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VDC UK MANAGEMENT COMPANY LIMITED

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Environmental Permit Application: Operational Report

LHR-21, 37-39 North Acton Road, Park Royal, London

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Non-Technical Summary

This Part A(1) Environmental Permit application is submitted by VDC LHR21 Limited (referred to hereinafter as "VDC" or "the Client") for the operation of a combustion plant comprising electricity generators present at the LHR-21 Datacentre to be located at North Action Road, Park Royal, London, NW10 6SN ("the Installation").

The LHR-21 data centre campus is a 0.5-hectare site, with a single six-storeyed building planned for the site. The campus will contain 14 diesel or Hydrotreated Vegetable Oil (HVO)-fired generators to produce electricity located in a gantry structure adjacent to the datacentre building. The generators are intended as emergency generation provision to the datacentre in the event of an interruption to the electricity supply to the site from the National Grid. Each generator is expected to operate for approximately 24-hours per year as part of periodic testing and maintenance, in addition to any emergency operation. As such, the typical operation of the generators will be limited to less than 50 hours per year for testing and maintenance.

In total 14 generators will be present at the site, with an aggregated net rated thermal input capacity of approximately 80 MW_{th}. Under Schedule 1, Part 2, Chapter 1, Section 1.1 Part A(1)(a) of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ("the EP Regulations") the burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts is a regulated activity, and an environmental permit is required to operate the Installation.

Raw materials

The primary raw materials used in the permitted activity consists of diesel or HVO fuel, which is used to power the generators, lubricants, and coolants. All materials are provided with suitable containment measures.

Waste

The permitted activity is expected to generate minor quantities of waste, primarily from maintenance and repair activities. All waste generated at the Installation will be managed in line with the waste hierarchy and will be removed from the site by a licenced waste management company.

Energy

Diesel/HVO is used as the predominant primary energy source for the facility; however, a limited amount of electricity would also used by the generator plant control equipment. All plant being installed is new and highly efficient, with the typical electrical efficiency of the generators being in the region of 45%.

Emissions to air

The flue stacks for the generators will be co-located at the roof level; although not within a single windshield the co-location of the stacks can be considered as a single stack, therefore resulting in one emission point in the generator building at the Installation, which has the potential to generate emissions of oxides of nitrogen (NOx). The emissions limit values set out under the medium combustion plant requirements of Schedule 25A of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) are applicable to the Installation. However,

as the generators are planned to operate for less than 500 hours per year the emission limit values applicable under this Schedule are not applicable to the site.

The impact of the emissions from these points have been assessed using air dispersion modelling and the Environment Agency's risk assessment methodology, which demonstrates that the long-term and short-term impacts are insignificant.

As there are no emissions limit values relevant to the Installation, the monitoring of NO_x emissions is not proposed.

Emissions to Water and Sewer

There are no process emissions to surface water. The site currently discharges into a public surface water sewer, owned by Thames Water. The proposed surface water drainage network will tie into the 600mm storm sewer on the east of the site. This storm sewer then discharges into the Grand Union canal to the north-east of the site.

The surface water associated with the proposed development will be suitably treated prior to it discharging from the development site with both of the proposed treatment SuDS applying an adequate level of treatment to stormwater originating from all surfaces around the development.

Emissions to Land

The Installation will be comprised of concrete on composite steel decking, steel beams and steel columns, with no pathways to the underlying ground. There will therefore be no process emissions to land from the Installation.

Noise

A noise impact assessment has been undertaken and found that during normal operation, noise levels from the facility are expected to be at least 5dB lower than the background noise level at the closest properties. The noise impact of the Installation is expected to be low.

During emergency conditions when backup generators are running, noise levels are expected to be no more than 5dB above the background level and the impact is expected to be minor to moderate. Therefore, noise is not considered to be a significant issue at the Installation.

Environmental Management Systems

The Installation will be operated in line with an environmental management system (EMS), which will be developed prior to commencement of operations, to manage the environmental aspects of the operation of the Installation.

Site Condition

A Site Condition Report has been prepared which considers the risks presented by the materials stored at the installation, the sensitivity of the receiving environment and the measures in place to mitigate the potential for ground contamination. The primary risk is derived from the storage and use of diesel/HVO. It is considered that appropriate containment will be provided to all fuel storage and transfer systems to prevent loss of materials to environment. All raw materials and wastes will be stored in appropriately sized containers.

1. Introduction

This document supports the application submitted by VDC LHR21 Limited (referred to hereinafter as "VDC" or "the Client") to the Environment Agency ("EA") under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (the "EP Regulations") for an Environmental Permit (application reference EPR/VP3225SC/P001) for the operation of a combustion plant at the LHR-21 Datacentre located at 37-39 North Action Road, Park Royal, London, NW10 6SN (the "site" or the "Installation"). An overview of the location of the site is provided in Figure 1 in Appendix 1.

The Installation comprises one six-storey building, which is proposed to be used as a datacentre (LHR-21). The datacentre will be powered using electricity from the national grid under normal operation conditions. The datacentre will have provision for emergency backup electricity generators to provide electricity in the event of an interruption to the national grid supply. The generators will be fuelled using diesel or Hydrotreated Vegetable Oil (HVO) which is considered to have the same fuel specifications as diesel.

The generators will be located on an adjacent structural gantry that abuts the building (though it will be structurally independent). Each generator is provided with a diesel/HVO fuel storage tank connected to a central fuel pump , equipped with spill containment features. Fourteen generators will be installed, each with an electrical output of 2.6 MW_e and a net rated thermal input of 5.7 MW_{th}. When aggregated, the net thermal input capacity of all fourteen generators at the Installation will be approximately 80 $MW_{th,}$ and the thermal input is therefore higher than 50 MW_{th}. The LHR-21 generator plant will therefore require an environmental permit under EP Regulations Schedule 1, Part 2, Chapter 1, Section 1.1 Part A (1) (a) - Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

This Operations Report is intended to support VDC's application to the Environment Agency for a permit to operate the combustion plant at the site and provides an overview of the proposed regulated activity and the Operators management arrangements.

2. Process Description

2.1 Proposed Activity

The proposed Installation will comprise fourteen diesel/HVO fired generators to provide emergency power to the datacentre. The total thermal input to the generators is approximately 80 MW_{th}, whilst the electric output will be just over 36 MW_e. The maximum power generation will be dependent on the reliability of the local electric grid. It is anticipated that the typical annual operation of the generators for regular testing and maintenance purposes will not exceed 50 hours.

A summary of the scheduled activity to be included in the environmental permit and directly associated activities is shown below in Table 2.1.

Table 2.1: List of Proposed Activities to be undertaken at the Installation

Activity Ref	Schedule 1 – Part 2 Reference	Description of Activity	Limits of Specified Activity
AR1	Section 1.1 Part A(1) (a) Burning any fuel	Operation of 14 emergency standby	From receipt of raw materials and

Activity Ref	Schedule 1 – Part 2 Reference	Description of Activity	Limits of Specified Activity
	in an appliance with a rated thermal input of 50 or more megawatts.	generators with a total thermal input of approximately 80 MW_{th}. The generators will burn diesel/HVO solely for the purpose of providing electricity to the datacentre in the event of a failure of supply from the National Grid and during maintenance testing. 14 x 5.7 MW_{th} engines	generation of electricity to despatch of waste. Electricity produced at the Installation will not be exported to the National Grid.
Directly Associated Activities			
AR2	Storage of raw materials	Storage of raw materials	From receipt of raw materials to use within the facility.
AR3	Surface water drainage	Surface water drainage	Input to site drainage system until discharge to surface water sewer via interceptors (emission point W1) and foul sewer (emission point S1).

