0%
DR40	646	18	0.0%	18	0.0%	0	0.0%	0	0.0%	9	0.0%	0	0.0%	108	0.0%	0	0.0%	0.0%
DR41	580	11	0.0%	11	0.0%	0	0.0%	0	0.0%	9	0.0%	0	0.0%	597	0.0%	0	0.0%	0.0%
DR42	434	8	0.0%	8	0.0%	0	0.0%	0	0.0%	3	0.0%	0	0.0%	41	0.0%	0	0.0%	0.0%
DR43	382	7	0.0%	7	0.0%	0	0.0%	0	0.0%	2	0.0%	0	0.0%	20	0.0%	0	0.0%	0.0%
DR44	402	4	0.0%	4	0.0%	0	0.0%	0	0.0%	3	0.0%	0	0.0%	80	0.0%	0	0.0%	0.0%
DR45	341	4	0.0%	4	0.0%	0	0.0%	0	0.0%	2	0.0%	0	0.0%	58	0.0%	0	0.0%	0.0%
DR46	416	9	0.0%	9	0.0%	0	0.0%	0	0.0%	7	0.0%	0	0.0%	71	0.0%	0	0.0%	0.0%
DR47	457	9	0.0%	9	0.0%	0	0.0%	0	0.0%	8	0.0%	0	0.0%	57	0.0%	0	0.0%	0.0%
DR48	421	2	0.0%	2	0.0%	0	0.0%	0	0.0%	4	0.0%	0	0.0%	35	0.0%	0	0.0%	0.0%

6.3.3 Particulate and CO Impacts

The predicted PM_{10}, $PM_{2.5}$, and CO impacts, combined for MSM and CSM from HH4 and MSM from all sites, are presented in Appendix A Table A-10 to Table A-13 respectively. The PEC is not predicted to exceed the AQAL at any of the selected receptors.

6.3.4 Impacts on Ecological Receptors

The impacts on C_{Le} are presented in Table 6-15 below. The findings are that:

- the PC does not exceed 1% of the annual mean C_{Le} or 10% of the daily mean C_{Le} at the European designated SAC (ER1) therefore the impact is considered to cause 'no likely significant effect';
- the PC does not exceed 100% of the annual mean or the daily mean C_{Le} at the LWS's.

Table 6-15
NO_x Impact on Critical Levels

ID	Annual Mean NO_x PC [MSM1+MSM2] (µg/m^3)	% of C_{Le}	Maximum Potential daily mean NO_x PC [(a)] (µg/m^3)	% of C_{Le}
ER1	<0.1	0.1%	3.3	4%
ER2	0.2	0.5%	8.6	12%
ER3	0.6	2.1%	20.2	27%
ER4	0.7	2.4%	22.0	29%
ER5	0.3	0.8%	8.2	11%
ER6	0.4	1.4%	10.9	15%
ER7	1.5	5.1%	39.4	53%
ER8	1.1	3.6%	56.6	75%
ER9	0.1	0.3%	7.5	10%
ER10	0.2	0.6%	13.8	18%
ER11	0.1	0.5%	31.0	41%
ER12	0.5	1.6%	20.3	27%

Table note: (a) CSM1 (i.e. 12-hour In-Service Test) represents the greatest impact on daily mean NO_x C_{Le}.

The results of the assessment of impact on nitrogen and acid C_{Lo} are presented in Table 6-16 and Table 6-17 below. The findings are that:

- the nitrogen (N) and acid PC do not exceed 1% of the C_{Lo} for the European designated SAC (ER1) and therefore the impacts are considered to cause 'no likely significant effect'; and
- the N and acid PC do not exceed 100% of the C_{Lo} at any locally designated LWS and therefore it can be concluded there is 'no significant pollution'.

Table 6-16
Impact on Nitrogen Critical Load

Site	Applied C_{Lo} (kg N/ha/yr)	PC (kg N/ha/yr)	PC as % of C_{Lo}
ER1	10	0.004	<0.1%
ER2	10	0.030	0.3%
ER3	10	0.128	1.3%
ER4	10	0.147	1.5%
ER5	10	0.050	0.5%
ER6	10	0.084	0.8%
ER7	10	0.308	3.1%
ER8	10	0.217	2.2%
ER9	10	0.017	0.2%
ER10	10	0.036	0.4%
ER11	10	0.028	0.3%
ER12	10	0.098	1.0%

Table 6-17
Impact on Acid Critical Load

Site	C_{Lo} CLmaxN (kg $_{eq}$ /ha/yr)	N PC (kg $_{eq}$/ha/yr)	PC as % of C_{Lo}
ER1	1.647	<0.001	<0.1%
ER2	1.981	0.002	0.1%
ER3	1.981	0.009	0.5%
ER4	1.981	0.011	0.5%
ER5	1.973	0.004	0.2%
ER6	1.985	0.006	0.3%
ER7	1.982	0.022	1.1%
ER8	1.982	0.016	0.8%
ER9	1.977	0.001	0.1%
ER10	1.978	0.003	0.1%
ER11	1.978	0.002	0.1%
ER12	1.982	0.007	0.4%

7.0 Conclusion

The assessment has considered potential impacts on air quality from the diesel SBGs as a result of routine (testing and maintenance) operations, and non-routine 'electrical grid outage' emergency hours for a realistic 1-hour outage, and a hypothetical and highly precautionary 36-hour outage scenario.

The findings of the assessment are summarised below.

Routine testing and maintenance operations and HH4 Phase 2 Commissioning phases:

- the annual mean AQALs are not predicted to be exceeded at any of the selected human receptors;
- statistical analysis of the probability of exceedances of the 1-hour mean AQAL predicts exceedances to be 'highly unlikely' at all modelled sensitive human receptors;
- there are no exceedances of the 1-hour AEGL-1, or AQALs for 24-hour PM_{10}, 1-hour and 8-hour CO exposure;
- the PC does not exceed 1% of the annual mean C_{Le} or C_{Lo} or 10% of the daily mean C_{Le} at the European designated SAC (ER1) therefore the impact is considered to cause 'no likely significant effect';
- the PC does not exceed 100% of the annual mean C_{Le} at the LWS's; and
- the potential maximum daily mean PC exceeds 100% of the C_{Le} at a number of locally designated LWS during routine testing, however the probability of exceedance is <5% and therefore 'unlikely', therefore it can be concluded there is 'no significant pollution'.

