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Pure DC

Environmental Permit Application – Supporting Information

June 2021

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All figures have been provided by Pure DC.

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Project: *Environmental Permit Application – Supporting Information*

Version: Draft 1.17

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Acronyms and Abbreviations

Term	Description
BAT	Best Available Technique
BREF	BAT Reference document
CO	Carbon monoxide
C&I	Commercial and Industrial waste
EA	Environment Agency
EMS	Environmental Management System
EP	Environmental Permit
EPR	Environmental Permitting Regulations
kWe	Electrical power in kilowatts
F-gas	Fluorinated greenhouse gas
IED	Industrial Emissions Directive
ISO	International Standards Organisation
km	kilometre
l	litre
m	metre
MCP	Medium Combustion Plant
MCPD	Medium Combustion Plant Directive
MWe	Electrical power in megawatts
MWth	megawatt thermal
NO_x	Oxides of nitrogen
OTNOC	Other Than Normal Operating Conditions
PUE	Power Usage Effectiveness
SO_2	Sulphur dioxide
t	metric tonne
TGN	Technical Guidance Note
UPS	Uninterruptable Power Supply
WWTP	Waste Water Treatment Plant

Application Checklist

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Form B2 – Question 5a	Site Plan showing site boundary and discharge point(s), including site drainage plans, plant design drawings / process flow diagrams (as required)	This report: Figure 1 Site Location Plan and Installation Boundary
Form B2 – Question 5b	Relevant sections of a site condition / baseline report	This report: Section 9.2 Site Condition Report
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Form B3 – Question 6a	Improving energy efficiency	This report: Section 8 Energy
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Form B3 – Question 6c	Climate Change Levy Agreement	Not applicable?
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Form B3 – Question 6e	Avoidance of waste	This report: Section 6 Waste Management

Requirement	Description	Location in Report
Form B3 – Appendix 1 Question 1	Types of fuel use in combustion units	This report: Section 2.3.2Stand-by Power Generating System Overview Section 4.3 Operating Techniques Review Section 8 Energy

Non-Technical Summary

A new data centre is proposed to be installed and operated at JVC Business Park, Staples Corner, London, NW2 7BA, an existing commercial and brownfield location in the London Borough of Brent, north London. The data centre will be located within a renovated site situated in proximity to significant transport routes (road, and rail), along with potentially sensitive ecological and human receptors.

The data centre is required to be permanently online and will be powered by the national electricity supply grid. In consultation with relevant stakeholders and following a review of historic electricity outages and forecast ongoing grid resilience it is considered that the electricity supply grid will remain sufficiently stable to enable the data centre to operate on grid supplied electricity only. However, the provision of standby power generating plant is essential in accordance with best practice and contractual obligations.

An Environmental Permit is sought specifically in relation to standby electricity generating plant (The Installation), and directly associated activities (i.e. fuel delivery). The generators specified (MTU 20V4000G94LF) are considered best in class based on current technology and are a contingency solution, and do not function as electricity-generators within the daily operation of the wider site. In an abnormal / emergency event, the generators will, through an automated system, become operational; under these events, the plant would operate for no more than 72 hours in line with industry best practice, and (for the avoidance of customer compromises) no longer than 48 hours.

The power generating plant will be subject to a routine start-up testing regime which will ensure that the hardware and operator can switch to standby power in the event of an abnormal / emergency situations.

In support of both the earlier planning application (to the Local Authority) and this Environmental Permit application (to the Environment Agency), specific relevant technical evaluations have been undertaken to evaluate the potential impact of the proposed development on the wider environment. Outcomes of the noise, air quality and site condition assessments are summarised in this report, and full copies of report appended for reference. The Noise report was updated from Planning Application and the Air Modelling Report, and the Site Condition Report are new for the Permit Application.

The noise assessment has been updated to reflect the selected engines highlighted that with provision of appropriate abatement, noise levels associated with the Installation would be appropriately mitigated. This has been reviewed by the design engineers for Pure DC and the abatement has been provided for the selected engines.

The Site Condition Report highlighted the potential for historic ground contamination as a result of previous land use. A monitoring programme has been underway for several years to evaluate changes in contaminant levels. This programme will continue, and mitigation measures have been proposed and adopted to minimise likelihood of establishing new pollution pathways associated with legacy contaminants. A risk assessment has also evaluated the likelihood of potential pollution caused by the Installation, determining that delivery and bulk storage of fuel to by the most significant. Consequently, mitigation measures have been adopted that are intended to minimise the likelihood and consequence of a pollution event from the oil storage and use.

Air pollution directly associated with exhaust emissions from the Installation has been subject to detailed atmospheric dispersion modelling, based on emissions data provided by the equipment supplier. The background atmospheric pollution

levels of this populous and strategically significant location affords limited capacity for additional pollution, to maintain compliance with air quality standards for typical generation, but for short term use as here this is a different issue. Given the short-term operational cycle of the plant (<72 hours in an event, most likely 3 hours at most per year, if any; and 208 planned hours a year for all testing conditions), the Installation is predicted to not result in long-term air quality impacts. The air modelling report details the short-term impacts and considerations taken in their regard.

Prior to operation, the site will implement an environmental management system, based on requirements of ISO14001, which will establish processes for monitoring and minimising the potential environmental impacts of the Installation, and be the basis for ongoing emissions reporting, including compliance with the applicable Emissions Trading Scheme (the UK scheme is being implemented at this time to replace the EU ETS).

1. Introduction

1.1 Reason for Application

Pure DC has secured planning permission for construction and operation of a data centre at JVC Business Park, Staples Corner, London, NW2 7BA.

The data centre comprises permanent buildings that contain data storage and associated IT infrastructure. The facility will under normal operating conditions be powered by grid supplied electricity. A contingency standby power solution, comprising multiple liquid-fuelled engines, is integrated within the design providing onsite electrical generating capacity to be used in the event of power outages to the site.

An Environmental Permit (EP) is required for only the back-up generation, following the guidance document provided by the EA (Environment Agency FAQ on Environmental Permitting of Data Centres [1]) and discussed in a Pre-Application Meeting on 19 April 2021 and a following discussion with the EA Sector lead Howard Tee on 14 May 2021 and again on 14 June 2021. The installation therefore is only the engines and directly associated activities, and the corresponding pathways to the environment; mainly air emissions and engine fuel storage.

1.2 Listed Activities

The primary commercial activity of the data centre is data storage. This is not an activity that in and of itself requires an Environmental Permit, as outlined in the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

Table 1 confirms the appropriate Installation Listed Activity Reference.

Table 1 Listed Activities

Listed activity	Description	Limits
Section 1.1 Part A(1)(a) "Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts"	Combustion of diesel fuel in electrical generators of varying capacities but with an aggregated thermal input >50 MWth (total thermal input c. 131 MWth)	From receipt of fuel (diesel) to emission of combustion products

1.3 Details of Company Directors

The following are named Directors:

- Mr Nick On
- Mr Clive Atkinson
- Mr Martin Lynch
- Mar Simon Berrill

[1] Data Centre FAQ Headline Approach Draft v10, s1.2 point 8.

2. Site Description

2.1 Site Location

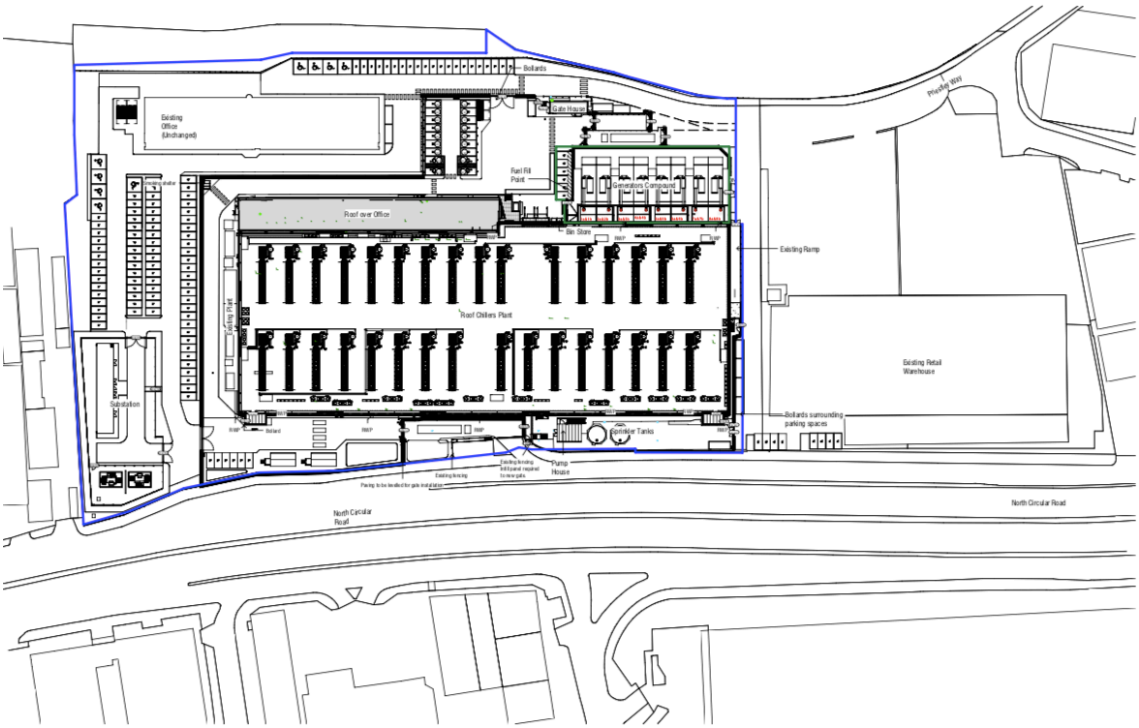
The site is located within the authoritative boundary of the London Borough of Brent, and within the designated Strategic Industrial Location of “Staples Corner”.

- National Grid Reference: TQ 22296 87216

Site access is via Priestley Way, from an easterly direction.