2.2 Process Summary and Technical Standards

2.2.1 Process Summary

The primary activities proposed to be undertaken at the site are associated with the operation and maintenance of one datacentre which is planned for construction. Fourteen electricity generators will be installed and commissioned in line with the construction schedule for LHR-21.

The datacentre will comprise a six-storey building. The fourteen electrical power HVO generators will be located on an adjacent structural gantry that abuts the building (though it will be structurally independent) and will each have a belly tank with integrated spill containment features for fuel storage. There will be no fuel storage inside the building or other than that in the belly tanks.

Under normal operating conditions the electrical demand for the data centre will be met through the provision of electricity from the National Grid; however, in the event of an interruption to the supply of electricity from the National Grid, an uninterruptable power supply (UPS) and the proposed installation will provide electricity to the site until the electricity supply from the National Grid can be restored.

Each generator will be provided with a belly tank, with each tank having a capacity of 20,000-litre located adjacent to each generator set, providing the generators with a minimum of 24-hour fuel storage capacity. The belly tanks will be filled directly via road tankers from a dedicated fill point. the total fuel stored at the installation will therefore be limited to that in the belly tanks, totalling 280,000 litres. The installation will not comprise any additional bulk storage tank(s). Therefore, activities directly associated with the regulated activity at the site are limited to the storage, handling (e.g., receipt, distribution etc.) and use of fuel across the site.

The site location is shown on Figure 1 and a site layout plan and installation boundary is provided in Figure 2 provided within Appendix 1.

2.2.2 Technical Standards

The following technical standards are considered to apply to the proposed installation:

- EA's Data Centre FAQ Headline Approach guidance[1];
- Best Available Techniques (BAT) Reference (BRef) document for Emissions from Storage[2]; and
- Medium combustion plant and specified generator regulations[3].

The Data Centre FAQ document is not an official release from the EA, however, this document forms the basis for a common methodology for applications for combustion activities associated with data centres.

Since the individual generator units have a thermal input of <15 MW_{th}, they are not classed as Large Combustion Plant (LCP), therefore the LCP BRef is not applicable to the Installation.

The general permitting guidance provided by the EA for Part A (1) environmental permits[4] has also been considered. In addition, the Installation will operate in line with a management system developed in accordance with available EA guidance[5].

2.3 Process Description

2.3.1 General Overview

VDC intends to operate fourteen diesel/HVO-powered generators located within an adjacent structural gantry that abuts the building as an emergency power supply for the LHR-21 datacentre.

Each of the generators will be identical, and will have the following specification (the manufacturers specification sheet has been provided as Appendix 2):

[1] Data Centre FAQ Headline Approach, Draft version 10.0, Environment Agency, published 01st June 2018
[2] Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on Emissions from Storage, EC, July 2006
[3] Medium combustion plant and specified generator regulations, Environment Agency, published 15th July 2019
[4] A1 Installations: Environmental Permits, Environment Agency, published 01st February 2016, Last updated 20th July 2023, available at: https://www.gov.uk/guidance/a1-installations-environmental-permits, accessed on 03rd August 2023
[5] Develop a Management System: Environmental Permits, Environment Agency, Published 01st February 2016, Last updated 03rd April 2023, available at: https://www.gov.uk/guidance/develop-a-management-system-environmental-permits accessed on 03rd August 2023

Table 2.2: Generator Specification

Manufacturer	Model	Net Rated Thermal Input (MW_{th})	Thermal Efficiency	Output Rating kVA (kW)	Fuel
Kohler	3500E	5.70	45.6%	3250 (2600)	Diesel/HVO

The generators will be capable of providing a N+1 level of resilience with each of the generators running in Standby Mode, which is applicable for supplying power to support the maximum electrical demand, including starting and distorted loads for the duration of power interruption of a reliable utility source.

The mains failure relays on the incoming circuits to the low voltage switch panels will constantly monitor the supply voltage and frequency for under and over tolerance. In the event of a power supply interruption, or variation in supply which is out of tolerance, the immediate power demand of the site will be met via an uninterruptable power supply (battery bank) followed by the generators approximately 15 seconds after the National Grid power supply has been interrupted. The status of the supply interruption is constantly monitored, facilitating single or multiple generators to start depending on the severity of the failure in the supply. Once started the generators will remain operational until the mains restoration detection equipment determines that the supply from the National Grid is stable. The return to the National Grid supply is an automated process, with the National Grid and generator supplies being interlocked to ensure that parallel running cannot be achieved. The generators will not synchronise with the mains supply at any time.

The generators will only be used to meet site demand in the event of an interruption in electricity supply to the site. The generators will not be used for voluntary elective power, such as demand side response (i.e., on-site use), grid short term operating reserve (STOR) (i.e., off-site export of electricity) and frequency control by demand management (FCDM).

2.3.2 Generator Overview

The standby Back-up generators are placed on a structural gantry consisting of 4 levels above the truck loading area. The deck is encased in a mesh screen to allow air to the generator intakes. This approach allows for long term plant replacement and control of noise when the gensets are in operation.

Each generator unit will consist of its own flue stack located at the roof level of the gantry structure; the flue stacks will be located adjacent to each other. The flue heights are 5.8m above the maximum building height of 39.7m meaning the effective stack height is 9.6m.

Each generator will be independent in terms of fuel supply, cooling, fire safety, shut down and control, and for resilience reasons there will be no common points of failure between any two sets.

Each generator will be provided with a fuel tank (belly tank) containing sufficient fuel for the units to operate for a minimum of 24 hours at 100% load, with each tank operating independently. Each tank will be located adjacent to the generator it serves, with fuel being transferred from the tanks to the generating sets using pumps located within tank. The belly tanks will be equipped with leak detection and integral bunding having a capacity of 110% of the tank volume.

2.3.3 Stability of Electricity Supply

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. The generators are automatically triggered to start once the power supply has been interrupted, providing power within 20 seconds of the failure of the National Grid supply, at which point the UPS would revert to standby.

The use of the generators to provide electrical power to the site is considered to be unlikely, on the basis that the site is supplied with electricity via two diverse routes and associated infrastructure (e.g. transformers) providing a 2N level of resilience, where N is the power demand of the Installation.

The likelihood of long periods of reliance on the generators to provide power to the site is considered to be highly unlikely given that the National Grid Electricity Transmission System, which serves the site, reportedly achieved an overall reliability of supply of 99.999981% over the period 2022 - 23[6].

2.3.4 Testing Regime

Regular testing of the generators at the site will ensure that these are operational and capable of providing back-up power. Each of the generators at the site will be subject to a regular testing regime; the testing regime is expected to be in place prior to commencement of operations.

Based on available information, it is anticipated that each generator will be run for up to 24 hours per year for periodic testing.

This testing regime is below the individual generator testing target set out by the EA within the Data Centre FAQ Headline Approach Guidance of 50 hours/annum per generator. The likely impacts associated with operating the generators in accordance with the above testing regime and the operation of the generators to support an interruption to the national grid power supply have been assessed and further information is available in the detailed air quality impact model provided in support of this application.

2.4 Ancillary Activities

The following activities are considered to be associated with the principal regulated activity:

- Fuel handling and storage system;
- Fire protection system; and
- Drainage.

These are discussed further below.

2.4.1 Fuel Handling and Storage

Fuel handling is associated with the delivery of diesel/HVO to the site.