36-hour 'electrical grid outage' emergency scenario:

- the annual mean AQALs are not predicted to be exceeded at any of the selected human receptors;
- statistical analysis of the probability of exceedances of the 1-hour mean AQAL predicts exceedances to be 'highly unlikely' at all modelled sensitive human receptors;
- the probability of exceedances of the 1-hour AEGL-1 is more than 5%;
- there are no exceedances of the AQALs for 24-hour PM_{10}, 1-hour and 8-hour CO exposure;
- the PC does not exceed 1% of the annual mean C_{Le} or C_{Lo} at the European designated SAC (ER1), and the maximum daily mean PEC does not exceed the C_{Le}, therefore it can be concluded there is 'no likely significant effect' at the SAC; and
- the PC due to the 36-hour outage scenario does not exceed 100% of the annual mean C_{Le} or C_{Lo} at the LWS but the daily mean PC exceeds the C_{Le} and the risk of exceedance is more than 5%.

This outage scenario is considered highly unlikely on the basis that there has never been a grid failure at any of the operational NTT Hemel data centres and therefore a typical number of emergency outage hours per year is zero, the probability of this scenario occurring can be considered very low.

1-hour 'electrical grid outage' emergency scenario:

- the annual mean AQALs are not predicted to be exceeded at any of the selected human receptors;
- statistical analysis of the probability of exceedances of the 1-hour mean AQAL predicts exceedances to be 'highly unlikely' at all modelled sensitive human receptors;
- statistical analysis of the probability of exceedances of the 1-hour mean AEGL-1 predicts exceedances to be 'highly unlikely' at all modelled sensitive human receptors;
- there are no exceedances of the AQALs for 24-hour PM_{10}, 1-hour and 8-hour CO exposure;
- the PC does not exceed 1% of the annual mean C_{Le} or C_{Lo} at the European designated SAC (ER1), and the maximum daily PC does not exceed 10% of the C_{Le}, therefore it can be concluded there is 'no likely significant effect' at the SAC; and
- the PC due to the 1-hour outage scenario does not exceed 100% of the annual mean C_{Le} or C_{Lo}, or daily mean C_{Le} at the LWS and therefore impacts can be considered insignificant.

APPENDIX A

Tabulated Results for PM and CO

Maintenance Schedule Impacts

Table A-1
Impacts on Annual Mean PM_{10} AQAL

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR1	0.1	0.4%	14.7	36.9%
DR2	0.1	0.3%	14.7	36.8%
DR3	0.1	0.3%	14.7	36.8%
DR4	0.1	0.2%	14.7	36.7%
DR5	<0.1	0.1%	14.7	36.6%
DR6	<0.1	0.1%	14.6	36.6%
DR7	<0.1	0.1%	14.6	36.6%
DR8	<0.1	0.1%	14.6	36.6%
DR9	<0.1	0.1%	14.6	36.6%
DR10	<0.1	0.1%	14.6	36.6%
DR11	0.1	0.2%	14.7	36.7%
DR12	<0.1	0.1%	14.7	36.6%
DR14	0.2	0.5%	14.8	37.0%
DR16	0.2	0.5%	14.8	37.0%
DR25	0.1	0.2%	14.7	36.7%
DR26	0.1	0.1%	14.7	36.7%
DR27	0.2	0.6%	14.8	37.1%
DR28	0.2	0.5%	14.8	37.0%
DR29	0.2	0.5%	14.8	37.0%
DR30	0.2	0.4%	14.8	36.9%
DR31	0.2	0.5%	14.8	37.1%
DR32	0.2	0.5%	14.8	37.0%
DR33	0.2	0.5%	14.8	37.1%
DR34	0.2	0.5%	14.8	37.0%
DR35	0.1	0.1%	14.7	36.6%
DR37	0.1	0.3%	14.7	36.8%
DR38	0.1	0.3%	14.7	36.8%
DR39	0.1	0.3%	14.7	36.8%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR40	0.1	0.2%	14.7	36.7%
DR42	<0.1	0.1%	14.7	36.6%
DR43	<0.1	0.1%	14.6	36.6%
DR44	<0.1	0.1%	14.6	36.6%
DR45	<0.1	0.1%	14.6	36.6%
DR46	0.1	0.2%	14.7	36.7%
DR47	0.1	0.1%	14.7	36.6%
DR48	<0.1	0.1%	14.6	36.6%

Table A-2
Impacts on Annual Mean $PM_{2.5}$ AQAL

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR1	0.1	0.4%	9.9	24.7%
DR2	0.1	0.3%	9.9	24.7%
DR3	0.1	0.3%	9.9	24.6%
DR4	0.1	0.2%	9.8	24.6%
DR5	<0.1	0.1%	9.8	24.5%
DR6	<0.1	0.1%	9.8	24.5%
DR7	<0.1	0.1%	9.8	24.5%
DR8	<0.1	0.1%	9.8	24.5%
DR9	<0.1	0.1%	9.8	24.5%
DR10	<0.1	0.1%	9.8	24.5%
DR11	0.1	0.2%	9.8	24.5%
DR12	<0.1	0.1%	9.8	24.5%
DR14	0.2	0.5%	10.0	24.9%
DR16	0.2	0.5%	9.9	24.8%
DR25	0.1	0.2%	9.8	24.6%
DR26	0.1	0.1%	9.8	24.5%
DR27	0.2	0.6%	10.0	25.0%
DR28	0.2	0.5%	10.0	24.9%
DR29	0.2	0.5%	9.9	24.9%
DR30	0.2	0.4%	9.9	24.8%

