

Permitting Decisions- Bespoke Permit

We have decided to grant the permit for Virtus Data Centres Stockley Park, data halls London 5 and London 6, operated by Virtus HoldCo Limited.

We have decided to refuse part of the permit application relating to data halls London 7 and London 8, operated by Virtus HoldCo Limited.

The permit number is EPR/AP3903PD.

The application is for a data centre which consists of a Schedule 1 Part A(1) 1.1(a) activity under the Environmental Permitting Regulations (EPR) for the burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts (MW).

Virtus HoldCo Limited are permitted to operate two data halls London 5 and London 6, with an aggregated total combustion capacity on-site of approximately 223.43 MWth from 36 emergency standby generators comprised of:

London 5: 21 emergency standby generators each at 6.286MWth with an aggregate total thermal input of 132.00MWth.

London 6: 15 emergency standby generators consisting of 10 x 5.714MWth and 5 x 6.857MWth with an aggregate total thermal input of 91.43MWth.

The two buildings are a single data centre campus under the same operational management system and structure.

Following a detailed technical review of the information submitted in support of the application we have decided to refuse part of the application relating to the operation of two additional data halls known as London 7 and London 8. This is discussed within the decision document. London 7 comprises 24 engines with a design capacity of 132MWth and London 8 comprises 14 engines with a design capacity of 88MWth.

We consider in reaching our decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision-making process. It:

- highlights key issues in the determination including reasons for refusal of part of the application
- summarises the decision making process in the decision considerations section to show how the main relevant factors have been taken into account
- shows how we have considered the consultation responses (Annex 1)

Unless the decision document specifies otherwise we have accepted the Applicant's proposals.

For London 5 and London 6, read the permitting decisions in conjunction with the environmental permit.

Key issues of the decision

1. Background to this application

Virtus Data Centres Stockley Park Campus is located at National Grid Reference TQ 07304 80166 on the outskirts of west London approximately 3km to the north of Heathrow Airport in the London Borough of Hillingdon. The installation is bounded by Horton Road and Stockley Park Golf Course to the north, Ironbridge Road North and Stockley Business Park to the east, the Grand Union Canal and Mainline railway to the south and the Horton Industrial Area to the west. The installation is within Hillingdon Air Quality Management Area (AQMA), designated for the pollutant nitrogen dioxide in 2003¹.

Data centres are buildings and associated infrastructure providing security and reliability in storing digital data on servers. The data centre at Stockley Park Campus is connected to the local electricity transmission network via three grid connections. Given the need for uninterruptable power supply, diesel powered generators are used as standby plant.

Informal discussions were held between the Applicant and the Environment Agency in July 2018 and January 2019 to outline the EA's approach to permitting datacentres and to understand Virtus' operations and obligations in relation to the EPR. Subsequently the Applicant applied for our basic pre-application service and received advice from us on 30/01/19. The Applicant was provided with advice about the application fee, application forms, supporting documents and assessments required. As part of our response the Applicant was sent the 'Data

¹ London Borough of Hillingdon Air Quality Annual Status Report, 2018 (July 2019)

Centre FAQ – DRAFT version 10.0, 01/06/18'; a document that summarises our approach to permitting and regulating data centres. Although the Data Centre FAQ document is not presently an official release, it forms the basis for a common methodology for the permitting of data centres.

On 03/03/20 the Applicant submitted an application for a Schedule 1, Section 1.1 A(1)(a) activity under the Environmental Permitting Regulations for the burning of any fuel in an appliance with a rated thermal input of 50 or more megawatts (MW).

The original application proposed up to 72 diesel fired standby generators across four separate buildings. The four buildings house individual data halls referred to as London 5, London 6, London 7 and London 8. All buildings are designed to operate independently but be grouped together as a single data centre campus under the same management system and management structure. The purpose of the generators is to provide power to the site in the event of an emergency situation such as failure of the electricity transmission network.

At this point, we were not aware the applicant was already operating some of the data halls illegally without a permit.

Following a detailed technical review of the information submitted in support of the application, which included a change to the engine models, we are not satisfied that we can permit the operation of two of the proposed data halls; London 7 and London 8. These are therefore refused. We can accept and permit data halls London 5 and London 6. The reasons for refusal of London 7 and London 8 and key issues on the determination of London 5 and London 6 are discussed in this decision document.

2. The legal framework

We permit the emergency standby combustion plant serving data centres within the context of the Industrial Emissions Directive (IED) and Section 1.1 A(1) (a) of the EPR as a combustion activity aggregated to >50MWth input (as defined by the IED Chapter II).

There is not a best available technique (BAT) conclusion document or BAT reference document (BREF note) that covers the scope of the combustion activities carried out at data centres.