The general process of delivery of diesel/HVO comprises attaching a flexible hose to the fill point and pumping fuel from the road tanker into the belly tanks using a pump mounted on the delivery vehicle. Each of the belly tanks at the site are fitted with overfill protection devices, which will

[6] National Electricity Transmission System Performance Report 2022-23, NationalGridESO, published 28th September 2023, available at https://www.nationalgrideso.com/industry-information/industry-data-and-reports/system-performance-reports accessed on 22nd October 2023

close the fill point once the storage capacity is reached to prevent a spillage. The level alarms are connected to the building management system, which will be set off if the high-level, low-level or bund alarms are triggered.

The belly tanks shall be filled centrally from a security cabinet housing the tank fill points, level gauges and overfill alarms. The security cabinet shall have spillage containment and be fitted with a lockable roller shutter, or a similar secure access door. The adjacent vehicle hard standing is bound by slot drainage leading to a below ground class 1 full retention separator with alarm in case of spillages or loss of containment from the road tanker. This is to be connected to the foul water network.

The road will slope towards the ACO kerbing to contain spillages in the direction of the fuel interceptor tank.

2.4.2 Fire Protection System

An addressable fire alarm system will be provided throughout the Installation. Power to all fire alarm equipment and all fire circuits entering or leaving the building will be provided with surge protection devices. All fire alarm circuits will be electronically supervised.

The installation will include fire protection sprinklers and smoke detection systems to provide early warning of any combustion events. The water demand for the building will be provided from an underground water storage tank and a fire pump set to meet the pressure and flow requirements of the sprinkler system.

Sprinkler system water flow, valve supervisory, and high/low air pressure switches will be monitored by the building fire alarm system. The fire alarm system will also provide detection and releasing for the preaction sprinkler systems.

Fire hydrants will be located around the perimeter of the facility to maintain hose coverage within code mandated distance of any portion of the building, as well as the vehicle parking lots. The Installation will be fitted with fire rated panels and walls, fire resistant door frames and doors and steel structures with appropriately designed fire resistance.

2.4.3 Drainage System

The Installation will not have any process emissions to controlled waters due to the nature of operations. The main drainage system at the Installation will comprise of surface water drainage. The storm sewer system for the facility will consist of a combination of roof drainage network, drain inlets, storm drainage network, and underground attenuation.

Stormwater will be collected across the site via number of ways, through a network of channel drain, roofline drainage and permeable paving. The proposed surface water drainage network will tie into the existing Thames Water storm sewer on the east side of the site. This storm sewer then discharges into the Grand Union canal to the northeast of the site.

2.4.4 Process Control System

The generator system shall be equipped with the engine instrumentation and protection functions. The day to day running of the plant will occur remotely, with the plant being capable of both manual (local) start and operation from a remote station via appropriate communications links to facilitate remote operation, monitoring and control. The equipment will incorporate provision for a remote control of each engine via an appropriate system.

The engine control shall be a control panel located outside each engine enclosure and shall include all required control and monitoring equipment and protection systems.

The plant will have engine control and monitoring systems with interface for local and remote access including remote stop/start and load modification capability. There would also be remote monitoring and control software and interfaces in place to ensure efficient operation.

Functions of the visualisation system at the engine control panel will be available remotely, and will include control and monitoring, trend indications, alarm management, parameter management, and access to long term data recording. The data available via the control panel will also allow reporting on virtually any parameter associated with the plant operation; typically reports covering plant performance and environmental compliance.

2.5 Management System

The Installation will be operated under an Environmental Management System (EMS), which will be developed in line with the requirements of the ISO14001 standard.

In summary, the management system will identify systems and procedures that minimise the risk of pollution and harm to human health, which may arise from the operation, maintenance, accidents, incidents and non-conformances specific to the proposed generator plant.

The management system and procedures will be available for inspection at the facility and will be applicable to all staff, contractors and visitors to the facility. The management system will be developed to enable compliance with the Environmental Permit and other legislative requirements for the protection of the environment and human health.

Written procedures clearly describing responsibilities, actions and communication channels will be available for operational personnel dealing with emergencies.

The systems and procedures will be externally audited and contingency plans written in preparation for any unexpected complications. Internal review of the management system (or relevant parts therein) will be undertaken at least on an annual basis or in the event of a change in operations / site processes.

Internal audits will be undertaken to ensure compliance with the management system, relevant legal requirements, environmental and management performance and to identify preventative / corrective actions to minimise the risk of breach / non-compliance. The findings of any such review and audits will be communicated to all staff and relevant external contractors and, where appropriate, improvement works / corrective actions will be implemented. All internal reviews, audits, amendments to the management system and improvement measures implemented will be recorded for reference and inspection purposes.

2.6 General Maintenance

VDC will produce Operations and Maintenance (O&M) Manuals for the Installation and associated ancillary infrastructure. The site will have a service and maintenance schedule in place with an accredited contractor.

As such all plant, equipment, and infrastructure shall be inspected regularly, which will be developed for the site as part of the Operations and Maintenance regime. Any issues identified during the inspections will be actioned following the inspection. The installation maintenance and inspection procedures will include asset review and management activities (i.e. bunds, drainage etc.), and will be reviewed periodically.

Routine maintenance will be undertaken annually with major maintenance events undertaken periodically on each major unit. As the plant is not intended for continuous use, the frequency of

regular required maintenance is expected to be low. Any materials required for maintenance works at the installation will be brought to site by maintenance contractor and removed for appropriate treatment and/or disposal off-site on completion of works. No materials, including chemicals, required for maintenance works will be stored on site.

Any effluent and other wastes generated from maintenance works will normally be disposed of to an appropriate disposal facility off site.

3. Raw Materials, Water & Waste

3.1 Raw Materials

3.1.1 Raw Material Use

Raw materials use associated with the operation of the generator plant is detailed in the table below.

Table 3.1: Summary of Raw Material Use

Substance	Reason for use	State (Solid/ Liquid / Gas)	Estimated Annual Use	Maximum Storage Capacity	Environmental Hazard Statements
Diesel/HVO	Generator Fuel	Liquid	156,744 litres(1)	280,000 litres	H411 – Toxic to aquatic life
Lubricant Oil (Mineral)	Lubrication on generators	Liquid	294 litres(2)	7,840 litres(3)	Not Classified
Glycol (70/30 solution)	Generator coolant	Liquid	5,712 litres(4)	17,150 litres(5)	No Environmental classifications
Urea Solution (AdBlue or similar)	SCR reagent	Liquid	14,938 litres	25,805 litres	Not classified

Notes:

1) Based on 12 hours under 25% load (197.2 litres/hour per generator) and 12 hours under full load (100%) (735.8 litres/hour per generator).
2) Based on the lubrication oil being changed on an annual basis.
3) Based on a lubrication oil capacity of 560 litres per generator.
4) Based on coolant being changed every three years.
5) Based on fourteen generators each with a capacity of 1,225 litres within coolant systems and associated pipework.

3.1.2 Storage & Containment

Lubricating oils and glycol coolants are both present within the generator sets. These substances are maintained at the optimal level for the operation of the generator sets by the Operators nominated maintenance contractor. There is no routine storage of lubricant or coolant at the installation other than within the generator plant. As the lubrication oil and the coolant are located within the generator plant secondary containment is provided by the generator container, which is

of mild steel construction. The generator container is designed to provide adequate secondary containment for coolant and lubrication oil held within the generator set.