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR31	0.2	0.5%	10.0	24.9%
DR32	0.2	0.5%	9.9	24.9%
DR33	0.2	0.5%	10.0	24.9%
DR34	0.2	0.5%	9.9	24.9%
DR35	0.1	0.1%	9.8	24.5%
DR37	0.1	0.3%	9.9	24.7%
DR38	0.1	0.3%	9.9	24.7%
DR39	0.1	0.3%	9.9	24.6%
DR40	0.1	0.2%	9.8	24.6%
DR42	<0.1	0.1%	9.8	24.5%
DR43	<0.1	0.1%	9.8	24.5%
DR44	<0.1	0.1%	9.8	24.5%
DR45	<0.1	0.1%	9.8	24.5%
DR46	0.1	0.2%	9.8	24.5%
DR47	0.1	0.1%	9.8	24.5%
DR48	<0.1	0.1%	9.8	24.5%

Table A-3
Impacts on 24-hour Mean PM_{10} AQAL

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR1	4.9	10%	19.5	39%
DR2	4.2	8%	18.8	38%
DR3	3.3	7%	17.9	36%
DR4	3.6	7%	18.2	36%
DR5	1.7	3%	16.3	33%
DR6	1.6	3%	16.2	32%
DR7	1.5	3%	16.2	32%
DR8	1.3	3%	16.0	32%
DR9	1.5	3%	16.1	32%
DR10	1.5	3%	16.1	32%
DR11	3.5	7%	18.1	36%
DR12	2.3	5%	16.9	34%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR13	5.9	12%	20.5	41%
DR14	7.0	14%	21.6	43%
DR15	3.2	6%	17.8	36%
DR16	3.4	7%	18.0	36%
DR17	2.4	5%	17.0	34%
DR18	2.7	5%	17.3	35%
DR19	3.0	6%	17.6	35%
DR20	3.3	7%	18.0	36%
DR21	3.5	7%	18.1	36%
DR22	3.6	7%	18.2	36%
DR23	3.7	7%	18.3	37%
DR24	3.5	7%	18.1	36%
DR25	2.8	6%	17.4	35%
DR26	2.2	4%	16.8	34%
DR27	7.8	16%	22.4	45%
DR28	7.2	14%	21.8	44%
DR29	6.3	13%	20.9	42%
DR30	6.0	12%	20.6	41%
DR31	7.3	15%	21.9	44%
DR32	6.7	13%	21.3	43%
DR33	7.2	14%	21.8	44%
DR34	6.8	14%	21.4	43%
DR35	1.8	4%	16.4	33%
DR36	4.2	8%	18.8	38%
DR37	3.3	7%	17.9	36%
DR38	3.0	6%	17.6	35%
DR39	2.6	5%	17.2	34%
DR40	2.5	5%	17.1	34%
DR41	2.2	4%	16.8	34%
DR42	1.1	2%	15.7	31%

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR43	1.0	2%	15.6	31%
DR44	1.0	2%	15.6	31%
DR45	0.9	2%	15.5	31%
DR46	1.2	2%	15.8	32%
DR47	1.1	2%	15.7	31%
DR48	0.9	2%	15.5	31%

Table A-4
Impacts on 8-hour Mean CO AQAL

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR1	564.5	6%	757.1	8%
DR2	549.7	5%	742.4	7%
DR3	564.6	6%	757.2	8%
DR4	329.1	3%	521.7	5%
DR5	291.8	3%	484.5	5%
DR6	316.1	3%	508.8	5%
DR7	231.0	2%	423.7	4%
DR8	229.9	2%	422.6	4%
DR9	321.0	3%	513.6	5%
DR10	387.7	4%	580.3	6%
DR11	479.8	5%	672.5	7%
DR12	419.8	4%	612.4	6%
DR13	451.0	5%	643.6	6%
DR14	445.8	4%	638.4	6%
DR15	374.5	4%	567.2	6%
DR16	419.3	4%	612.0	6%
DR17	282.1	3%	474.7	5%
DR18	331.5	3%	524.2	5%
DR19	353.5	4%	546.1	5%
DR20	362.4	4%	555.0	6%
DR21	365.0	4%	557.6	6%
DR22	398.9	4%	591.5	6%

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR23	421.1	4%	613.8	6%
DR24	396.9	4%	589.5	6%
DR25	311.4	3%	504.0	5%
DR26	372.6	4%	565.3	6%
DR27	527.0	5%	719.6	7%
DR28	520.3	5%	713.0	7%
DR29	565.8	6%	758.4	8%
DR30	557.5	6%	750.1	8%
DR31	500.0	5%	692.6	7%
DR32	469.8	5%	662.5	7%
DR33	472.4	5%	665.1	7%
DR34	459.9	5%	652.5	7%
DR35	241.1	2%	433.7	4%
DR36	589.7	6%	782.4	8%
DR37	503.4	5%	696.1	7%
DR38	486.1	5%	678.8	7%
DR39	420.5	4%	613.2	6%
DR40	428.5	4%	621.1	6%
DR41	256.7	3%	449.3	4%
DR42	198.4	2%	391.0	4%
DR43	139.8	1%	332.5	3%
DR44	161.7	2%	354.3	4%
DR45	152.4	2%	345.1	3%
DR46	269.9	3%	462.6	5%
DR47	160.1	2%	352.7	4%
DR48	135.3	1%	328.0	3%