The site location is shown in Figure 1 (a large format, high resolution image is included with the application pack). The primary reference landmark feature is the North Circular road that runs approximately west to east along the lower part of the image. The blue line shows the perimeter of the site; the green line shows the Installation boundary (for clarity, this is the rectangular compound located at the top right corner of the site. Access to the site (vehicular and pedestrian) is via an approach road and security-controlled gate adjacent to the Installation.

Figure 1 Site Location Plan and Installation Boundary



2.2 Site Context

2.2.1 Site history

The site will operate within existing buildings renovated and repurposed to accommodate the Data Centre as well as new buildings and with some removed. The site was formally recognised as the JVC/Harp View business park. The Data Centre will comprise two (No.2) interconnected warehouse buildings.

The site comprises existing buildings (that functioned in previous use as administrative and warehouse space) and vehicular access and service yard.

The existing building was constructed in 2005.

To the eastern boundary a builder’s merchant operates, whilst the western boundary comprises light industrial and Outlet retail units. The A406 North Circular

forms the southern boundary. Bordering the site to the North is Neasden recreational ground and Brent Reservoir, which is a SSSI.

A full description of historic land use on the site is detailed in the Site Condition Report appended to the Application. In summary, previous site uses have included:

- Between c.1920 and c. 1955: production of acetylene, including onsite waste disposal pits (two are believed to remain in situ, one has been excavated and backfilled)
- Between c.1955 and 1999: use as a depot, works, warehouse and factory (exact activities is unknown)
- Approximately 1977: installation of two (still operational) electrical substations; shortly thereafter a third was installed elsewhere within the site boundary
- Between 2005 and 2010: corporate head office and distribution centre for JVC

2.2.2 Topography

The site predominately slopes from west to east, located approximately 40m above ordnance datum.

2.3 Site Activity

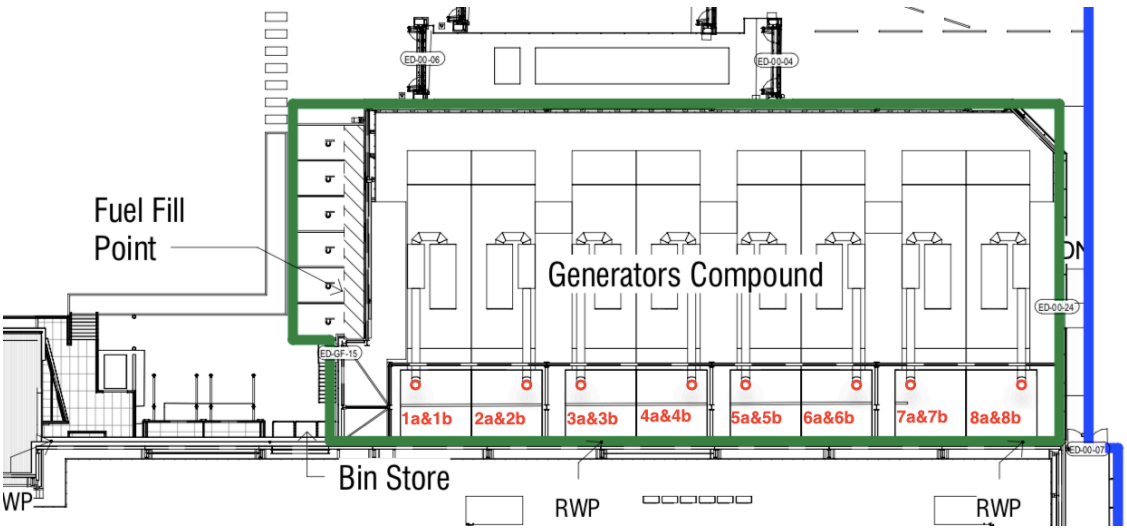
2.3.1 Overall Site Activity

The primary activity onsite is data storage. The Data Centre is located in a purpose-built building housing data storage equipment, administrative and technical spaces and ancillary equipment that includes redundancy capability, environment control and safety systems, and standby power generating equipment.

The data centre requires capability to continue to operate in the immediate event of power failure, and continued operation in the event of prolonged power outages. The contingency system comprises Uninterruptable Power Supplies (UPS) and multiple liquid-fuelled generators. The specific details of the standby power are detailed below.

A schematic of the site layout is presented in Figure 2.

Figure 2 Schematic of Site Layout with Installation Boundary in Green



Later we provide layout diagrams of the fuel unloading and protection systems, to storage, to transfer to the engines with the engine layout, the exhaust plenums and the final heat and stack / discharge to plenum shown.

Figure 3 presents a visualisation of the data centre and the associated stand by power Installation. The Installation is the structure in the foreground, with a slightly lower elevation height that the primary building in the background. The installation only extends for part (approximately 40%) of the overall elevation of the long-axis of the main building.

Figure 3 Visualisation of Installation

2.3.2 Stand-by Power Generating System Overview

The Data Centre comprises 16 backup generators installed to provide emergency power in the event of a grid supply failure, which will be delivered in two phases. The assessment has been based on all 16 being in place.

Each generator set comprises a generator and alternator in a combined set.

The generators are proposed to be arranged in a stacked, paired formation installed in 2 phases (allowing for phased expansion and capacity across the site as part of a forecast operating strategy). A common fuel bunker (one storage tank per engine) servicing each pair of the paired generators is located at ground level. “Engine a” is located directly above the fuel bunker and corresponds to installation and commissioning in Phase 1 of the development; “Engine b” is located directly above “Engine a” corresponds to installation and commissioning in Phase 2 of the development.

This sketch below (Figure 4) shows the layout of the engines above the fuel tank and the exhausts to the Plenum.

Exhaust gases from each pair of engines will be discharged through a common plenum that exclusively serves each paired generator set, along with discharged air from the associated engine cooling system. Only one engine may be on at a time, for testing certainly.

These generators are intended to function exclusively as standby power generators for the site and will be limited to less than 500 hours per year run time, including the

testing regime. The limited runtime of the generators significantly affects the viability of installing Combined Heat and Power (CHP) functionality. Consequently, at this time, there is considered to be no economic, operational, or environmental benefit associated with the installation of CHP system.

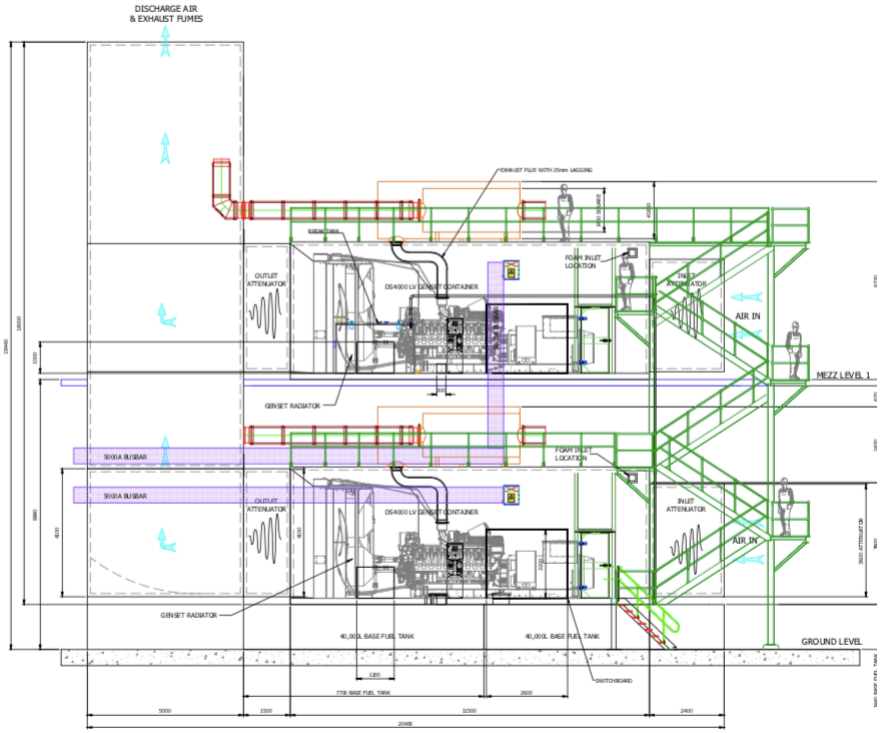
A schematic showing more detail of the engine arrangement is presented in Figure 4.

The inventory and generating capacity of the engines are presented in Table 2.