Adjacent to each generator is an integrally bunded (110%) mild steel belly tank, containing HVO for the operation of the specific generator, and a similar sized tank containing SCR reagent (AdBlue or similar). The tanks have a nominal capacity of 20,000 litres each.

The belly tanks will be automatically refuelled from the delivery road tankers, providing 24-hours fuel storage capacity and a redundancy of N+1. The total fuel storage capacity of the site is 280,000 litres. This is considered sufficient capacity to enable the operation of all generators at the site on full load for a maximum period of 24-hours without the need to refuel. The tanks shall have an access hatch to allow for inspection, a tank vent and a fill point connection to allow for the delivery of fuel to each tank from a road tanker.

The belly tanks are equipped with overfill and leak protection. The bund (interstitial space between the two tank skins) is equipped with a vacuum leak detection system which monitors the interstitial place and gives an alarm when a leak in inner or outer tank is detected. Visual and audible alarms will be triggered by a pressure increase as a result of leaks in the tank walls, above or below the liquid level. The belly tanks will have level detectors to ensure that each tank is filled to no more than 87.5% of its capacity (total internal volume), which is just below the location of the first high level alarm. The tanks will also include low-level alarm sensors which are set off when the fuel is detected to be at 25% of normal fuel level.

The tanks are designed in accordance with BS EM 12285-1, and the surface of the tanks are corrosion protected in accordance with EN ISO 12944 (Corrosion Class C3 (Medium) / Durability: Very High (>25 years)) and applying a protective paint layer consisting of zinc rich rust inhibiting primer, epoxy intermediate and polyurethane finish.

The fill point cabinet will be located on concrete foundation plinth adjacent to a vehicle hard standing, which will be bound by slot drainage leading to a below ground class 1 full retention interceptor; the interceptor will comprise a full retention separator such as Kingspan 'klargester' class 1 forecourt separator or equivalent.

A drainage plan is provided within Appendix 1 (drawing ref. LHR21-PIN-XX-SP-DR-C-2300 - C03).

3.1.3 Raw Material Efficiency Measures

Raw material use at the installation is limited to the use of diesel/HVO, lubrication oil, glycol-based coolant and urea. Annual consumption of lubrication oil and glycol are based on maintaining the generator plant in accordance with the manufacturer’s specification for optimal performance of the plant. In addition, regular maintenance of the generator plant ensures that use of these substances is kept to a minimum.

Diesel/HVO and urea use at the site is primarily associated with the testing and maintenance schedule for the generator sets. This has been developed to allow for the optimal performance of the generator sets. The Operator proposes to maintain records of run-hours for each generator and associated fuel consumption to enable consumption of diesel/HVO to be monitored.

3.2 Water

3.2.1 Use

Water will not be routinely used across the Installation; however, it may be used during scheduled maintenance activities to ensure that the engine coolant level within the engines is maintained at a suitable level by the operators nominated third-party maintenance contractor.

3.2.2 Efficiency Measures

As water use is not considered to be routine efficiency measures are not considered to be appropriate to the Installation.

3.3 Waste

3.3.1 Wastes Generated

Under normal operating conditions wastes associated with the regulated activity are limited to oil contaminated absorbents, which may arise during small releases during refuelling (e.g. clean-up of drip trays etc.).

Under testing and maintenance operations of the generator plant (i.e., testing, maintenance and emergency power generation) the wastes arising from the regulated activity at the Installation will comprise:

Table 3.2: Summary of Wastes: Testing and Maintenance Operations

Description of Waste	Source	State (Solid/ Liquid / Gas)	Estimated Annual Quantity	Classification
Filters	Filtration of fuel and oil on generators	Solid containers with fuel/oil saturated filter material	<5 tonnes	Hazardous
Lubricant Oil (Mineral)	Lubrication on generators	Liquid	294 litres(1)	Hazardous
Glycol (70/30 solution)	Generator coolant	Liquid	5,712 litres(2)	Hazardous

Notes:

(1) Based on the total estimated lubrication oil use for 14 generators and the lubrication oil being changed on an annual basis.

(2) Coolant is changed on three-yearly cycles

Under abnormal conditions, such as a breakdown, fuel polishing or periodic overhauls wastes arising from the regulated activity at the installation will occur infrequently and will comprise:

Table 3.3: Summary of Wastes: Abnormal Operations

Description of Waste	Source	State (Solid/ Liquid / Gas)	Classification
Oily wastes	Filtration of fuel and oil on generators	Liquid	Hazardous

Description of Waste	Source	State (Solid/ Liquid / Gas)	Classification
Batteries	Generators	Solid (contain sulphuric acid)	Hazardous
Engine / alternator parts	Generators	Liquid	Hazardous/non-hazardous depending on part and contamination with fuel / oil.

In addition to these wastes, oil/fuel contaminated wipes and absorbents may arise on an ad-hoc basis resulting from unintended small-scale releases during maintenance and refuelling operations.

3.3.2 Storage & Containment

Wastes arising under normal operating conditions are limited in volume and will be stored in a suitable sealed container and provided with secondary containment. Wastes arising from maintenance and abnormal conditions are not routinely stored on-site and will be removed by the third-party contractor undertaking these works. Liquid wastes stored on-site during maintenance / abnormal works will be suitably contained within adequate secondary containment.

3.3.3 Waste Minimisation

Wastes arising from the regulated activity at the Installation will be limited to the maintenance of the generators. Maintenance will be undertaken in accordance with the manufacturers specification and is intended to prolong the life and efficiency of the generator sets, as such waste minimisation measures are not considered to be appropriate to the Installation.

4. Energy Use & Efficiency

4.1 Energy Consumption

This application for an environmental permit is made for the proposed regulated activity of burning of any fuel in an appliance with a net rated thermal input of 50 or more megawatts, when the National Grid supply is interrupted. Therefore, the focus of energy consumption under the permit is in relation to the generators alone, rather than the energy consumption of the data centre operations, which are not considered to be a regulated activity under the environmental permitting regime and are outside the permit boundary.

The annual fuel oil consumption associated with the testing and maintenance of the generators is estimated to be 156,744 litres or 122,260 tonnes[7]. Based on an annual conservative operation of up to 50 hours it is expected that the Installation will have an energy consumption of 3,990 MWh (based on operation of 14x5.7 MW_{th}). Electricity consumption will be relatively small and based around pre-heating the engines, monitoring and control systems.

Table 4.1: Summary of Energy Consumption

Energy Source	Approximate Annual Energy Consumption		
	As Delivered (MWh)	At Primary Source (MWh)	% of total (primary)
Electricity	Nominal	Nominal	<1
Diesel/HVO	3,990	3,990	>99

* For electricity from the public supply a factor of 2.4 should be used to convert from delivered to primary energy.

4.2 Energy Efficiency Measures

4.2.1 Operating & Management Procedures

The generators will be maintained and serviced in accordance with the manufacturer's recommended maintenance schedule to ensure the efficiency of the engines is maintained.

Given the infrequent, intermittent and unplanned nature of the operation of the generators other energy efficiency measures are not considered appropriate.

4.2.2 Energy Efficiency Directive – Article 14

Article 14 of the Energy Efficiency Directive (2012/27/EU) requires a cost-benefit analysis in relation to measures for promoting efficiency in heating and cooling at industrial installations with a thermal input exceeding 20MW_{th}. Whilst this capacity is exceeded at the Installation, the operating hours for the plant are significantly below the 1,500 hours a year threshold which also applies. Therefore, the generators are exempt from the requirement to provide a cost-benefit analysis on recovery of heat as part of the application.