Table A-5
Impacts on 1-hour Maximum CO EAL

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR1	1433.3	5%	1818.6	6%
DR2	1937.4	6%	2322.6	8%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR3	2025.7	7%	2411.0	8%
DR4	1977.0	7%	2362.3	8%
DR5	1104.3	4%	1489.6	5%
DR6	1061.7	4%	1447.0	5%
DR7	1023.3	3%	1408.5	5%
DR8	945.4	3%	1330.7	4%
DR9	1153.7	4%	1539.0	5%
DR10	1116.6	4%	1501.9	5%
DR11	1411.6	5%	1796.9	6%
DR12	1239.0	4%	1624.2	5%
DR13	2131.2	7%	2516.5	8%
DR14	2183.8	7%	2569.1	9%
DR15	1546.3	5%	1931.6	6%
DR16	1538.3	5%	1923.5	6%
DR17	1164.7	4%	1550.0	5%
DR18	1196.9	4%	1582.2	5%
DR19	1208.7	4%	1594.0	5%
DR20	1219.6	4%	1604.9	5%
DR21	1232.6	4%	1617.9	5%
DR22	1230.3	4%	1615.6	5%
DR23	1233.7	4%	1619.0	5%
DR24	1265.4	4%	1650.7	6%
DR25	1238.3	4%	1623.5	5%
DR26	1239.4	4%	1624.7	5%
DR27	2652.4	9%	3037.7	10%
DR28	2536.2	8%	2921.5	10%
DR29	2455.6	8%	2840.9	9%
DR30	2345.6	8%	2730.9	9%
DR31	2576.8	9%	2962.1	10%
DR32	2497.2	8%	2882.5	10%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR33	2229.7	7%	2615.0	9%
DR34	2198.3	7%	2583.5	9%
DR35	1080.7	4%	1465.9	5%
DR36	2187.9	7%	2573.2	9%
DR37	1591.5	5%	1976.7	7%
DR38	1670.9	6%	2056.1	7%
DR39	1506.1	5%	1891.4	6%
DR40	1599.2	5%	1984.5	7%
DR41	1860.3	6%	2245.6	7%
DR42	1518.1	5%	1903.4	6%
DR43	1062.2	4%	1447.5	5%
DR44	997.3	3%	1382.6	5%
DR45	845.8	3%	1231.1	4%
DR46	1032.5	3%	1417.8	5%
DR47	1132.5	4%	1517.8	5%
DR48	1045.1	3%	1430.4	5%

Electrical Grid Outage Model

Table A-6
Impacts on Annual Mean PM_{10} AQAL

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
	36-hour Outage				1-hour Outage			
DR1	0.1	0.2%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR2	0.1	0.2%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR3	0.1	0.1%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR4	0.1	0.1%	14.7	36.6%	<0.1	<0.1%	14.6	36.5%
DR5	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR6	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR7	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR8	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR9	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR10	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR11	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR12	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR14	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR16	0.1	0.4%	14.8	36.9%	<0.1	<0.1%	14.6	36.5%
DR25	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR26	<0.1	0.1%	14.7	36.6%	<0.1	<0.1%	14.6	36.5%
DR27	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR28	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR29	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR30	0.1	0.2%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR31	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR32	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR33	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR34	0.1	0.3%	14.7	36.8%	<0.1	<0.1%	14.6	36.5%
DR35	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR37	0.1	0.2%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR38	0.1	0.2%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR39	0.1	0.2%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR40	0.1	0.2%	14.7	36.7%	<0.1	<0.1%	14.6	36.5%
DR42	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR43	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR44	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR45	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR46	0.1	0.1%	14.7	36.6%	<0.1	<0.1%	14.6	36.5%
DR47	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%
DR48	<0.1	0.1%	14.6	36.6%	<0.1	<0.1%	14.6	36.5%

Table A-7
Impacts on Annual Mean $PM_{2.5}$ AQAL

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
	36-hour Outage				1-hour Outage			
DR1	0.1	0.3%	9.8	39.3%	<0.1	<0.1%	9.8	39.0%
DR2	0.1	0.3%	9.8	39.3%	<0.1	<0.1%	9.8	39.0%
DR3	0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR4	0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR5	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR6	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR7	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR8	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR9	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR10	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR11	<0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR12	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR14	0.1	0.5%	9.9	39.5%	<0.1	<0.1%	9.8	39.0%
DR16	0.1	0.6%	9.9	39.6%	<0.1	<0.1%	9.8	39.0%
DR25	<0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR26	<0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR27	0.1	0.5%	9.9	39.5%	<0.1	<0.1%	9.8	39.0%
DR28	0.1	0.4%	9.9	39.4%	<0.1	<0.1%	9.8	39.0%
DR29	0.1	0.4%	9.9	39.4%	<0.1	<0.1%	9.8	39.0%
DR30	0.1	0.4%	9.8	39.4%	<0.1	<0.1%	9.8	39.0%
DR31	0.1	0.5%	9.9	39.5%	<0.1	<0.1%	9.8	39.0%
DR32	0.1	0.4%	9.9	39.4%	<0.1	<0.1%	9.8	39.0%
DR33	0.1	0.5%	9.9	39.5%	<0.1	<0.1%	9.8	39.0%
DR34	0.1	0.5%	9.9	39.5%	<0.1	<0.1%	9.8	39.0%
DR35	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR37	0.1	0.3%	9.8	39.3%	<0.1	<0.1%	9.8	39.0%
DR38	0.1	0.3%	9.8	39.3%	<0.1	<0.1%	9.8	39.0%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR39	0.1	0.3%	9.8	39.3%	<0.1	<0.1%	9.8	39.0%
DR40	0.1	0.2%	9.8	39.3%	<0.1	<0.1%	9.8	39.0%
DR42	<0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR43	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR44	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR45	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%
DR46	0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR47	<0.1	0.2%	9.8	39.2%	<0.1	<0.1%	9.8	39.0%
DR48	<0.1	0.1%	9.8	39.1%	<0.1	<0.1%	9.8	39.0%

Table A-8
Impacts on 8-hour Mean CO AQAL (36-hour outage)