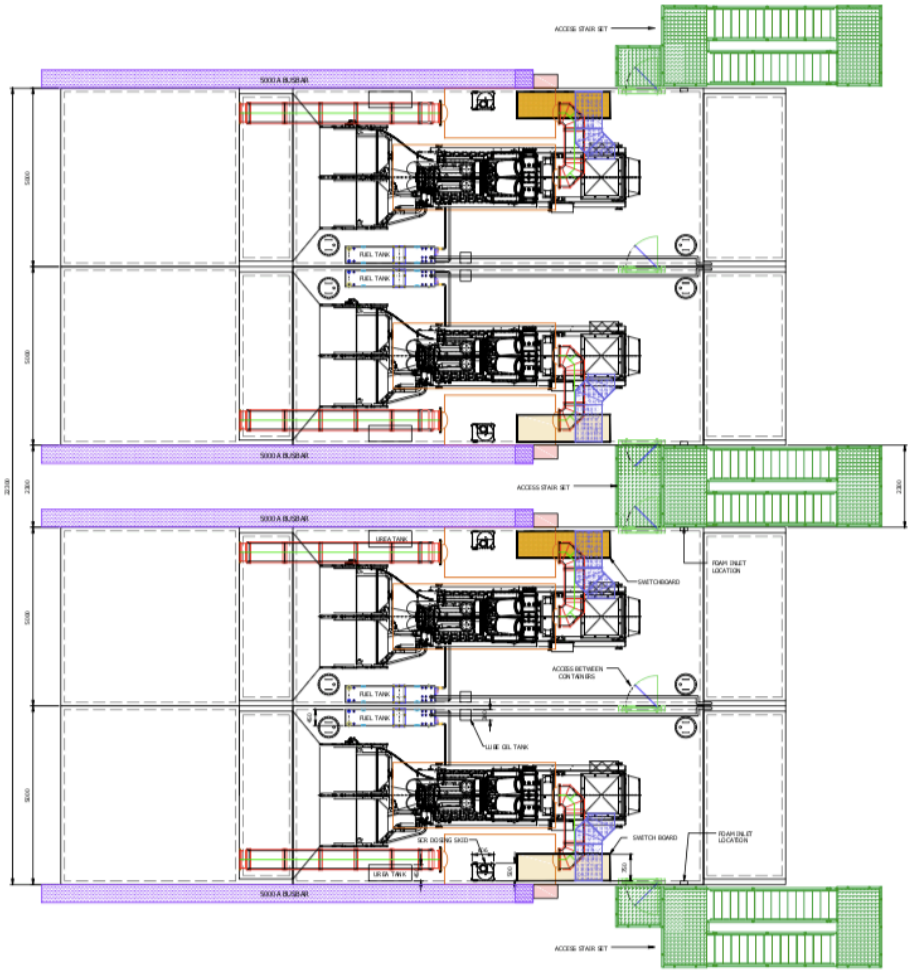
Table 2 Generators at the Site

Location ID	Engine	Status (Operational, Installed, Planned)	Individual Generator Power Rating (MWe)	Number	Total MWe	Total MWth input (assuming 35% efficient and 0.8 power factor)[a]
1a, 2a, 3a, 4a, 5a, 6a, 7a, 8a	MTU 20V4000G94LF	Planned – Phase 1	3,200	8	25.6	58.5
1b, 2b, 3b, 4b, 5b, 6b, 7b, 8a	MTU 20V4000G94LF	Planned – Phase 2	3,200	8	25.6	58.5
Total				**16**	**51.2**	**117**
a Calculated Thermal Input (MWth) as per FAQ: (MWe * power factor) / efficiency						

Figure 4 Schematic of Stacked, Paired Generator Arrangement



Section View ↑



Plan View→

Reference: E2020-1994-004 48 Hour Base Fuel Tank Site Layout Rev B

2.3.3 Testing Regime

It is essential that the standby power systems are routinely tested to ensure that they function correctly in the event of them being required to operate. The testing regime is detailed in Table 3.

Table 3 Testing Regime

Type of Test	Duration	Scheduling	Load
Individual engine, low load	30minutes	Single engine tested once per month for 10 months per year;	Up to 10% load
Individual engine, full load	4hours	Single engine tested once every 6 months (maximum 2 tests per year)	Approximately 100% load

Direct emissions of exhaust gases from the engines will be vented to atmosphere. A dedicated air quality assessment, including atmospheric dispersion modelling, has been undertaken in support of this permit application and is included in Section 9.1 and Section 9.1, and as a separate report attached.

2.3.4 Fuel Storage

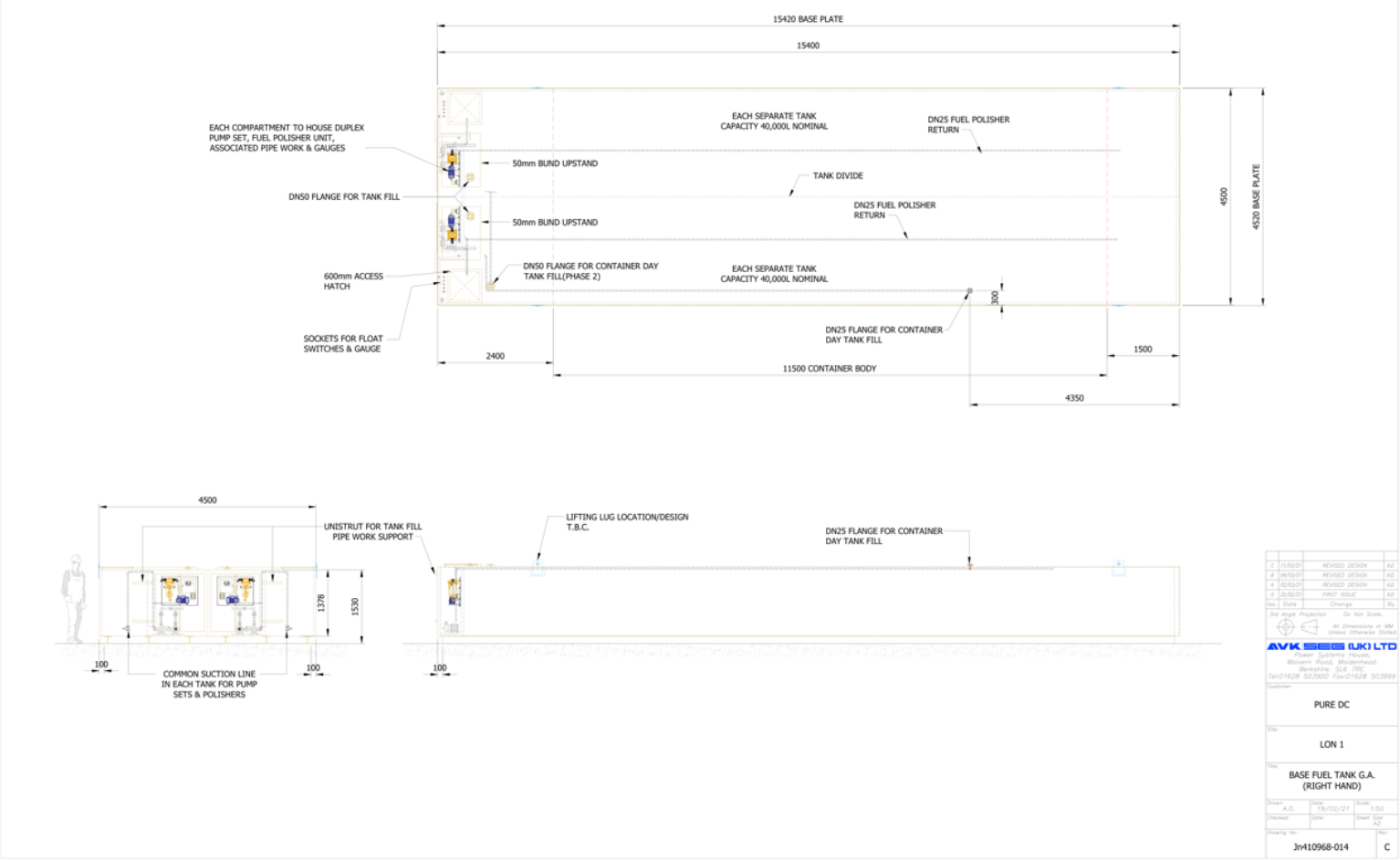
Each engine has its own dedicated bulk fuel storage tank (capacity 40,000 litres). The tanks are positioned above ground and set at ground level. They are positioned underneath the engines, minimising pipe-runs and pumping distances to point of use.

Each tank is double walled, affording integrated primary and secondary containment and minimisation of leakage associated with containment failure.

Automated monitoring systems will be installed and integrated within the site's monitoring system. Daily site walk overs will be undertaken to provide a visual inspection of multiple key locations; including visual inspection of fuel storage tanks, leaks, fill points and hardstanding, and vent points.

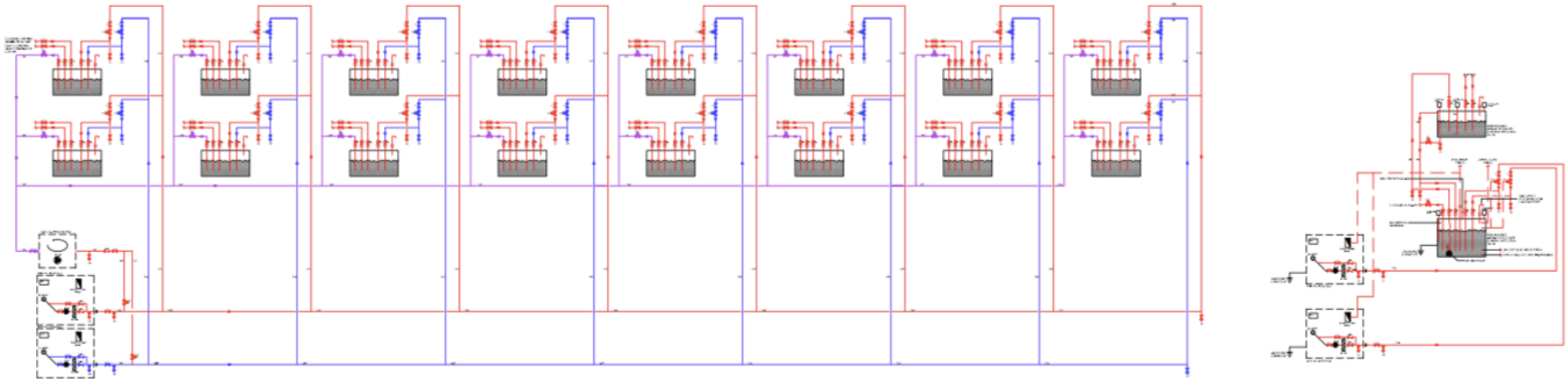
Figure 5 (large format is attached separately) below shows the layout of the fuel storage arrangements; a schematic drawing of the fuel system is presented in Figure 6 (large format is attached separately).

Figure 5 Schematic of Fuel Storage Tank Arrangement



Reference: Jn410968-014 Base Fuel Tank GA RH Rev C

Figure 6 Schematic of Fuel System



Reference: 015823-RED-XX-XX-DR-M-1600_P0.pdf

2.3.5 Cooling Systems

The engines will be cooled using a drawn-air system. Ambient air will be drawn in, pass through the container housing the engine, and exit in a vertical direction through a plenum venting above building roof-level (at a level consistent with the planning approved acoustic parapet). Given the operational design mounting pairs of engines in a vertical arrangement, the plenum has been designed to serve both engines. The Plenum also serves as the routing and structural support for single twin-flue exhaust stack per engine pairing.

A forced air colling system will be utilised to maintain optimum operating temperatures for the engine. Ambient air will be drawn in from the free areas surrounding the Installation, will pass over the engines and be drawn into the plenum. The horizontal air flow from the engines will be vertically discharged from the plenum.

3. Emissions

3.1 Introduction

3.1.1 Due consideration has been given to evaluating the potential emissions associated with the Installation. The following section provides details related to possible and anticipated emissions from the installation.