[7] Crown HVO Brochure 2023, Crown Oil Fuels and Lubricants, available online at https://cdn.crownoil.co.uk/wp-content/uploads/2023/03/Crown-HVO-Brochure_2023.pdf accessed on 22nd October 2023

5. Emissions to Air, Water, Sewer & Land

5.1 Emissions to Air

Emissions to air from the installation will principally comprise combustion gases arising from the operation of the generation plant under emergency, testing and maintenance scenarios.

When in use in an emergency, all the generators could be operational and therefore the impacts during an emergency are higher than those when individual or groups of generators are being routinely tested. The impacts during an emergency have been assessed as well as the impacts during routine testing.

The proposed engines are Kohler KD3500E derated to 3250 kVA. Eight generators will be installed initially in Phase 1 in 2024, followed by a further six generators in Phase 2 in 2025 (fourteen diesel/HVO generators in total). The engines will be fitted with SCR to reduce NOx emissions; it is proposed that the SCR abatement is set to reduce NOx emissions by approximately 90% which means that the engine emissions will meet MCPD emission limits for NOx.

5.1.1 Point Source Emissions to Air

Combustion gases from the operation of each of the generators will be emitted to air via 14 separate flues located adjacent to each other, and would only take place in the event of an interruption to the Installation's electricity supply from the National Grid or running the engines for maintenance and testing.

The Emission Point reference and the method of emissions are as shown on the table below. These emission points are also shown on Figure 2 provided in Appendix 1 with the same reference number for convenience.

Table 5.1: Schedule of Electricity Generation Plant Emission Points

Combustion Plant (source)	Emission Point Reference	Stack Position	Stack Height (from ground level)	Parameters
Generators 1 - 14	A1 - A14	Vertical	45.5m	NO_x, CO

The total planned operating hours for testing of all generators is 336 hours (14 generators, 24 hours each) per annum.

5.1.2 Assessment of Emissions to Air

5.1.2.1 Emission Limit Values

As each of the generators at the site has a rated thermal input of below 15MW, the installation is not classified as a Large Combustion Plant, and the emission limit values specified under Chapter III of the Industrial Emissions Directive (2010/75/EU) are not applicable; however, the requirements set out in Chapter II of the IED are considered to apply, although there are no specific emissions limit values relevant to the Installation under this Chapter.

As the generators are subject to the provisions of Chapter II of the IED, the generator plant is considered to be an excluded generator for the purposes of Schedule 25B of the Environmental

Permitting (England and Wales) Regulations 2016 (as amended) for specified generators, and the emission limits and rules set out therein do not apply.

The emission limit values set out under the medium combustion plant requirements of Schedule 25A of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) are considered to represent the most appropriate limits in relation to the proposed generators at the Installation. However, as the generators are planned to operate for less than 500 hours per year the emission limit values set out in this Schedule are not applicable to the site.

Whilst there are no specified emission limit values, which are applicable to the site, the default engine specification for new plant to minimise the impacts of emissions to air from oxides of nitrogen (NO_X) is the 2g TA-Luft standard (or equivalent), which consists of NOx emissions of 2,000 mg/Nm^3 at oxygen concentration of 5%. According to the specification information provided by the manufacturer the engines meet this standard at operational loads of 75%. As the emergency generators are expected to run at 80%+ loading in the event of a grid failure, SCR has been installed as a precautionary measure to ensure the units achieve the 2g TA-Luft standard.

5.1.2.2 Site Summary

The whole of the London Borough of Ealing (LBE) has been declared an Air Quality Management Area (AQMA) for exceedances of the annual mean NO_2 and daily mean PM_{10} national air quality objectives (AQOs). The same applies to the north of the Site, where the whole of the London Borough of Brent has similarly been declared an AQMA.

5.1.2.3 Assessment Summary

The generators will be used to provide back-up power in the event of a loss of power to the data centre, i.e., an emergency scenario. For the purposes of the modelling, it was assumed that all of the generators would operate simultaneously at maximum load in an emergency. The likelihood of this occurring is very low given the grid reliability and redundancy in power supplies to the data centre; in addition, it is not predictable when an emergency scenario would occur.

The modelling has been undertaken to determine the emergency operation with a 1% probability of exceeding the objective. The allowable operating hours for a 1% probability of exceeding the objective would be 276 hours. If the LHR21 generators were to operate for 324 hours the probability of exceedance would be 5% indicating that exceedances are unlikely provided the lifetime of the generators is less than 20 years. The maximum probability occurs to south of the Site. The areas of 1% probability are small with much lower probabilities outside of the areas of maxima.

Regular testing of the generators at the site is also required to ensure that the generators are operational and capable of providing back-up power. Each of the generators at the site will be subject to a regular testing regime; the testing regime is expected to be in place prior to commencement of operations. The testing regime is likely to involve periods of operation at different loads on a monthly basis, but as a worst-case basis full load operation can be assumed.

Based on available information, it is anticipated that each generator will be run for up to 24 hours per year for periodic testing. This testing regime is below the individual generator testing target set out by the EA within the Data Centre FAQ Headline Approach Guidance of 50 hours/annum per generator. Total testing hours for all 14 generators will therefore be 336 hours per year. For the

purposes of assessing impacts during testing, the emissions from one generator have been considered.

In addition, the long term impacts of operating the generators has been assessed. The annual mean impacts have been factored to assume the emergency generators will run for 72-hours or three days. It is considered that the predicted impacts are conservative as it would require a loss of grid power to this area of London for 3 days in a year.

Air quality impacts were modelled using the Atmospheric Dispersion Modelling System (ADMS 6)[8] air quality dispersion model, originally developed for regulatory authorities in the UK. The model uses representative meteorological data for the local area and plant emissions data to predict ambient concentrations of pollutants in the vicinity of the site.

For dispersion modelling purposes it is assumed that the generators will be operational all year round and the annual average impacts can be factored by the calculated allowable operating hours for emergency operation. The allowable operating hours for emergency operation are primarily estimated from a statistical analysis of the likelihood of breaching the 1-hour objective for NO_2 concentrations.

As the generators are only tested for a total of 24 hours per year each, the standard modelling approach of running the generators all year round and using the highest predicted concentrations is very conservative. This is because it is unlikely that the generators will be operating when worst case dispersion conditions occur. Hence, the EA guidance requiring a statistical approach for assessing the likelihood of exceeding the short term NO_2 objective is considered the most appropriate approach to adopt for assessing the environmental risk.

The statistical approach allows for the fact that operation will only occur for a limited number of hours per year, and therefore operation is unlikely to occur during the meteorological conditions giving rise to the highest hourly average concentrations.

Emission rates and volumetric flowrates have been based on data contained in the Kohler data sheet (proposed engines are Kohler KD3500E derated to 3250 kVA). Flue heights and diameters were taken from the CAD layout drawings which indicated a flue height of 45.5 m (5.8 m above the building) and flue diameter of 0.57 m. In order to undertake the assessment, each generator was allocated its own flue, with a total of 14 generators.

The Installation design shows each generator having its own flue and the flues are arranged in one location (making a total of 14 generators for LHR21). The details of the point source emissions parameters are shown in Table 5.2.