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR1	1960.5	20%	2345.8	23%
DR2	1935.4	19%	2320.7	23%
DR3	3078.6	31%	3463.9	35%
DR4	1307.4	13%	1692.7	17%
DR5	1131.4	11%	1516.7	15%
DR6	1100.8	11%	1486.1	15%
DR7	1167.0	12%	1552.3	16%
DR8	1270.9	13%	1656.2	17%
DR9	1611.3	16%	1996.6	20%
DR10	1695.4	17%	2080.7	21%
DR11	931.0	9%	1316.2	13%
DR12	907.4	9%	1292.7	13%
DR13	1901.8	19%	2287.1	23%
DR14	2625.7	26%	3011.0	30%
DR15	3223.4	32%	3608.7	36%
DR16	3978.6	40%	4363.9	44%
DR17	1447.4	14%	1832.7	18%
DR18	1399.0	14%	1784.3	18%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR19	1376.4	14%	1761.7	18%
DR20	1334.5	13%	1719.7	17%
DR21	1274.0	13%	1659.3	17%
DR22	1282.1	13%	1667.4	17%
DR23	1313.8	13%	1699.1	17%
DR24	1320.4	13%	1705.7	17%
DR25	1338.7	13%	1724.0	17%
DR26	2194.3	22%	2579.6	26%
DR27	3311.0	33%	3696.3	37%
DR28	3413.1	34%	3798.4	38%
DR29	3751.8	38%	4137.1	41%
DR30	3793.7	38%	4179.0	42%
DR31	2175.9	22%	2561.2	26%
DR32	2207.6	22%	2592.9	26%
DR33	2998.6	30%	3383.9	34%
DR34	2973.0	30%	3358.3	34%
DR35	1349.8	13%	1735.1	17%
DR36	3365.7	34%	3750.9	38%
DR37	2223.4	22%	2608.7	26%
DR38	2772.5	28%	3157.8	32%
DR39	2658.4	27%	3043.7	30%
DR40	2053.9	21%	2439.2	24%
DR41	3513.3	35%	3898.6	39%
DR42	1922.0	19%	2307.3	23%
DR43	1196.1	12%	1581.4	16%
DR44	2004.1	20%	2389.4	24%
DR45	1299.8	13%	1685.1	17%
DR46	1752.8	18%	2138.1	21%
DR47	2171.8	22%	2557.1	26%
DR48	2311.4	23%	2696.7	27%

Table note: Results are unfactored

Table A-9
Impacts on 1-hour Maximum CO EAL (36 and 1-hour outage)

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR1	4231.9	14%	4617.2	15%
DR2	4257.8	14%	4643.1	15%
DR3	5180.9	17%	5566.2	19%
DR4	4280.4	14%	4665.7	16%
DR5	3227.2	11%	3612.4	12%
DR6	2592.7	9%	2978.0	10%
DR7	2328.2	8%	2713.5	9%
DR8	2331.2	8%	2716.4	9%
DR9	2556.1	9%	2941.4	10%
DR10	2832.0	9%	3217.3	11%
DR11	2168.2	7%	2553.4	9%
DR12	2242.9	7%	2628.1	9%
DR13	5724.7	19%	6109.9	20%
DR14	6435.1	21%	6820.3	23%
DR15	5961.9	20%	6347.2	21%
DR16	5985.4	20%	6370.7	21%
DR17	2646.9	9%	3032.2	10%
DR18	2628.0	9%	3013.3	10%
DR19	2671.8	9%	3057.1	10%
DR20	2853.7	10%	3239.0	11%
DR21	3017.8	10%	3403.1	11%
DR22	3002.2	10%	3387.5	11%
DR23	3040.3	10%	3425.5	11%
DR24	3040.3	10%	3425.6	11%
DR25	3498.6	12%	3883.9	13%
DR26	4692.2	16%	5077.4	17%
DR27	7004.7	23%	7390.0	25%
DR28	6804.0	23%	7189.2	24%
DR29	6435.6	21%	6820.9	23%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR30	6275.3	21%	6660.5	22%
DR31	6275.3	21%	6660.6	22%
DR32	6121.9	20%	6507.2	22%
DR33	6482.6	22%	6867.9	23%
DR34	6674.8	22%	7060.1	24%
DR35	2507.4	8%	2892.7	10%
DR36	5491.4	18%	5876.6	20%
DR37	4228.5	14%	4613.8	15%
DR38	4547.9	15%	4933.2	16%
DR39	4359.7	15%	4745.0	16%
DR40	4266.5	14%	4651.8	16%
DR41	7789.7	26%	8175.0	27%
DR42	6442.3	21%	6827.6	23%
DR43	2746.9	9%	3132.1	10%
DR44	4165.0	14%	4550.3	15%
DR45	3301.7	11%	3686.9	12%
DR46	4385.3	15%	4770.6	16%
DR47	4615.9	15%	5001.2	17%
DR48	4666.2	16%	5051.5	17%

Table note: Results are unfactored

Commissioning Schedule Impacts

Table A-10
Impacts on Annual Mean PM_{10} AQAL

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR1	0.1	0.4%	14.7	36.9%
DR2	0.1	0.3%	14.7	36.9%
DR3	0.1	0.3%	14.7	36.8%
DR4	0.1	0.2%	14.7	36.7%
DR5	<0.1	0.1%	14.7	36.6%
DR6	<0.1	0.1%	14.6	36.6%
DR7	<0.1	0.1%	14.6	36.6%
DR8	<0.1	0.1%	14.6	36.6%
DR9	<0.1	0.1%	14.6	36.6%
DR10	<0.1	0.1%	14.6	36.6%
DR11	0.1	0.2%	14.7	36.7%
DR12	<0.1	0.1%	14.7	36.6%
DR14	0.2	0.5%	14.8	37.0%
DR16	0.2	0.5%	14.8	37.0%
DR25	0.1	0.2%	14.7	36.7%
DR26	0.1	0.1%	14.7	36.7%
DR27	0.2	0.6%	14.8	37.1%
DR28	0.2	0.5%	14.8	37.0%
DR29	0.2	0.5%	14.8	37.0%
DR30	0.2	0.4%	14.8	36.9%
DR31	0.2	0.6%	14.8	37.1%
DR32	0.2	0.5%	14.8	37.0%
DR33	0.2	0.5%	14.8	37.1%
DR34	0.2	0.5%	14.8	37.0%
DR35	0.1	0.1%	14.7	36.6%
DR37	0.1	0.3%	14.7	36.8%
DR38	0.1	0.3%	14.7	36.8%
DR39	0.1	0.3%	14.7	36.8%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR40	0.1	0.2%	14.7	36.8%
DR42	0.1	0.1%	14.7	36.6%
DR43	<0.1	0.1%	14.7	36.6%
DR44	<0.1	0.1%	14.7	36.6%
DR45	<0.1	0.1%	14.6	36.6%
DR46	0.1	0.2%	14.7	36.7%
DR47	0.1	0.1%	14.7	36.7%
DR48	<0.1	0.1%	14.6	36.6%