3.2 Emissions to Air

3.2.1 Point Source Emissions

The only point source emissions to air associated with the data centre are related to the generators. These sources are detailed in Table 4 and Table 5, and location shown in Figure 7.

Table 4 Point Source Emissions to Air

Emission Point ID	Emission Source	Parameter	Quantity
1a, 2a, 3a, 4a, 5a, 6a, 7a, 8a	Standby power generator	NO_x. SO_2, CO, Total Suspended Particles, VOCs	No limits set. Backup generators only
1b, 2b, 3b, 4b, 5b, 6b, 7b, 8a	Standby power generator	NO_x. SO_2, CO, Total Suspended Particles, VOCs	No limits set. Backup generators only

Figure 7 Location of Emission Point Sources to Air

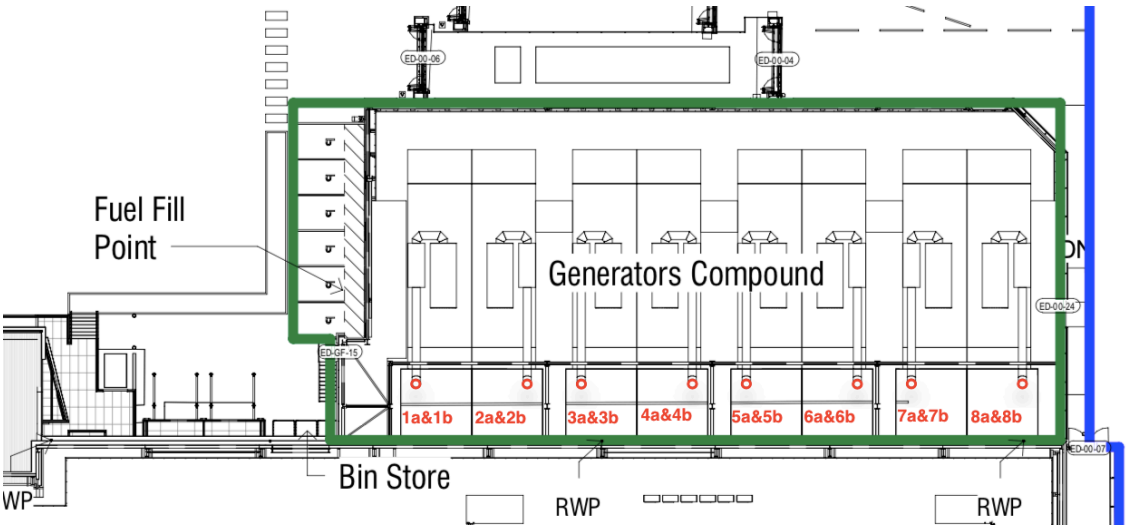


Table 5 Location of Point Source Emissions to Air

Emission Point ID	Easting	Northing
1a & 1b	522291	187252
2a & 2b	522299	187254
3a & 3b	522302	187255
4a & 4b	522310	187257

Emission Point ID	Easting	Northing
5a & 5b	522314	187258
6a & 6b	522321	187259
7a & 7b	522325	187260
8a & 8b	522332	187262

3.2.2 Fugitive emissions to air

Small quantities of alkane vapour from diesel storage tank breathers may potentially be emitted.

3.2.3 Fluorinated gas (F-gas) legislation

No fluorinated gases will be used within the Installation's systems.

3.3 Emissions to Water

3.3.1 Point source emissions to water

There are no direct emissions to controlled waters associated with the permitted activity.

3.3.2 Fugitive emissions to water

There are no fugitive emissions to water from the Site. Surface water (principally from rainfall) from areas of hardstanding will drain to sewer via the surface water runoff system.

An oil-water separator will minimise the likelihood of any low density, insoluble substances from entering the surface water drainage system. This system is maintained in accordance with processes documented within the Site's environmental management system.

Any spills of materials that could potentially have an adverse impact on water bodies will be managed in accordance with the Site's environmental management system.

3.4 Emissions to Sewer

3.4.1 Point source emissions to sewer

There are no direct emissions to sewer associated with the permitted activity.

There will be domestic sewerage proportionate with the low numbers of staff on site. This is outside of the installation boundary of the permitted activities and will be located in the Data Centre premises.

3.5 Emission to Land and Groundwater

3.5.1 Point source emissions to land and groundwater

There are no direct emissions to land or groundwater from permitted activities within the installation boundary of the Site.

3.5.2 Fugitive emissions to land and groundwater

There are not expected to be fugitive emissions to land or groundwater from permitted activities within the installation boundary of the Site. There is a potential for windblown litter although this is to be mitigated by keeping waste in a secure waste storage area.

Surface water (principally from rainfall) will drain to sewer via the surface water runoff system.

Surface water from rainfall landing on vegetated areas of the wider Site will infiltrate into surface soils.

The fuel storage tanks are described in section 2.3.4, including details of leak prevention and detection, with a supporting schematic shown in Figure 5.

4. Operating Techniques

4.1 Applicable Technical Standards

The proposed Installation has been designed by the operator's technical partner taking into account best practice design and operation outlined in various technical standards, as outlined below.

4.1.1 ISO8528 - Reciprocating internal combustion engine driven alternating current generating sets

The generator set complies to ISO8528. Generating sets meeting the requirements of this standard are used to generate electrical power for continuous, peak-load and standby applications.

4.1.2 National Electrical Manufacturers Association (NEMA) MG1

The specified generators meet the requirements of National Electrical Manufacturers Association (NEMA) MG1 standard. This standard is intended to assist users in the proper selection and application of motors and generators.

4.1.3 Environment Agency Draft Data Centre FAQ Headline Approach

The Draft Data Centre FAQ Technical guidance from the Environment Agency has been considered in preparing this Permit Application. Specific note has been made relating permissible air emission limit values in the context of Best Available Techniques (BAT) and issues such as testing schedules.

4.1.4 Tech UK Data Centres Standards Map 2017

A holistic view of the design of the data centre has been conducted in reference to the Tech UK Data Centres Standards Map.

4.1.5 Tech UK Data Centres and Environmental Permitting Regulations: Industry Position 2018

This position paper has been referred to in preparing the Permit Application.

4.1.6 National Fire Protection Association (NFPA) 110 Standard for Emergency and Standby Power Systems

NFPA 110 has been referred to as to covers performance requirements for emergency and standby power systems providing an alternate source of electrical power in buildings and facilities in the event that the normal electrical power source fails. Systems include power sources, transfer equipment, controls, supervisory equipment, and accessory equipment needed to supply electrical power to the selected circuits.

4.2 Other Technical Standards Considered

Standard BS7671 has been referred to and will be followed in relation to the requirements for electrical installations.

Engine generator set is designed and manufactured at facilities with quality and environmental management systems certified to meet the requirements of ISO9001 and ISO14001 respectively.

4.3 Operating Techniques Review

RAMS in place for maintenance tasks and servicing.

Life cycle of plant controlled via CAFM system.

Competency and qualifications-based system for control of work orders.

Approved suppliers/contractors list to confirm ISO14001 approved.

The Facility will have ISO14001 certification for site in place for completion.

All of these are part of the justification of BAT on the site to control spills, manage emissions from the stacks during testing and emergency use and to run the engines to reduce emissions as well as efficiently.

Table 6 Best Available Techniques (BAT) Reference Document for Large Combustion Plants, (UK Interpretational Guidance Nov 2019) as structure

Section	Subsection	BAT#	BAT Text	Requirements	Comments
General BAT Conclusions	Environmental Management Systems (EMS)	BAT1	In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates the features presented in the BREF.	See BREF for detailed requirements, in this case the EA Draft FAQ Headline Approach and materials shared with TechUK on 12 May 2021 (these are attached as an appendix).	A documented environmental management system will be implemented prior to operation of the Installation. The system will be based on the ISO14001 standard; a commercial and operational decision at a later date whether to progress through external certification process. The EMS will consider potential environmental aspects though operation and ultimately decommissioning. The EMS will function principally as a risk management tool to enable the operator to comply with all applicable legislation and best practice and to minimise harm to the environment. The system will also enable the operator to identify opportunities for continual improvement in performance.

Section	Subsection	BAT#	BAT Text	Requirements	Comments
	Monitoring	BAT2	BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.		The engines specified for installation currently represent the best performing (based on emissions and power output capacity) units available on the market. As per Environment Agency FAQ on Environmental Permitting of Data Centres[1] **no monitoring of emissions to atmosphere is required.**
	Monitoring process parameters for emissions to air and water	BAT3	BAT is to monitor key process parameters relevant for emissions to air and water including those given in the table.	Flue gas • Flow • Oxygen content, temperature and pressure • Water vapour content Waste water from flue-gas treatment	As per Environment Agency FAQ on Environmental Permitting of Data Centres1 no monitoring of emissions to atmosphere is required. The plant will operate for no more than 500 hours per year, and testing of individual generators will be limited to not more than 50 hours per year.