Table 5.2: Emission parameters for the Installation

Parameter	Value (per flue)
Stack height (m above finished ground level)	45.5
Average efflux velocity (m/s)	40.2
Volumetric flow at stack exit parameters (Am^3/s)	10.266
Average stack exit Temp (°C)	510
Approx. flue diameter (m)	0.57

[8] https://www.cerc.co.uk/environmental-software/ADMS-model.html

Parameter	Value (per flue)
Assumed maximum operating hours / year for assessment purposes	336
Oxides of nitrogen (NOx), mg/Nm^3)	120
Oxides of nitrogen (NOx) emission rate (g/s)	0.78

Notes:

(1) Emissions have been normalised to 273K, dry gas and 15% oxygen

In an emergency scenario the emergency generators can operate up to 276 hours per year with a 1% probability of exceeding the short term NO_2 objective. Predicted annual mean NO_2 impacts have been factored to 72 hours to represent a maximum emergency scenario. Predicted annual mean NO_2 at all relevant receptor locations are not significant.

Impacts at ecological sites are potentially significant during the emergency scenario for daily mean NO_x concentrations, however, is it unlikely that the generators would be running for more than 24 hours.

Impacts during testing are lower than in an emergency scenario and are not significant.

5.1.3 Fugitive Emissions to Air

Fugitive emissions to air at the Installation are limited to the venting of fuel tanks. It is not anticipated that the fugitive emissions from the tank vents will be significant.

5.2 Generator Cost-benefit Analysis

Published EA guidance for datacentres states that in order to minimise the impact of NO_x emissions from electricity generators the default engine specification is 2g TA-Luft (or equivalent standard), consisting of NOx emissions of up to 2,000 mg/Nm^3 (at 5% O_2 content). The generators proposed for the installation meet this specification at 75% load (see Technical Specifications shown in Appendix B), and SCR has been installed as a precautionary measure to cover operation above 75% loading. Therefore, a detailed cost benefit analysis (CBA) to justify using these engines is not required.

5.3 Global Warming Potential

The release of greenhouse gas emissions at the Installation is anticipated primarily from direct emissions produced or associated with operation of the emergency generators. This is diesel/HVO combustion at the installation.

The anticipated emission of carbon dioxide resulting from the Installation as a consequence of the consumption of diesel/HVO is presented below. Note that this data is based upon the regulated activity only (electricity generators). Other greenhouse gas emissions associated with the operation of the data centre are excluded from this assessment. As a conservative assessment, HVO is considered to have the same emissions profile as diesel, therefore the same carbon dioxide emission factor[9] has been used.

[9] Assess the impact of air emissions on global warming, Environment Agency and Department for Environment, Food & Rural Affairs, Published 1 February 2016, available online at https://www.gov.uk/guidance/assess-the-impact-of-air-emissions-on-global-warming accessed on 22nd October 2023

Table 5.3: Primary Energy Consumption

	Primary Energy Consumption		
Energy Source	**MWh**	**CO_2 emission factor (t/MWh)**	**Annual CO_2 emissions (tonnes)**
Diesel/HVO	3,990	0.26	1,037
Total	-	-	**1,037**

5.4 Emissions to Surface Water

5.4.1 Point Source Surface Water

Surface water runoff from the generator areas is routed across the site through a dedicated surface water drainage system to a flow attenuation system before being pumped into the municipal surface water drainage system maintained by Thames Water at emission point W1. The surface water drainage system will consist of appropriate oil/water interceptors to ensure only uncontaminated water is discharged to the sewers.

The operation of the Installation will not result in any discharges of wastewater to surface water.

5.4.2 Fugitive Emissions to Surface Water

The operation of the Installation will not result in any fugitive discharges of process water to a surface water body.

5.5 Emissions to Groundwater

There will be no process emissions to groundwater from the installation.

5.6 Emissions to Sewer

There will be no process emissions to the foul or surface water municipal sewers associated with the regulated activity undertaken at the Installation.

5.7 Emissions to Land

There will be no emissions to land associated with the regulated activity at the Installation.

5.8 Odour Emissions

There will be no significant sources of odour from the permitted operations at the Installation, therefore odour is not considered further in this application.

5.9 Noise Emissions

5.9.1 Noise Assessment

A noise assessment was undertaken by Ramboll for the Installation as part of the Planning process. The assessment was undertaken in line with BS 4142: 2014 + A1:2019 and is therefore considered to demonstrate the environmental risk assessment from the Installation for the purpose of the permit application. As only the operation of the Installation i.e., the generators is

a regulated activity, only this has been discussed here. A copy of the assessment is provided in Appendix 4. A summary of the noise assessment is provided below.

The Installation will include several key plant and equipment which could lead to noise emissions from the site without appropriate mitigation. The data centre will include chiller equipment, generators and ancillary plant such as air handling and extract. The chillers and other ancillary plant would operate continuously during daytime and night-time periods. Generators would only be required to be operational during power failures and briefly for testing and maintenance during the day.

The assessment considers the noise sensitive receptors (NSRs) listed in Table 5.4 below.

Table 5.4: Noise sensitive receptors considered in the assessment

Location	Description	Distance from site (m) at closest point
R1	Houses on North Acton Road	35
R2	Houses on Wesley Avenue	65
R3	Wesley Playing Fields	15

A baseline noise survey was carried out at the identified NSRs and across the application site, to quantify the prevailing ambient and background noise levels during daytime and night-time periods. Operational noise limits for the Installation will be set based on the background noise levels measured during the baseline survey.

Based on the noise survey results, and statistical analysis of the measured background noise levels in accordance with guidance set out in BS 4142:2014+A1:2019, the following background noise levels have been used to set noise limits for 24 hour operation.

Table 5.5: Background noise levels

Location	Description	Representative night-time background noise level dB LA90	Representative daytime background noise level dB LA90
R1	Houses on North Acton Road	42	48
R2	Houses on Wesley Avenue	38	43
R3	Wesley Playing Fields	N/A	45

The rating sound level from fixed plant at the installation has been set 5 dB below the representative background noise level (L_{A90}) during the night-time, as operation of the facility will be 24 hours. During emergency operation, it is appropriate for standby equipment to be designed to a relaxed criterion. Therefore, the rating level during emergency operation (or testing) has been set at 5 dB above background noise levels.

Table 5.6: Plant noise rating level limits

Receptor	Time	Representative background noise level dB L_{A90}	Plant noise rating level dB L_{Ar} at sensitive receptors
R1 – Houses on N Acton Rd	24 hour normal operation[1]	42	37
	Emergency operation[1]	42	47
	Testing of emergency plant (daytime only)	48	53
R2 – Houses on Wesley Av	24 hour normal operation[1]	38	33
	Emergency operation[1]	38	43
	Testing of emergency plant (daytime only)	43	48
R3 - Wesley Playing Fields (daytime impact only)	Normal operation (daytime only)	45	40
	Emergency operation (daytime only)	45	50
	Testing of emergency plant (daytime only)	45	50

Notes: (1) Limit based on typical night time (23:00-07:00) background level

Noise levels from the Installation has been calculated using proprietary modelling software (CadnaA), based on manufacturers noise data for each item of plant. The following elements of the Installation are considered to present sources of noise:

- Auxiliary Plant – DOAS air handling unit (DOAS 1-4), DOAS air handling unit (DOAS 5), CRAC DX (serving MMR), CRAC DX (serving ER03/ER08), CRAC DX (serving ER03b), VRF, Extract fan, Admin air cooled chiller and Admin Heat Pump (NOT IN USE);
- Air cooled chillers; and
- Emergency generators

Full details of the plant and associated data used for the assessment is provided in Table 10 of the noise assessment (see Appendix 4) and has not been repeated here.

The noise assessment concludes that additional attenuation of specific plant or buildings would be needed to achieve the defined noise criteria.