Table A-11
Impacts on Annual Mean $PM_{2.5}$ AQAL

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR1	0.1	0.4%	9.9	24.7%
DR2	0.1	0.3%	9.9	24.7%
DR3	0.1	0.3%	9.9	24.6%
DR4	0.1	0.2%	9.8	24.6%
DR5	<0.1	0.1%	9.8	24.5%
DR6	<0.1	0.1%	9.8	24.5%
DR7	<0.1	0.1%	9.8	24.5%
DR8	<0.1	0.1%	9.8	24.5%
DR9	<0.1	0.1%	9.8	24.5%
DR10	<0.1	0.1%	9.8	24.5%
DR11	0.1	0.2%	9.8	24.5%
DR12	<0.1	0.1%	9.8	24.5%
DR14	0.2	0.5%	10.0	24.9%
DR16	0.2	0.5%	10.0	24.9%
DR25	0.1	0.2%	9.8	24.6%
DR26	0.1	0.1%	9.8	24.5%
DR27	0.2	0.6%	10.0	25.0%
DR28	0.2	0.5%	10.0	24.9%
DR29	0.2	0.5%	9.9	24.9%
DR30	0.2	0.4%	9.9	24.8%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR31	0.2	0.6%	10.0	24.9%
DR32	0.2	0.5%	9.9	24.9%
DR33	0.2	0.5%	10.0	24.9%
DR34	0.2	0.5%	9.9	24.9%
DR35	0.1	0.1%	9.8	24.5%
DR37	0.1	0.3%	9.9	24.7%
DR38	0.1	0.3%	9.9	24.7%
DR39	0.1	0.3%	9.9	24.7%
DR40	0.1	0.2%	9.8	24.6%
DR42	0.1	0.1%	9.8	24.5%
DR43	<0.1	0.1%	9.8	24.5%
DR44	<0.1	0.1%	9.8	24.5%
DR45	<0.1	0.1%	9.8	24.5%
DR46	0.1	0.2%	9.8	24.6%
DR47	0.1	0.1%	9.8	24.5%
DR48	<0.1	0.1%	9.8	24.5%

The CSM 1-hour CO impacts are unchanged from the MSM impacts (see Table A-5), the CSM 8-hour CO impacts are higher than MSM due to the 12-hour Suite by Suite In-service Test (impact presented in Table A-12).

Table A-12
Impacts on 8-hour Mean CO AQAL

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR1	578.2	6%	770.9	8%
DR2	558.1	6%	750.8	8%
DR3	930.4	9%	1123.0	11%
DR4	491.9	5%	684.6	7%
DR5	378.8	4%	571.5	6%
DR6	383.6	4%	576.3	6%
DR7	277.2	3%	469.9	5%
DR8	293.7	3%	486.3	5%
DR9	417.9	4%	610.6	6%

Receptors	PC (µg/m^3)	PC % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
DR10	424.2	4%	616.8	6%
DR11	508.7	5%	701.3	7%
DR12	434.4	4%	627.0	6%
DR13	649.9	6%	842.5	8%
DR14	781.5	8%	974.1	10%
DR15	743.8	7%	936.4	9%
DR16	848.4	8%	1041.0	10%
DR17	344.4	3%	537.1	5%
DR18	342.4	3%	535.0	5%
DR19	372.1	4%	564.7	6%
DR20	395.4	4%	588.0	6%
DR21	417.7	4%	610.4	6%
DR22	465.9	5%	658.5	7%
DR23	502.9	5%	695.6	7%
DR24	490.9	5%	683.5	7%
DR25	424.7	4%	617.3	6%
DR26	461.1	5%	653.7	7%
DR27	837.7	8%	1030.3	10%
DR28	772.7	8%	965.3	10%
DR29	1037.8	10%	1230.4	12%
DR30	1004.5	10%	1197.2	12%
DR31	782.9	8%	975.5	10%
DR32	752.6	8%	945.3	9%
DR33	886.5	9%	1079.1	11%
DR34	840.6	8%	1033.3	10%
DR35	290.6	3%	483.3	5%
DR36	1002.4	10%	1195.0	12%
DR37	572.1	6%	764.8	8%
DR38	678.9	7%	871.6	9%
DR39	633.5	6%	826.1	8%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR40	484.5	5%	677.2	7%
DR41	838.3	8%	1030.9	10%
DR42	523.3	5%	715.9	7%
DR43	358.0	4%	550.6	6%
DR44	469.2	5%	661.8	7%
DR45	334.3	3%	526.9	5%
DR46	446.7	4%	639.3	6%
DR47	500.0	5%	692.6	7%
DR48	513.3	5%	706.0	7%

Table A-13
Impacts on 24-hour Mean PM_{10} AQAL

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR1	8.2	16%	22.8	46%
DR2	7.5	15%	22.1	44%
DR3	5.8	12%	20.4	41%
DR4	6.4	13%	21.0	42%
DR5	3.2	6%	17.8	36%
DR6	3.3	7%	17.9	36%
DR7	3.0	6%	17.6	35%
DR8	2.7	5%	17.3	35%
DR9	2.9	6%	17.6	35%
DR10	2.9	6%	17.5	35%
DR11	4.7	9%	19.3	39%
DR12	3.4	7%	18.0	36%
DR13	10.7	21%	25.3	51%
DR14	12.5	25%	27.1	54%
DR15	9.1	18%	23.7	47%
DR16	9.4	19%	24.0	48%
DR17	4.6	9%	19.2	38%
DR18	5.1	10%	19.7	39%