Section	Subsection	BAT#	BAT Text	Requirements	Comments
	Monitoring of emissions to air	BAT4	BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	NH_3; NOx; N_2O; CO; SO_2; SO_3; Gaseous chlorides; HF; Dust; Metals and metalloids; Hg; TVOC; Formaldehyde; CH_4; PCDD/F	As per Environment Agency FAQ on Environmental Permitting of Data Centres[1] **no monitoring of emissions to atmosphere is required.** The plant will operate for no more than 500 hours per year, and testing of individual generators will be limited to not more than 50 hours per year. Detailed atmospheric dispersion modelling has been undertaken.
	General environmental and combustion performance	BAT5	BAT is to monitor emissions to water from flue-gas treatment	*Undertaken for listed pollutants at the stated minimum monitoring frequency*	There will be no flue gas treatment or associated emissions to water. BAT5 is not applicable

	General environmental and combustion performance	BAT6	In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques	Fuel blending and mixing Maintenance of the combustion system Advanced control system Good design of the combustion equipment Fuel choice	The combustion plant has been designed by technical experts in this field, and in accordance with current standards and approached. The hardware is also sourced from MTU, one of the leading manufacturers of the engines. As an integrated system, the fuel tanks are designed so that fuel remains of suitable quality for use within the system. The system is considered to be one of the most efficient and best performing of its capacity A fully integrated control system will be deployed enabling the operator to have clear understanding and visibility of the system performance. As per the Operator's environmental management system, the Installation will be maintained in accordance with a documented preventative maintenance schedule. A range of technologies and fuels has been considered as part of the design and specification phase. At this time the latest generation of diesel-powered generators are optimally viable for operators based on availability, reliability, capital and operating costs. Alternatives, including battery storage, hydrogen fuel cells and other clean technologies and mains gas were considered but are not operationally viable yet. A regular options appraisal will be

Section	Subsection	BAT#	BAT Text	Requirements	Comments
					undertaken to evaluate potential system improvements.
		BAT7	In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NO_X emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR	*(No requirements specified)*	SCR and SNCR are not proposed to be installed at this time. The engines will operate for short periods of time (anticipated to be exclusively for the test regime), and for durations of up to 30min and max 4hours. These cycles do not enable the BAT technologies to rapidly achieve optimal performance and consequently is considered that there would be no net benefit to the environment. Furthermore, the air quality modelling indicates that there would be no significant long-term impact associated with emissions without SCR/SNCR further undermining the potential relevance of these technologies.
		BAT8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.	*(No requirements specified)*	Under normal operating conditions the plant will not be combusting fuel. The temperature of the plant will be maintained using electrically heated thermal jackets to enable effective and efficient operation on immediate start-up, in a power outage emergency.

Section	Subsection	BAT#	BAT Text	Requirements	Comments
		BAT9	In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):	Initial full characterisation of the fuel used to include at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed); Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 10.8.1)).	Only fuel that meets or exceeds the quality standards specified by the engine manufacturer will be used. Fuel supplier(s) will be required to supply in-specification that meets quality requirements. Routine periodic fuel testing will be conducted in accordance with the process detailed in the Installation's Environmental Management System.

Section	Subsection	BAT#	BAT Text	Requirements	Comments
		BAT10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: - Air procedures - Water / groundwater procedures	Appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines). Set-up and implementation of a specific preventive maintenance plan for these relevant systems. Review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary. Periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.	BAT10 is not considered relevant. Under normal operating conditions the Installation will not be operating (with the exception of routine testing). OTNOC events are beyond the direct control of the operator and is part of the rationale for installing the back-up power supply generators. Nonetheless, an environmental management system will be implemented that will seek to enable continual improvement, minimising the environmental impact of the Installation,
		BAT11	BAT is to appropriately monitor emissions to air and/or to water during OTNOC.	The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.	As per Environment Agency FAQ on Environmental Permitting of Data Centres[1] **no monitoring of emissions to atmosphere is required.**

Section	Subsection	BAT#	BAT Text	Requirements	Comments
	Energy Efficiency	BAT12			To optimise the atmospheric emissions the engines have been specified for emission reduction and not fuel efficiency, as the hours per year are so few.
	Water usage and emissions to water	BAT13	Closed system		None reported to be used after commissioning.
	Noise Emissions	BAT 14	In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below.	*Techniques* Operational measures Low-noise equipment Noise attenuation Noise-control equipment Appropriate location of equipment and buildings	The Noise report describes the integrated abatement design to manage noise from the engines. Operational noise during testing and any events will be managed by the designed abatement when running