Noise from the facility during normal operation is made up from a large number of diverse plant sources and the cumulative noise is not expected to have any distinct tonality and noise levels are expected to remain steady. Noise levels calculated are very low due to distance and high levels of attenuation and are significantly lower than the typical ambient noise (L_{Aeq}), so any tonality or cycling of plant due to changes in demand are unlikely to be perceivable under normal conditions.

The cumulative noise level from the LHR21 facility is calculated to be 37dB(A) at the nearest noise sensitive property (North Acton Road, R1) and lower than this at other positions. The proposed noise limits are achieved at all locations. At most positions the noise level is more than 5dB lower than the typical background noise level at night, and significantly lower than the daytime background level.

5.9.2 Noise Assessment Conclusions

On the basis of the worst-case prediction of noise from the LHR21 facility, there is expected to be a low magnitude of impact at the nearest properties.

Given the context of the area and the current industrial and commercial operations in the surrounding area, noise may be heard but is not expected to cause any change in behaviour or significant change in the quality of life.

Noise levels from LHR21 experienced in gardens would generally be lower than 30dB(A) and is unlikely to affect amenity in these areas, particularly in the context of the industrial/commercial nature of the wider area.

During an emergency situation where power is lost to the facility, the backup generators will run until power is restored. The approximate noise level at each receptor has been calculated based on the worst case of all of the generators running concurrently at full power (as well as the rest of the normal operation plant) for the assessment.

The assessment concluded that while noise from the generators may be audible, based on the affected properties having windows closed under these temporary conditions and having typical standard double glazed windows, the noise is not likely to be significantly disturbing to sleep at night and is within the internal noise limits set in BS8233. There is expected to be a minor to moderate magnitude of impact at the nearest properties during emergencies.

It is assumed that generators would be tested during the daytime only and for a limited period. On the basis of the nearest generator to the nearest sensitive receptors running on its own, the level at these locations would be no more than the typical background level.

6. Monitoring

6.1 Monitoring Emissions to Air

As discussed in Section 5.1 there are no emission limit values applicable to the site. Furthermore, emissions from the generator plant are not anticipated on a routine basis other than for testing or short-term operation in the event of a failure of the National Grid supply. Therefore, emission monitoring will be limited to that undertaken as part of routine maintenance.

6.2 Monitoring Emissions to Water

There will be no process emissions to controlled waters i.e., groundwater, surface waters or sewers associated with the proposed installation and therefore no monitoring is required.

6.3 Monitoring Emissions to Land

There will be no emissions to land associated with the proposed regulated activity and therefore no monitoring is required.

7. Application of BAT

7.1 Determining Applicable BAT

The proposed regulated activity does not have an applicable specific Best Available Technique (BAT) reference document or any associated BAT conclusions. However, it is acknowledged that

the EA has provided generic advice setting out the general requirements for compliance with the conditions of a Permit. This generic guidance has been considered throughout the preparation of this application and therefore no specific assessment against these requirements is provided in this section.

In the absence of sector/activity specific BAT, an assessment is provided in the following sections against the main applicable requirements set out within the EA's Data Centre FAQ Headline Approach guidance.

Table 7.1: FAQ Headline Approach Conclusions

Requirement	Installation Arrangements	Conclusion
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).	Generator units chosen can deliver an N+1 standby arrangement with a high efficiency (>40%).	The generator sets and configuration are appropriate for the installation.
Standby engine capacities are aggregated in MW thermal input at the quoted standby rating, being usually 110% of the continuous rating.	In total 14 generators will be present at the site. Each generator will have a net rated thermal input of 5.7 MW_{th} (based on the manufacturers thermal efficiency value of 45.6%.). Therefore, the aggregated net rated thermal input capacity of the installation is 79.8 MW_{th}.	The thermal input to the Installation exceeds 50 MW_{th} and therefore requires an environmental permit as per Schedule 1, Part 2, Chapter 1, Section 1.1 Part A(1) of the EP Regulations.
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 MWelec.	Although not stated on the specification sheet for the generators the efficiency of the generators has been estimated to be 45.6% on the basis of the information available in the technical specification. The specification sheet states that the electrical output of the generator units is 2.6 MWe, based on a power factor of 0.8. Based on these values the MW_{th} rating of each generator has been calculated to be 5.7 MW_{th}.	Each of the generators has a net rated thermal input of 5.7 MW_{th} based on the provided methodology.
The sum of generator plant capacities is based only on MWthermal inputs of all plant	The MW_{th} capacities of the generators at the site have been calculated only on MW_{th}	Limiting factors have not been applied to the MW_{th} capacities of the generators.

Requirement	Installation Arrangements	Conclusion
regardless of the standby configuration. MWelec 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.	inputs without any constraints/limiting factors applied.	
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 of the installation as 'same site – same operator' as per RGN02.	The Installation comprises the combustion plant for LHR21 which is located within the same boundary as the generator building and considered a single site.	The proposed Installation is a separate site to other sites operated by VDC in the vicinity and does not meet the requirements set out in RGN02 requiring the sites to be considered as a single site.
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.	The operation of the generators at the Installation is predicted to be below the 500-hour threshold for emergency /standby operation. It is noted that emission limit values are not applicable to the site under this operational scenario.	The site meets the emergency / standby operational limit and therefore no emission limit values are applicable.
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 level of resilience built into the supply from the national grid, therefore the requirement to operate the generators under an emergency scenario is unlikely. However, should this be required performance will be monitored in accordance with the monitoring requirements set out in Section 6 of this report.	The use of generators to make emergency repairs of electrical infrastructure is unlikely given the inbuilt N+1 resilience of the national grid supply.
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	As set out in Section 2.3.4 of this report the testing regime for all generators will equate to 336 hours of operation. This equates to 24 hours per generator, which is well below the 50-hour target.	The testing regime proposed is below the individual generator testing target set out by the Environment Agency within the Data Centre FAQ Headline

Requirement	Installation Arrangements	Conclusion
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 as required for MCPD specified generator exclusion.		Approach Guidance of 50 hours/annum per generator.
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.	The planned operational scenarios for the site will be 24 hours per generator per year. Whilst the emergency operation of the plant cannot be foreseen based on the security of the supply to the site and the stability of the national grid exceeding the 500-hour emergency operations limit is highly unlikely.	The proposed Installation will operate for less than 500 hours per generator for maintenance, and it is anticipated that the emergency operation of the generators will be below 500 hours based on the reliability of the National Grid.
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.	The power supply into the Installation is constantly monitored, should the power supply be interrupted the sites UPS will ensure continuity of supply and the generators will start automatically taking over from the UPS typically within a 15 second timeframe. The run time on each generator is logged from the first ignition.	The generators at the site have minimal start-up and shut-down times. Operational hours for all generators are metered.
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	The generators will only be used to meet site demand in the event of an interruption in electricity supply to the site. The generators will not be used for voluntary elective power, such as demand side response (i.e. on-site use), grid short term operating reserve (STOR) (i.e. off-site export of electricity) and frequency control by demand management (FCDM).	The generators at the Installation will not be used for voluntary elective power operation.