Receptors	PC (µg/m³)	PC % of AQAL	PEC (µg/m³)	PEC as % of AQAL
DR19	5.7	11%	20.3	41%
DR20	6.3	13%	20.9	42%
DR21	6.6	13%	21.2	42%
DR22	6.9	14%	21.5	43%
DR23	6.8	14%	21.4	43%
DR24	6.3	13%	20.9	42%
DR25	5.4	11%	20.0	40%
DR26	4.2	8%	18.8	38%
DR27	14.5	29%	29.1	58%
DR28	13.1	26%	27.7	55%
DR29	11.6	23%	26.2	52%
DR30	10.6	21%	25.2	50%
DR31	13.5	27%	28.1	56%
DR32	12.6	25%	27.2	54%
DR33	12.9	26%	27.5	55%
DR34	12.0	24%	26.7	53%
DR35	3.7	7%	18.3	37%
DR36	7.2	14%	21.8	44%
DR37	7.1	14%	21.7	43%
DR38	6.9	14%	21.5	43%
DR39	6.2	12%	20.8	42%
DR40	5.3	11%	19.9	40%
DR41	8.5	17%	23.1	46%
DR42	3.9	8%	18.5	37%
DR43	3.3	7%	17.9	36%
DR44	3.6	7%	18.2	36%
DR45	2.9	6%	17.5	35%
DR46	3.6	7%	18.2	36%
DR47	3.3	7%	17.9	36%
DR48	2.8	6%	17.4	35%

APPENDIX B

Dispersion Modelling Plot Figures

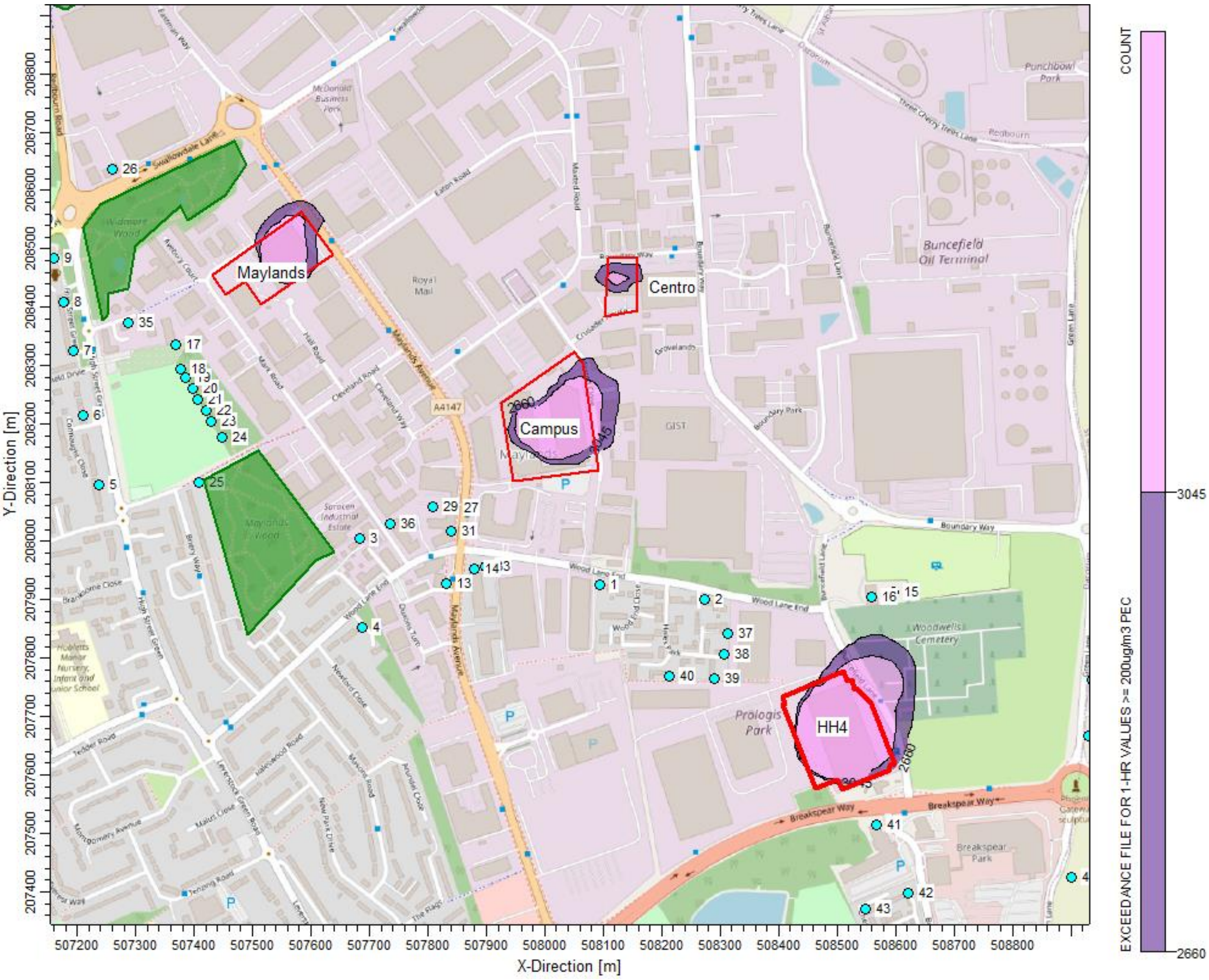

Figure B-1

36-hours Outage: Probability of Exceedance of NO_2 1-hour AQAL

Figure note:

<2655 exceedances represents a <1% probability of exceeding the AQAL based on 36 emergency hours (highly unlikely)

<3045 exceedances represents a <5% probability of exceeding the AQAL based on 36 emergency hours (unlikely)

>3045 exceedances represents a >5% probability of exceeding the AQAL based on 36 emergency hours (likely)