Table 7 Data Centre FAQ – Draft v10.1 1/06/2018 – as reference re BAT

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
1	We accept that oil fired diesel generators are presently the default technology for standby generators in data centres. However, the permit application still requires a BAT discussion detailing the choice of engine, the particular configuration and plant sizing meeting the standby arrangement (e.g. 2n).	We have selected the MTU 20V4000 DS4000 liquid fuelled generator set through our service partner AVK. MTU is a Rolls Royce company. These engines are widely regarded as being one of the highest quality products in the industry and have been selected for their operational efficiency, low emissions, high reliability and long service intervals. The systems are arranged in a distributed redundant N-1 firm arrangement per load group whereby N is 3 and there are 4 power systems per group. There are 4 load groups under this application.	The generator sets currently represent the best available technology for deployment within the use application and are appropriate for the installation. The technology represents a robust platform to which upgrades can be applied over the operational life of the plant as these become more readily accessible on the market.
2	Standby engine capacities are added together in MWth input at the quoted standby rating, being usually 110% of the continuous rating (if >=50MWth the site then needs an EA 1.1A Combustion Activity EPR permit)	See Line 3 below.	-
3	If precise MWth figures are unavailable and spec sheets or faceplates are unclear, the calculation for MWth derived from MVA output is based on power factor 0.8 and an assumed poor conversion efficiency of 0.35 for MWth to MWe e.g. 3MVA = (3*0.8)/0.35 = 6.86MWth.	Each engine is nominally specified at 3.2MWe. The thermal capacity of each engine has been determined to be ~7.31MWth when referring to the stated calculation methodology. This results in a total thermal input of 117MWth for the Installation.	The installation exceeds the threshold for a Part A(1) Permit under schedule 1, Part 2, Chapter 1, Section 1.1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended)
4	The sum of generator plant capacities is based only on MWth inputs of all plant regardless of the standby configuration. MWe output constraints such as realistic customer load or other practical output limiting factors do not constitute a limit to the MWth input as defined in the EA's guide RGN02.	In accordance with the stated requirement, the MWth capacities of the generators at the site have been calculated only on MWth inputs, with no constraints or limiting factors applied.	No constraints or limiting factors have been applied to the thermal capacity of the generators.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
5	Proximity of data centres with a company campus, adjacent, neighbouring or close-by buildings in urban locations (e.g. within a common trading estate but only separated by a road width or notional distance) may constitute a single site for determining the boundary	The data centre is installed as a standalone facility with no direct relationship to any other premises on site or in the immediate vicinity. In accordance with the guidance received, the Installation relates exclusively to the standby power generating plant and does not include the data centre building or any technical plant and equipment contained therein.	The site is considered to be a single, standalone facility.
6	Permits will include a maximum 500 hour 'emergency/standby operational limit' for any or all the plant producing on-site power under the limits of the combustion activity; and thereby emission limit values ELVs to air (and thus engine emissions monitoring) are not required within the permit.	Under "normal" operating conditions (i.e. testing and maintenance only) each generator is anticipated to be operational for approximately 13hrours per year. The engines are installed as contingency generating capacity in the event of an electricity supply outage. Records spanning the past 10 years indicate the occurrence of just 3x outages have occurred, and none lasting more than 3 minutes in duration. The Operator is confident that there will be a negligible likelihood of the generators operating at or above 500 hours per year.	The site meets the emergency / standby operational limit and therefore no emission limit values are applicable.
7	Emergency hours' operation includes those unplanned hours required to come off grid to make emergency repair of electrical infrastructure associated but occurring only within the data centre itself.	The site has a N-1 firm level of resilience built into the supply from the national grid, therefore the requirement to operate the generators under an emergency scenario is unlikely.	The use of generators to make emergency repairs of electrical infrastructure is unlikely given the inbuilt N-1 firm resilience of the national grid supply.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
8	Each individual generator with its own discharge stack, can be maintained, tested and used in a planned way for up to 500 hours per calendar year each without ELVs (and hence no monitoring) under IED/MCPD. Though clearly the EA expects planned testing and generator operations to be organised to minimise occasions and durations (subject to client requirements). Ideally a target should seek to keep individual generator testing to below 50 hours/annum each.	The plant has been designed to enable independent testing of each individual generator. Following completion of detailed atmospheric dispersion modelling of the emissions, a generator testing and maintenance regime has been devised (Table 3). It is anticipated that each engine will be tested for approximately 13hours per year. The majority of testing (monthly 10 times per year) will last less than 30minutes and be run at low load. Twice a year each engine will be run individually for up to 4hours at full load.	The proposed testing regime is below the individual generator testing target detailed in the Environment Agency Data Centre FAQ of 50 hours per year per generator
9	The whole or part site can only operate as emergency plant up to 500 hours as an absolute limit for grid backup issues; but that individual plant (at any load) with its own stack (or a stack with multiple plant) with justification can be operated for up to 500 hours (ideally <50) each as part of its non-emergency role under maintenance and testing.	Under “normal” operating conditions (i.e. testing and maintenance only) each generator is anticipated to be operational for approximately 13hrours per year. The engines are installed as contingency generating capacity in the event of an electricity supply outage. Records spanning the past 10 years indicate the occurrence of just 3x outages have occurred, and none lasting more than 3 minutes in duration. The Operator is confident that there will be a negligible likelihood of the generators operating at or above 500 hours per year.	The proposed testing regime of approximately 13 hours per year is substantially below the 500-hour operational duration for standby power engines. Operator is confident that each engine will operate for less than 500 hours per year based on the historic power outage record for the site locality.
10	For the purposes of determining operating hours, data centre diesel generators are regarded as having a minimal start-up or shut-down times. Operational hours start on the first fuel ignition.	Power supply into the data centre is continually monitored. Should available electricity supply reduce below operating thresholds, the UPS system will immediately provide power and automatically initiate start-up of the generators with no latency of supply.	As a result of the thermal conditioning of the engines, the generators have a minimal start-up and shut-down time. The operational hours for each generator will be recorded.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
11	Data Centre permits (unless they apply and justify it in a permit application) will expressly have a limit on the activity to exclude voluntary 'elective power operation' such as demand side response (i.e. on-site use) or grid operating reserve (STOR) (i.e. off-site export of electricity) and Frequency Control by Demand Management (FCDM) for grid support. This is primarily to differentiate data centres from 'diesel arrays' that voluntarily operate within the balancing market, and importantly a clear way to demonstrate minimisation of missions to air as 'Emergency plant'.	The plant will operate exclusively to serve as back-up power supply in the event of interruption to electricity supply at the site. There will be no grid paralleling provided. The generators will not be used for voluntary elective power, such as: demand side response (i.e. onsite use) grid short term operating reserve (STOR, i.e. off-site export of electricity), or frequency control by demand management	The generators will not be used for voluntary elected power.
12	The default engine specification as a minimum for new plant to minimise the impacts of emissions to air (NOx) is 2g TA-Luft (or equivalent standard). A detailed cost benefit analysis (CBA) is otherwise needed justifying worse emission such as 4g TA-Luft plant or for example a justification under FCDM.	Tier 2 optimised engines provided and NEA (ORDE) optimised also provided. The UK EA BAT for diesels under IED indicate TA Luft 2g (which is not a reference to an existing TA Luft metric but a way of reporting, e.g. 5% O_2) but the real focus is to not exceed the 18 hours > 200ug/m^3 and to minimise short term peak exposure and to not exceed the vegetation standard. We have looked at emissions via the Plenums in two versions, one is with the engines exhausting directly into the plenum and the other with flues for each engine to the top of the plenum. This allows a comparison for dispersion from a larger volume, lower temperature, lower velocity and lower concentration discharge compared to the reverse of lower, higher, higher and higher respectively. The discharge into the plenum gives improved compliance with the AQS.	The generators sourced do not meet, just, the 2g-TA LUFT standard and are approximately 2.1g NOx at 5% O_2. The benefits associated with the specified engines are considered to outweigh the adverse implications associated with technology (SCR) that could achieve this requirement (primarily the cost associated with compliant hardware, including the provision of pollutant abatement technologies, would be prohibitive). The air quality assessment concluded that under the normal operating (testing and maintenance) regime there is expected to be a significant air quality impact, and this is being reviewed with an ecological specialist for impact potential on the SSSI adjacent. There are no deposition or annual impacts from NOx and none from other air pollutants at any metrics. Please see the detailed air modelling report.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
13	CBA for improved exhaust emissions, dispersion and mitigations from the plant is expected for the maintenance/testing and the emergency standby roles. We would be looking for improvements particularly if Local Air Quality (LAQ) modelling (under H1) indicates anything other than an insignificant contribution to short term local air quality for the 'planned' maintenance emissions of the plant.	Detailed atmospheric dispersion modelling has been undertaken in relation to planned testing and maintenance of the plant. The impact on human health associated with these activities was concluded to be: not significant for the 30minute test, and the probability of an exceedence of the relevant air quality objective `for NO_2 would be highly unlikely. In relation to potential impact on habitat, the air quality assessment concluded the 24hr mean critical level for NOx may be exceeded at the Brent Reservoir during the 4-hour testing, but only where two or more tests per day were undertaken – the proposed mitigation is to limit 4-hr testing to 1x engine per day. Proposed mitigation recommendations from the Air Quality Report have been adopted within the proposed testing regime.	Based on the conclusions from the air quality assessment and the modelled testing regime the emissions were considered not to be significant.
14	Retrofit abatement techniques for existing installations for engine emissions such as selective non-catalytic or catalytic reduction (SNCR or SCR) would not normally be expected for standby plant to mitigate the emissions for standby/emergency operation. BAT might include improved flue gas dispersion (e.g. stack modifications, increased height) or improved low NOx engine management controls or possibly fuel choice.	The installation is newly constructed and specified and therefore retrofitting or other mitigation is not required at this time.	Retrofitting abatement technologies or further emissions mitigation beyond that stated previously are not required.
15	Operations and management procedures should reflect the outcomes of the air quality modelling by minimising the duration of testing, phasing engines into subgroups, avoiding whole site tests and planning off-grid maintenance days and most importantly times/days to avoid adding to "at risk" high ambient pollutant background levels.	The testing regime is detailed in section 2.3.3. The testing regime is proposed based on the results of the air quality assessment. Testing will be avoided (where possible) where wind is from a south easterly to south westerly direction, which may result in NOx being dispersed towards the Brent Reservoir SSSI.	The testing regime will not adversely impact local air quality, and specifically relevant local habitats.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
16	When AQ modelling the emissions from the engines, the certified technical standard provided by the manufacturer should be used (i.e. likely worst-case emissions). However any 'fit for purpose' monitoring of the actual emissions from installed plant will be considered as evidence of the likely real impacts as part of the permitting decision process.	Emissions data from the certified technical standard has been provided by the generator manufacturer. The modelling is considered to be a worst-case assessment and that actual impacts will be of lesser significance than concluded within the associated technical report.	The data from the certified technical standard provided by the manufacturer of the generators has been used in the air quality modelling. The manufacturer is providing actual emissions testing for the engines at their site when tested to compare to the worse case assumptions and these data will allow further modelling. Once installed, due to the layout, it will not be possible to test the emissions; this decided based on the sector guidance on no testing for emergency supply engines.
17	The groundwater monitoring of fuel storage tanks and distribution pipework using GW boreholes is risk based for the site condition report (SCR) and IED 5-yearly monitoring. Should GW monitoring be required for underground tanks and/or the SCR, the boreholes should be positioned for whole site surveillance (for the SCR) rather than as a very local control immediately around the buried fuel oil tanks (i.e. not be just an addition to double skinned tanks already protected by leak detection and hence ignoring distribution pipework etc.).	The site condition report highlighted potential historic land use known to result in legacy ground contamination. In developing the site a routine ground water monitoring programme has been maintained. It is proposed that this programme will continue as part of the site's routine monitoring activity. All bulk storage of liquids (i.e. fuel) and pipelines associated with the installation are above ground and designed with appropriate primary and secondary containment systems. Monitoring and control systems are also to be installed and documented processes implemented, including preventative maintenance, to prevent leaks from occurring (e.g. overfilling, interconnect failing).	Based on the site condition report existing routine ground water monitoring will continue to be undertaken, results monitored, and findings reported.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
18	10-yearly soil sampling under IED is normally not needed but still needs some justification.	At present the Operator does not intend to take 10-yearly soil samples. Ongoing ground water sampling is considered to be appropriate at this time. Any changes to the need to undertake intrusive soil sampling will follow a risk-based approach taking into account operations and or incidents undertaken at the site. Presently, the proposed controls (i.e. primary, secondary, tertiary containment, impermeable ground across operational areas of the Installation, documented management control and provision of appropriate training) are considered to sufficiently reduce the risk of soils being adversely impacted by site activity.	Current control measures are appropriate to prevent impacts to soil at the Installation. A risk-based approach will be adopted to review the need to undertake soil sampling at a future date.
19	The permit application must assess and provide evidence of actual reliability data for the local electricity grid distribution (including data centre internal electrical design) for the EA to judge the realistic likelihood of the plant needing to operate for prolonged periods in an emergency mode (especially if emissions model so as to exceed short term air quality standards).	Below is a summary table of the performance of the UK Transmission Grid. The data evidence that it delivers extremely high standard of supply reliability. By exception in the past 10 years there has been just 3 network incidents at Elstree causing interruption to supply. This historic grid reliability provides confidence that there is unlikely to be a regular, if indeed any, requirement for the generators to provide emergency standby power.	The likelihood of the Installation needing to operate for prolonged periods in an emergency mode is considered highly unlikely.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion

National Grid

National Electricity Transmission System Performance Report

Year of Report	GB Network	NGET System	
	Reliability of Supply	Reliability of Supply	Elstree Outages
2010-2011	99.99969%	99.99998%	1
2011-2012	99.99954%	99.99972%	1
2012-2013	99.99975%	99.99999%	0
2013-2014	99.99991%	99.99995%	0
2014-2015	99.99987%	99.99996%	0
2015-2016	99.999993%	99.999998%	0
2016-2017	99.999962%	99.999964%	0
2017-2018	99.999975%	99.999984%	1
2018-2019	99.999967%	99.999984%	0
2019-2020	99.999967%	99.999974%	0

Details of Elstree outages

Incident Date, Time and Location	MW Lost	Mins	MWh Unsupplied
2010-2011			
17 September 2010, 11:33 hrs at Elstree 275 kV substation A protection operation caused the trip of supergrid transformer 3A, resulting in a loss of supply on the distribution network of 42MW. National Grid continued to offer supplies to the distribution network from supergrid transformer 1B. The distribution network was unable to use the alternative supplies due to a combination of planned and unplanned outages. As supplies were available to the distribution network throughout the event, the unsupplied energy estimation methodology agreed with Ofgem gives MWh unsupplied as the default minimum value of 0.5MWh with a duration of 0 minutes.	42	0	0.5
2011-2012			
28 May 2011, 10:16 hrs at Elstree 400 kV substation The Elstree – Sundon circuit was switched out due to abnormal system conditions during planned maintenance, resulting in a loss of supply to Network Rail Bushey for 10-seconds.	0	0	0.5
2017-2018			
27 June 2017 12:35 at Elstree 400kV substation An arching observed on disconnector X103A which resulted in Elstree – Sundon 400kV No. 1 circuit and Elstree SGT5B (Network Rail feeder) being switched out of service. In total the supply was lost for 1 minute and 54 seconds.	Unknown	1.90	0.10†