Requirement	Installation Arrangements	Conclusion
differentiate data centres from 'diesel arrays or MCPD specified generators' that voluntarily operate within the balancing market, and importantly a clear way to demonstrate minimisation of emissions to air as 'Emergency plant'.		
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.	The engines procured for the site meet the 2g TA-Luft/EPA Tier II standard at 75% load; however, there is the potential for the genrators to operate above this load requirement. SCR has been included within the design as a precautionary measure to maintain emissions at the 2g TA-Luft standard.	The generators procured for the site meet the 2g-TA Luft standard at 75% load; the inclusion of SCR provides an additional layer of protection in achieving emission requirements for emergency generator operation. Additionally, the air quality assessment has concluded that the proposed engines will not have a significant impact on NO_2 concentrations at the nearest residential receptor.
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.	The local air quality modelling completed for the site demonstrates that the proposed generators would not have a significant impact on annual mean NO_2 concentrations at the closest residential receptors. Based upon the proposed testing regime, there would be a <1% probability of exceeding the 1-hour mean objective at the nearest commercial or residential receptors to the site. The allowable operating hours for a 1% probability of exceeding the objective would be 276 hours. If the LHR21 generators were to operate for 324 hours the probability of exceedance would be 5% indicating that exceedances are unlikely provided the lifetime of the generators is less than 20 years.	Emissions from the site are not considered to have a significant impact on short term local air quality at residential and ecological receptors, based on the planned maintenance related emissions from the Installation.
Retrofit abatement techniques for existing installations for engine emissions such as	N/A	N/A

Requirement	Installation Arrangements	Conclusion
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.		
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 for the Installation has been designed to meet the manufacturers recommendation and ensure that the generator provision is operational. This testing regime was considered in the air quality modelling, which determined that there is no negative impact to local air quality.	The testing regime for the Installation will not negatively impact local air quality.
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.	The data from the certified technical standard provided by the manufacturer of the generators has been used in the air quality modelling to provide a conservative assessment of impact.	The data from the certified technical standard provided by the manufacturer of the generators has been used in the air quality modelling.
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)	Since the site is a new site with all tanks and other infrastructure being installed in line with current standards and guidelines, it is considered that the risk from the fuel storage tanks and associated pipework is very low. It is therefore not proposed to carry out regular groundwater monitoring.	The condition of the site is based on available information and no further investigations are proposed. The Operator will adapt a risk-based approach to any future monitoring of soil and groundwater conditions.

Requirement	Installation Arrangements	Conclusion
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).	VDC, however, intends to adopt a risk-based approach to 5-yearly monitoring.	
10-yearly soil sampling under IED is normally not needed but still needs some justification.	The Operator does not intend to undertake 10-yearly soil sampling; however, a risk-based approach will be applied at that time taking into consideration the operations undertaken at the site, the management techniques implemented, records of accidents and incidents relating to losses of containment of relevant hazardous substances and associated corrective action reports. Given current controls proposed (e.g. primary, secondary and tertiary containment, impermeable hardstanding across operational areas of the site, management controls for handling hazardous substances) there is a reduced risk of the soil at the site being impacted.	Current control measures are suitable to prevent impacts to soil at the Installation. However, a risk-based approach will be taken in year ten of operations, considering the performance of the site over the preceding ten years to determine if an intrusive soil investigation is necessary.
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).	The power supply to the site is protected by an uninterruptable power supply (UPS), capable of meeting the full load capacity of the site for approximately 10 minutes. The generators are automatically triggered to start once the power supply has been interrupted, providing power within 20 seconds of the failure of the National Grid supply, at which point the UPS would revert to standby. The use of the generators to provide electrical power to the site is considered to be	The likelihood of the Installation needing to operate for prolonged periods in an emergency mode is considered highly unlikely.

Requirement	Installation Arrangements	Conclusion
	unlikely, on the basis that the site is supplied with electricity via two diverse routes and associated infrastructure (e.g. transformers) providing a 2N level of resilience, where N is the power demand of the installation. The likelihood of long periods of reliance on the generators to provide power to the site is considered to be highly unlikely given that the National Grid Electricity Transmission System, which serves the site, achieved an overall reliability of supply of 99.999981% over the period 2022 - 23[10].	
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 20 seconds of failure.	Use of battery storage as back-up minimises the emergency operation of the generators.
Reporting of standby engine operational run hours and discussion of any electrical outages (planned or grid failures regardless of duration) required annually.	The Operator propose to record and report on operational run hours of all generators and electrical outages on an annual basis.	The Operator will monitor and report operational run hours in accordance with the Environment Agency's Requirements.
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 other assessed short-term interval from modelling) is	The air quality model does not indicate that the operation of the Installation will have a significant impact on local air quality therefore the notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary.	The notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary.

[10] National Electricity Transmission System Performance Report 2022-23, NationalGridESO, published 28th September 2022, available at https://www.nationalgrideso.com/industry-information/industry-data-and-reports/system-performance-reports accessed on 22nd October 2023

Requirement	Installation Arrangements	Conclusion
likely required under a permit schedule 5 notification.		
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 18 hours with 5 or more engines operating together is required' (i.e. model shows 4 or less engines unlikely to breach LAQ).	The notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary, on the basis that the local air quality model indicates that the operation of the installation will have no significant impact on local air quality.	The notification to the EA of unplanned and pre-notification of planned continuous grid outages is not considered to be necessary.
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 AQ outage 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). An AQ outage action plan is also likely required for sites which might operate in conjunction with other neighbouring large sites during an outage i.e. data centre hubs.	The air quality modelling, which takes into consideration emergency outage operating scenarios indicates that there is an insignificant risk to local air quality and identified receptors from the operation of the combustion plant. As such an air quality outage action plan is not considered necessary.	Based on the results of the air quality modelling an air quality outage action plan is not required.
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	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.

Requirement	Installation Arrangements	Conclusion
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.		
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 2.3 of this report it is anticipated that approximately 294 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.
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'.	VDC has not applied for the EA 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.

Appendix 1
Figures

Appendix 2
Generator Specification

Appendix 3
Air Quality Assessment

Appendix 4
Noise Assessment

Appendix 5
List of Company Directors

Company Name - VDC LHR21 Limited
Company number - OE003138
Company Registration number – 133321
Registered on - 4 November 2022
Incorporated in – Jersey
Date of incorporation (in Jersey) - 29 December 2020

Full name	Date of Birth	Title	Date of Appointment
Darren Stewart Culbard	[redacted]	Director	July 01, 2022
Justin Marcus Jenkins	[redacted]	Director	Dec 29, 2020
Nicholas John Haslehurst	[redacted]	Director	May 18, 2021

Appendix 6
Application Checklist

Question reference	Document title	Document reference
Part A, Q5c	List of Company Directors	List of Company Directors
Part B2, Q3d	Management System	Section 2.5, Operations Report
Part B2, Q5a	Site Plan	Figure 2, Appendix 1, Operations Report
Part B2, Q5b	Site Condition Report	North Acton Road, Site Condition Report
Part B2, Q5c	Non Technical Summary	Non Technical Report, Operations Report
Part B2, Q6	Environmental Risk Assessment	North Acton Road, Environmental Risk Assessment
Part B3, Q2	Emissions to Air, Water, Sewer and Land	Section 5.1, 5.4- 5.7, Operations Report
Part B3, Q3a	Technical Standards	Section 2.2.2, Operations Report
Part B3, Q3c, Q6d	Raw Materials	Section 3.1, 3.2, Operations Report
Part B3, Q4a, Appendix 1 - Q10	Monitoring	Section 6, Operations Report
Part B3, 6a, Appendix 1 - Q11,12	Energy Efficiency Measures	Section 4.2, Operations Report
Part B3, Q6b	Energy Consumption	Section 4.1, Operations Report
Part B3, Q6e	Waste	Section 3.3, Operations Report
Part B3, Q7a	List of Combustion Plant	Table 1, Operations Report
Part B3, Appendix 1 - Q11	Cost Benefit Assessment	Section 5.2, Operations Report