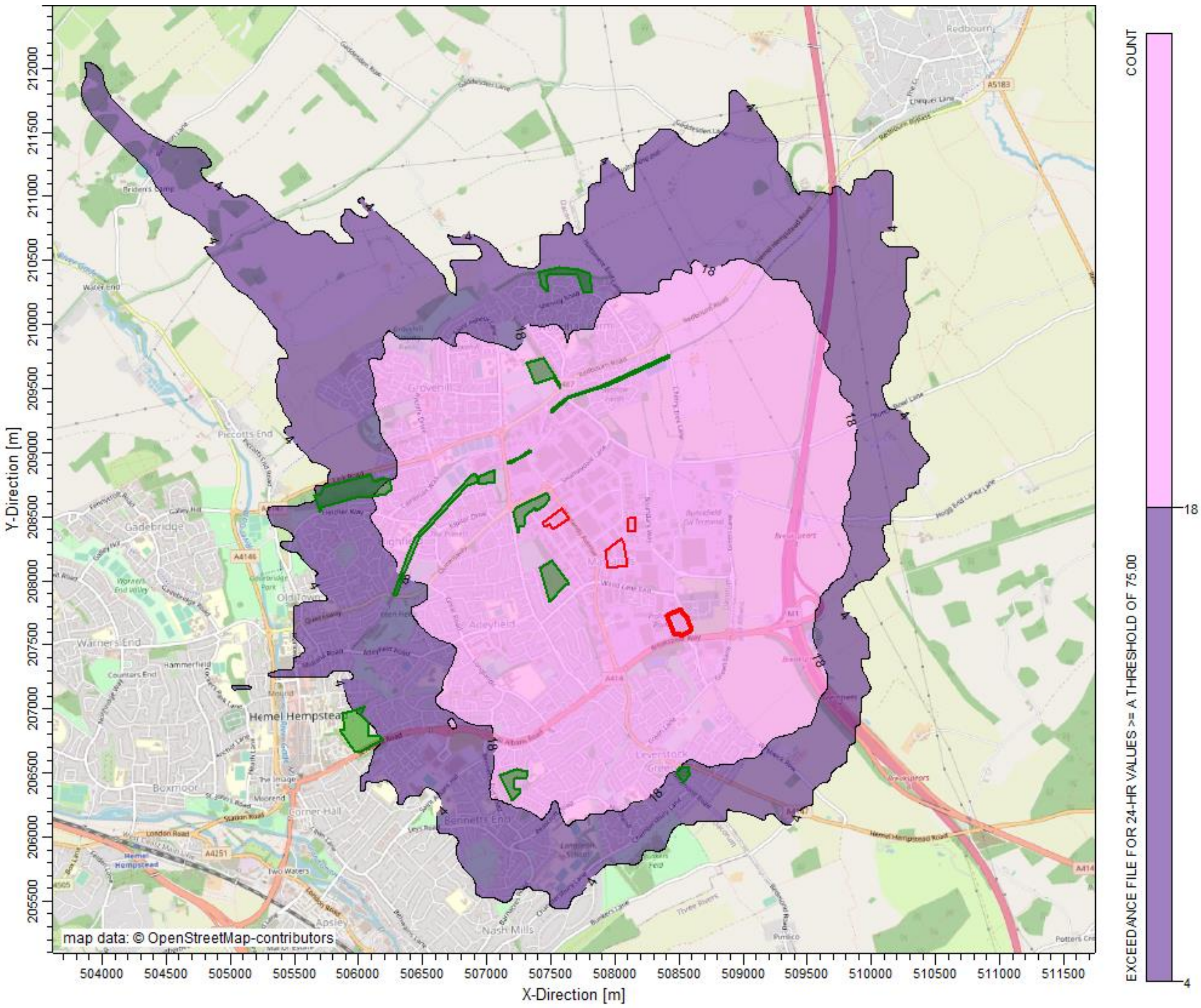

Figure B-2
36-hours Outage: Probability of Exceedance of NO_x Daily 30µg/m^3

Figure note:

<3 exceedances represents a <1% probability of exceeding the AQAL based on 36 emergency hours (highly unlikely)

<18 exceedances represents a <5% probability of exceeding the AQAL based on 36 emergency hours (unlikely)

>18 exceedances represents a >5% probability of exceeding the AQAL based on 36 emergency hours (likely)

APPENDIX C

Model Files (electronic only)

APPENDIX D

EA Dispersion Modelling Checklist

Item	Yes/No	Details / reason for omission
Location map	Y	Figure 4-1
Site plan	Y	Figure 3-1
Pollutants modelled and relevant AQALs	Y	Section 2.2 / 2.4
Details of modelled scenarios	Y	Section 5.2
Details of relevant ambient concentrations	Y	Section 4.0
Model description and justification	Y	Section 3.1
Special model treatment used	Y	Section 3.0
Table of emission parameters used	Y	Table 5-1
Details of modelled domain and receptors	Y	Section 3.1.3
Details of meteorological data used	Y	Section 3.1.7
Details of terrain treatment	Y	Section 3.1.4
Details of building treatment	Y	Section 3.1.5
Details of modelling deposition	Y	Section 3.3
Model uncertainty and sensitivity	Y	Section 3.1.2
Assessment of impacts	Y	Section 6.0
Contour plots	Y	Appendix B
Model input files	Y	Appendix C

EUROPEAN OFFICES

United Kingdom

AYLESBURY
T: +44 (0)1844 337380

BELFAST
belfast@slrconsulting.com

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 906 4280

CARDIFF
T: +44 (0)29 2049 1010

CHELMSFORD
T: +44 (0)1245 392170

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: + 44 (0)1392 490152

GLASGOW
glasgow@slrconsulting.com

GUILDFORD
T: +44 (0)1483 889800

LONDON
T: +44 (0)203 805 6418

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER (Denton)
T: +44 (0)161 549 8410

MANCHESTER (Media City)
T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE
T: +44 (0)191 261 1966

NOTTINGHAM
T: +44 (0)115 964 7280

SHEFFIELD
T: +44 (0)114 245 5153

SHREWSBURY
T: +44 (0)1743 23 9250

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310

Ireland

DUBLIN
T: + 353 (0)1 296 4667

France

GRENOBLE
T: +33 (0)6 23 37 14 14