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
20	Optimising grid reliability within the site as part of general BAT to minimise emergency operating hours is required – evaluation is needed within the permit application on the Tier reliability standard under ISO27001 and Uptime.	The power supply to the site is protected by an uninterruptable power supply (UPS), consisting of banks of batteries capable of meeting the full load capacity of the site for approximately 10 minutes. This allows for any fluctuations to be managed using battery backup, with the generators only being initiated after 15 seconds of failure.	Use of battery storage as back- up minimises the emergency operation of the generators.
21	Reporting of standby engine operational run hours and discussion of any electrical outages (planned or grid failures regardless of duration) required annually.	The operator will record and report on operational run hours of all generators (individually and collectively) and electrical outages on an annual basis.	The Operator will monitor and report operational run hours in accordance with the Environment Agency's Requirements.
22	Assuming AQ modelling, based on operating scenarios, indicates a local air quality risk then notification to the EA of unplanned (and pre-notification of planned) continuous grid outage exceeding 18 hours LAQM (or the otherwise assessed short term interval from modelling) is likely required under a permit schedule 5 notification.	The operator does not anticipate that there will be continuous grid outages to the site that exceed 18 hours. .	The Operator will implement a notification protocol, informing the Environment Agency of planned continued outages that exceed 18-hour duration
23	The notification requirement stated in the permit should also indicate the actual number of generators that need to be operating above which the local air quality is at risk e.g. 'notification of continuous emergency operation exceeding 18hours with 5 or more engines operating together is required' (i.e. model shows 4 or less engines unlikely to breach LAQ)	The air quality assessment evaluated the potential impact of operation of the generators during continuous prolonged outages of 48 hours and 72 hours. The probability of the Predicted Environmental Concentration (PEC) exceeding the 75μgm^{-3} 24-hour mean critical level for NOx was: 72 hours: 85.1% 48 hours: 71.8% The modelling therefore concluded that it was more likely that operating all 16 engines at 75% load capacity would not exceed the objective limit value. Note that the site is contracted to provide a service for a continuous period of 48 hours to customers.	In a scenario where engines are required to provide standby power to the site due to a full power outage the dispersion modelling concluded that this operation would likely be undertaken without needing to limit the number of operational engines.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
24	Assuming AQ modelling, based on emergency outage operating scenarios, indicates a very significant risk to local air quality and identified receptors, the EA will ask the operator to have a written action plan to manage the issue for prolonged emergency running of the plant (including sensitive receptors list and mitigations, assessments and impacts evaluation against modelled risk conditions i.e. occurrence at periods of most concern in the year, possibly ambient air monitoring surveillance at very sensitive receptors)	The air quality modelling evaluated the potential impact of the operation of the Installation during a prolonged electricity supply outage on nearby human health receptors and habitats. The assessment concluded that only the Brent Reservoir SSSI habitat was at potential adverse risk, although this habitat is designated for reasons other than environmental sensitivity to airborne pollution. A written action plan is not considered necessary given the likelihood of a prolonged outage and the sensitivity of receptors potentially adversely impacted by prolonged emergency operation.	Based on the results of the air quality modelling an air quality outage action plan is not required.
25	Due to the emphasis of the permit on electrical (and cooling) systems it is noted that the EA considers the F-Gas regulations as falling under the remit of the EPR permit (for notifications and management) where F-gases (or potentially any polluting potential substance) are used directly under the combustion aspects of the permitted activity (e.g. switchgear). It is important to notify the EA of any significant releases. Other uses of F-gases e.g. for server room cooling are not strictly under the EA permit but are regulated by the EA generally so it may still be prudent to make the EA aware of your F-gas releases.	There are no uses of F-gases at the Installation, which are directly associated with the combustion activities and therefore F-Gas notification requirements under the permit are not considered to be necessary.	This element of BAT is not applicable to the proposed Installation.
26	The permit application should detail the likely quantities of waste engine oil generated annually – EWC 13 02 waste oils following servicing for example. Although unlikely to be huge, the Pollution inventory has a reporting threshold of 1 tonne for non-hazardous waste but technically no lower thresholds for hazardous waste oil.	As discussed in section 6 of this report it is anticipated that approximately 5,000 litres of waste lubricating oil will be generated at the Installation each year.	The Operator will report on all relevant substances and wastes emitted from the Installation in accordance with the pollution inventory reporting requirements.

No.	EA Summary Requirement	Applicant Response	BAT Conclusion
	The permit application is for the combustion plant and associated environmental concerns and not for the Data Centre itself. The applicant should be aware that the permitting process and application is accessible to the public so should have regard to 'Commercial in Confidence' and Critical National Infrastructure. In the first instance discuss particular concerns directly with the EA and/or exclude such priority information from the application but indicate that such is 'available on request'.	The Applicant acknowledges the guidance on commercial confidentiality and in this instance has not applied for the Environment Agency to consider aspects of the application as commercially confidential. Additionally, the proposed Installation is not regarded as critical national infrastructure.	A claim for commercial confidentially has not been made.

5. Environmental Management System

5.1 Introduction

It is acknowledged that a robust approach to environmental management will result in reduced environmental impact, primarily as a result of day-to-day operations, but also in response to abnormal operating conditions.

5.2 Summary of Implemented EMS

An EMS that meets the requirements of the ISO14001 standard will be implemented prior to operation of the Installation.

The EMS will facilitate robust operational control of the plant, and include documented processes in relation to the plant, its operation, service and maintenance, and management of potential environmental issues highlighted elsewhere in this report. Principally the EMS will address matters regarding:

- Operations and maintenance
- Management of change
- Training and competence
- Incidents, accidents and complaints management
- Maintaining records, and
- Site closure

The EMS will enable identification and implementation of mitigation of potential risks of pollution and harm to human health related to operation, maintenance, accidents, incidents, and non-conformances of the Installation. All critical plant and equipment will be documented and incorporate a preventative maintenance schedule.

The system will enable ongoing monitoring and reporting of environmental performance and support an effective continual improvement programme.

Training needs requirements will be addressed and allow for evidencing of Operator and employee capability and competency.

The system will incorporate customer and stakeholder engagement and management process that address issues such as complaints (such as noise) and reporting requirements (e.g. potentially carbon emissions reporting).

EMS documentation, including a copy of the Environmental Permit, will be accessible and available to all members of staff. All members of staff will be expected to comply with the documented processes and procedures; appropriate training, including refresher training, will be provided to staff.

The EMS will be subject to regular review, including within a formal internal audit context, with the findings shared with the site's management. Additional reporting related to monitoring, incidents, accidents and complaints will be provided to the site's management.

6. Waste Management

6.1 Waste Generation

The activities to be undertaken do not generate significant quantities of operational waste, relative to the scale of the activities undertaken. The anticipated waste streams, and forecast typical quantities generated, are detailed in Table 8.

Table 8 Waste Streams

Waste Stream	Source	State (Solid / Liquid / Gas)	Typical annual generation	Hazardous Waste?
Testing and Maintenance				
Filters	Filtration of fuel and oil on generators	Solid	<1 tonne	Yes
Lubricant Oil (Mineral)	Lubrication of Generators	Liquid	~5,000 litres (based replacement at annual service)	Yes
Glycol solution	Generator Coolant	Liquid	Unknown (assumed replacement every 3 years)	Yes
Abnormal Operations				
Oily wastes	Filtration of fuel (diesel polishing)	Liquid	Irregular, not yet known	Yes
Batteries	Generators	Solid	Irregular, not yet known	Yes
Mechanical and electrical components	Generators	Liquid	Irregular, not yet known	Yes / No – depending on part

The majority of the waste associated with the permitted activity is anticipated to be non-hazardous in nature. The small administrative function will generate wastes typical of an office, comprising mainly paper/cardboard and plastic/metal office consumables. Food and drink related waste streams are also expected.

There are anticipated to be waste streams associated with routine service and maintenance of equipment. This is anticipated to include oils and lubricants and their associated containers and applicators.

6.2 Waste Minimisation

The site will operate in accordance with the waste hierarchy. In the first instance opportunities for elimination of waste will be addressed.

6.3 Waste Storage

Secure dedicated and segregated centralised waste storage areas are provided on site. These areas are positioned away from potential ignition sources (both accidental and malicious). The areas provide weather protection for wastes thereby preventing material degradation (that can reduce recyclability) and also rainwater ingress and potential contamination of surface or ground waters. Segregation at source maximises potential for recycling of wastes.

Hazardous waste materials are to be securely stored separately from non-hazardous materials in containers that are appropriate to the nature of the waste stream. Appropriate primary and secondary containment (e.g. cages, bunds, etc.) will be provided.

All wase storage areas will be clearly labelled showing what materials are to be held in each area.

Management of waste, its onsite storage and offsite disposal processes will be documented within the site's environmental management system.

7. Raw Materials

7.1 Raw Materials Usage

The Site uses the raw materials detailed in *Table 8.* Typical consumption values are given as all raw materials usage is intermittent.

Table 9 Raw Materials Usage

Substance	Approximate Annual Consumption	Typical Storage Capacity (to be confirmed at detailed design)	Use	Risk
Diesel	Approximately 100m3/yr under normal conditions	Maximum 40,000L per engine x 16 engines = 640,000 litres maximum	Generator fuel	Flammable liquid and vapour, Toxic to aquatic life with long lasting effects. May cause damage to organs, skin irritant and harmful if inhaled; carcinogenic
Glycol			Generator coolant	Harmful if swallowed
Mineral Lubricant Oil			To lubricate generators	None specifically known

Diesel and lubricants are consumable items within the Installation and are consumed as part of the operation essential for operation.

7.2 Raw Materials Storage

Diesel fuel is stored in dedicated storage tanks, described in Section 2.3.4.

Lubricants and glycol coolants are present within the generator sets and stored in pipework, storage containers and sumps. Levels are monitored and maintained in accordance with the site's Environmental Management System. There is no routine storage of surplus lubricant or glycol on site; additional quantities are delivered to site by approved service and maintenance suppliers and contractors.

The generator units function as an integrated secondary containment solution. The result is that any failure of primary containment will be controlled within the secondary containment system, thereby preventing uncontrolled spills to ground. Routine site inspection and preventative maintenance activities seeks to identify potential leaks and implement remediation before an issue arises.

7.3 Raw Material Efficiency Measures

The use of materials will be routinely monitored in line with the site's operating processes. The quantity of diesel consumed is the primary opportunity for driving efficiency given that diesel is the primary material (by volume) consumed and has the greatest environmental impact when in normal use (combustion pollutants discharged to atmosphere).

8. Energy

8.1 Energy Consumption

The purpose of the Installation is to provide standby power generating capacity in the event of primary electricity supply failure to the Site.

It is intended that the Installation is installed only as a contingency solution, and one that is anticipated will not be called into operation: a reflection on the robustness and reliability of the electricity supply network.

The testing regime discussed elsewhere in this document is anticipated to be the only time when the plant will be operational and will operate within the 500hr limit for emergency plant outlined in the Environmental Permit FAQ for data centres.

Based on the planned testing schedule it is forecast that the Installation will generate approximately 450MWh of electricity and consume approximately 100m^3 of fuel per year.

Should the Installation become operational in the event of an electrical supply outage to the wider site, fuel consumption will substantially increase to fulfil the energy demand requirements.

8.2 Energy Efficiency

The scope of the Environmental Permit is limited to the combustion plant Installation, and consequently the energy efficiency of the data centre itself is beyond the scope of that boundary. Nonetheless, as a reflection of the Operator's approach the data centre is intentionally designed to be as energy efficient as practicable within the constraints of direct operational control.

The combustion plant specified for inclusion are market leading in terms of their reliability and performance (operational and environmental). The Electronic Control Unit will be optimised to enable the plant to operate as efficiently as possible. Given the infrequent and intermittent operation through the testing regime, and the unplanned operation during an outage, other energy efficiency measures such as heat recovery, are not considered appropriate.

9. Detailed Technical Assessments

9.1 Air Emissions

The air quality assessment concluded that there was the potential for exceeding prescribed air quality standards. As stated previously, the generators provide standby power only and exist as a contingency in the event of electricity outage on the wider grid network. Over the past 10 years there have reportedly been just three outages, and all of a duration of no longer than approximately 3 minutes in duration. Should future outages be for a similar duration, the air quality assessment concluded that:

> *For human health impacts, predicted ground level concentrations of PM_{10}, $PM_{2.5}$ CO_2, CO and Benzene … would be assessed as not significant. Annual mean concentrations of NO_2 would also be assessed as not significant.*

The assessment also concluded that (in relation to human health impacts):

> *For the six-monthly testing, the probability of an exceedence [of the relevant Air Quality Objective for NO_2] … would be highly unlikely.*

The impact on habitats was also assessed and concluded:

> *For airbourne SO2, acidification and nutrient nitrogen deposition the impact on habitat sites is assessed as **not significant** for the testing regimes or during an outage event. For Annual NOx the impact would also be assessed as **not significant**.*
>
> *There is a potential risk that the 24 hour mean critical level for NOx **may be exceeded** at the Brent Reservoir SSSI during the 4-hour testing (only where two or more tests per day are carried out) and during a prolonged interruption to the supply.*
>
> *For airborne NOx, the cumulative annual mean NOx concentration varies between 1.5% and 4.9% of the critical level and is potentially significant. For nutrient nitrogen deposition, the cumulative deposition rate exceeds 1% of the critical load but the PEC is less than 50%. Therefore, the critical load is **unlikely to be exceeded**.*
>
> *The SSSI is designated for its assemblages of breeding birds rather than the habitat itself and any air quality effects are mediated through effects on their supporting habitats… Furthermore, despite elevated annual mean background concentrations of NOx across the SSSI, it has been assessed by Natural England to be in a favourable condition (i.e. it supports more wetland breeding birds than the target). Furthermore, the habitats (reedbeds, wet woodland) are classified by APIS to be relatively insensitive to nutrient nitrogen deposition.*

The recommendations published in the air quality report primarily relate to the testing regime for the engines. These recommendations have been adopted and are detailed in Section 2.3.3.

9.2 Site Condition Report

In support of the Environmental Permit Application a Site Condition Report has been prepared. The site history is extensive and complex. There is a prolonged history of ground disturbance onsite, and production and use of chemicals. The Site Condition Report should be referred to for detail.

A programme of evaluation, and ground water monitoring has been undertaken over recent years and is proposed to be continued. This ongoing monitoring programme will be used to identify any potential loss of diesel and will be included within the Annual Environmental Review Report.

9.3 Noise Assessment

As part of the supporting activities a noise impact assessment was undertaken. It should be noted that this noise report refers to all activities planned to be undertake on site, including beyond the Installation Boundary. For completeness, a full copy of the noise report is provided with this permit application.

The report concluded that:

> *As noted above if all the generators were to operate together during an outage, then the noise level would be of the order of 5 dB above the typical background noise level during the day and 10 dB at night at the northern residences. It is assumed reasonable that on the occasions when this may occur neighbours would close their windows, and internal noise levels would remain significantly within BS 8233 guidance for bedroom/living rooms, or with windows open less than 5 dB above the day-time criteria internally, which for a short-term emergency scenario is considered reasonable.*

As a final summary, the report stated:

> *The noise from the standby generators during both testing and an outage are such that they are anticipated to be acceptable for the purposes intended to the nearest noise sensitive residential receptors in this environment.*

9.4 BAT Technical Assessment Conclusions

9.4.1 Technical Assessments specifically related to emissions to air, noise and ground protection have been undertaken.

9.4.2 Air Emissions

The recommendations published in the air quality report primarily relate to the testing regime for the engines. These recommendations have been adopted and are detailed in Section 2.3.3.

9.4.3 Noise

Mitigation measures highlighted in the assessment have been adopted within the design of the wider property, and will be integrated within the site environmental management system:

- The vertical discharge from the engines will be enclosed by acoustic discharge shroud, installed in relation to cooling and air handling equipment for activities outside of the Installation.
- Testing of the generators will be scheduled to daytime hours only.

9.4.4 Water and Ground Protection

Existing ongoing ground water monitoring will continue to be undertaken

10. Monitoring

10.1 Emissions to Air

In line with Environment Agency Guidance regarding Environmental Permitting of standby power generators for data centres, no air emissions monitoring is required to be undertaken.

10.2 Emissions to Water

There is no direct emission to water associated with the Installation and consequently no monitoring is required.

10.3 Emissions to Ground

Ground water has routinely been undertaken given the historic land use at the site. This monitoring will continue to be undertaken and will be undertaken within scope of the Installation's Environmental Management System that will be implemented prior to operation of the plant.

10.4 Reporting of Waste

The Installation is not associated with a waste-related activity. Furthermore, the types and quantities of waste anticipated to be generated by the site are anticipated to present relatively low risk to the environment, waste contractors and staff. No specific provision is anticipated beyond good practice of waste management undertaken in accordance with the Site's Environmental Management System.

10.5 Monitoring Performance

The Operator proposes to monitor and report performance based on the parameter's details in Table 10.

Table 10 Schedule of Monitoring Performance

Parameter	Reporting Frequency	Units
Diesel Consumption	Annually	m^3
Generator operating for testing / maintenance	Annually	Total **hours** for the site Total **hours** for each individual generator Total **number** of runs per generator (number) Total **number** of minutes per run
Generator operation for emergency running	Within 24hrs of emergency operation	**Date and time** of national grid failure **Number** of generators operating immediately after the failure **Number** of generators operating two hours after the failure Total duration **(hours)** of mains supply failure
Generator operation for emergency running	Annually	Total **number** of runs Total duration **(hours)** of runs

11. Environmental Risk Assessment

11.1 Identification and Consideration of Risks from the Site

Potential environmental risks associated with the permitted activity have been considered, with appropriate mitigation integrated within the design and operation of the process. The assessment is founded on a source – pathway – receptor model within the context of the specific site setting. The methodology for undertaking this assessment will be documented within the site's EMS.

The overall risk associated with the Installation is considered to be **LOW** following implementation of the proposed mitigation strategies. The risk assessment is presented in Table 11.

Table 11 Environmental Risk Assessment

Pure DC Environmental Permit - Operational Risk Assessment				Reference: https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit			
Hazard	**Process**	**Receptor**	**Pathway**	**Risk Management Techniques**	**Probability of Exposure**	**Consequence**	**Overall Risk After Management Techniques**
Ground contamination	Containment failure of fuel storage bunker	Ground	Infiltration through damaged concrete hardstanding	Integrated double-bunded tanks to be used Automated leak detection system installed in secondary containment chamber Remote monitoring of tank levels, with linked alarm notifiying out of specification changes to levels Daily visial inspection of tank external integrity Appropriate training to staff operatives re use of spill kits, and reporting / post incident learning. Documented processes	Remote	Extreme	Low Risk
Contamination of ground, and or water bodies; odour	Spill (onsite) from vehicle of third party contractor when deliering fuel (vehicle movement)	Ground/soils Groundwater Surface water	Infiltration through damaged concrete hardstanding	Use of drip trays Appropriately stocked spill kits to be stored in accessible location near to fill points Appropriate training to staff operatives re use of spill kits, and reporting / post incident learning. Documented processes Routine visual inspection of gound integrity, and other relevant infrastucture	Unlikely	Moderate	Low Risk
Contamination of ground, and or water bodies; odour	Spill (onsite) from vehicle of third party contractor when deliering fuel (decanting fuel)	Ground/soils Groundwater Surface water	Infiltration through damaged concrete hardstanding	Use of drip trays Appropriately stocked spill kits to be stored in accessible location near to fill points Appropriate training to staff operatives re use of spill kits, and reporting / post incident learning. Documented processes Routine visual inspection of gound integrity, and other relevant infrastucture	Unlikely	Moderate	Low Risk
Litter	Windblown litter from storage areas into receiving environment	Nearby habitats (terrestrial and aquatic)	Windbourne	All waste will be stored within enclosed storage areas that can be closed when being accessed. Documented waste management processes	Unlikely	Minor	No Risk
Prolonged emissions of atmospheric pollutants	Standby power generators operate for prolonged periods (either due to operational requirement - power outage - or routine test regime)	Nearby sensitive ecological habitats Nearby human health receptors	Direct atmospheric emission from genset exhaust vent	Atmospheric emissions regulated under Enviornmnetal Permit. Contractual requirement limits standby power generator operating duration (<48hrs continual operation) Documented operational controls implemented to minimise emissions (including process specification and design; routine servicing and maintenance) Routine test regime structured to minimise cumulative impact of emissions Approproate training for staff	Unlikely	Moderate	Low Risk
Noise	Noise generated by: startup and operation of genset(s) Audible alarms	Nearby human receptors Wildlife in and around Brent Reservoir SSSI and elsewhere	Windbourne	Acoustic baffles around perimeter of building roof, enclosing stack. Fans enclosed within structure affording accoustic suppression. Limited use of external alarms (security and safety systems only; operational alarms internal only)	Possible	Moderate	Moderate Risk
Visible dark smoke	Cold start of standby generators and or sudden changes in load demand resulting in elevated emissions of particulate material	Nearby human receptors	Direct atmospheric emission from genset exhaust vent	Engine start-up sequence to be automated and process controlled to minimise conditions resulting in formation of dark smoke. Documented operational controls (including routine service and maintenance)	Possible	Moderate	Moderate Risk

Appendices

Air Quality Assessment

Site Condition Report

Noise Report

Pure DC Procedures