Article 14(6) of the IED requires that, where an activity or a type of production process carried out within an installation is not covered by any of the existing BAT conclusions or where those conclusions do not address all the potential environmental effects of the activity or process, the Environment Agency, as the Competent Authority, shall, after prior consultations with the Operator, set the permit conditions on the basis of the best available techniques that it has determined for the activities or processes concerned. Special consideration shall be given to the criteria listed in Annex III of the IED as follows:

- i. The use of low-waste technology.
- ii. The use of less hazardous substances.
- iii. The furthering of recovery and recycling of substances generated and used in the process and of waste, where appropriate.
- iv. Comparable processes, facilities or methods of operation which have been tried with success on an industrial scale.
- v. Technological advances and changes in scientific knowledge and understanding.
- vi. The nature, effects and volume of the emissions concerned.
- vii. The commissioning dates for new or existing installations.
- viii. The length of time needed to introduce the best available technique.
- ix. The consumption and nature of raw materials (including water) used in the process and energy efficiency.
- x. The need to prevent or reduce to a minimum the overall impact of the emissions on the environment and the risks to it.
- xi. The need to prevent accidents and to minimise the consequences for the environment.
- xii. Information published by public international organisations.

3. Best Available Techniques for engine choice

In determining BAT under Article 14(6) of the IED we must consider in particular minimising the duration and potential impact of peak NO_x emissions to air and the subsequent harm to human health.

The Environment Agency's 'Data Centre FAQ', draft version 10.0 summarises our approach to the permitting and regulation of data centres. This document has been developed by the Environment Agency as a draft non-statutory guidance following the principles set out in IED Article 14(6).

We must have regard to Article 18 of IED that states where an environmental quality standard (EQS) requires stricter conditions than those achievable by the use of the best available techniques, additional measures shall be included in the permit, without prejudice to other measures which may be taken to comply with EQSs.

The most relevant EQS to be considered for data centres is that for short term NO_x. Data centre engines typically operate less than 500 hours per year so are

exempt from mandatory emission limit values (ELVs) for medium combustion plant (EPR, Schedule 25A, Part 2 paragraphs 7(1) & 8(1)) therefore we look to permit conditions to achieve compliance with Article 18 of the IED. It should be noted that it is however, within the Environment Agency's remit to impose an ELV following our assessment of the application.

Application of BAT is the main basis for setting permit conditions however this must also satisfy Article 18 of the IED which states that where compliance with an EQS requires stricter ELVs than those achievable under BAT, the regulator must impose those stricter limits. Under Article 14(2) of the IED the stricter ELVs may be supplemented or replaced by equivalent parameters or technical measures. In meeting this requirements there is no consideration of cost and benefit.

Where relevant we should refer to existing regulations. In this case, each individual engine is an MCP so the Medium Combustion Plant Directive (MCPD) referenced in Schedule 25A of EPR applies.

BAT for existing data centre engines is based primarily around management techniques intended to minimise NO_x emissions; both peak and duration. BAT for new engines includes utilising the best available diesel engine technology for minimising NO_x emissions. This should be emissions optimised rather than efficiency optimised, which is broadly represented by the international build standards 2g TA-Luft or the United States Environmental Protection Agency (US EPA) Tier 2. Emissions from engines in Germany are controlled by the Technische Anleitung zur Reinhaltung der Luft, in short referred to as TA Luft.

'2000mg/m³' or '2g/m³' is the referred to short hand term for emission optimised engines quoted under the TA-Luft standard. The US EPA tier 2 standard expresses engines using a mass rate per kWh of power generated. Lower emissions are achieved through combustion controls, engine design and installation configurations so for any given engine arrangement (with reasonable tolerances around terms and definitions) an engine meeting '2g' also meets 'EPA Tier 2' and are indeed typically quoted together.

In considering how to implement BAT for data centres we must consider how they operate.

Routine testing is carried out to ensure they are available in the event of an emergency. In our Data Centre FAQ document there are a number of operating practices detailed such as limiting test hours and avoiding testing all engines together. Each engine is limited to less than 50 hours testing per year (EPR, Schedule 25B, paragraph 2(2)(c)).

Emergency operation is the primary purpose of data centre engines and is when the EQS is most likely to be at risk of being breached as a large number of engines will operate at one time. Data centres themselves have on-site fuel storage for typically 48 to 72 hours of engine running time, but with priority

contracts for refuelling so could theoretically operate for any outage duration. The Environment Agency has taken the view that a suitable worst case scenario for an outage is a period of up to 72 hrs. The mains supply grid and the data centres' typically dual-feed connections are considered to be reliable such that the likelihood of an outage happening and for this long is remote. However we must consider the impact of a 72 hour outage on air quality in the permit in order to allow such emergency operation.

We have considered limiting either the operating hours for data centres, or the number of permitted engines to a maximum based on their modelled air quality impact during an emergency. However for some large data centres, in particular those in AQMAs, this may result in hours of operation being limited to significantly less than 72 hours. Such a restriction would not be viable for the sector and their customers in providing integrity of servers and data. Given the likely occurrence and frequency of such an emergency is low we don't consider it appropriate to limit emergency operating hours provided BAT is implemented. In addition to minimising emissions through fitting emissions optimised engines, BAT for emergency operation require the Operator to develop a site specific Air Quality Management Plan (AQMP) to minimise and manage any impact of prolonged peak NO_x emissions.

Diesel engines technologies have improved over the years in terms of efficiencies and emissions, driven extensively by the demands made on the motor sector to develop improvements. Standby engines can be expected to have low run-hours and be installed for 25 years or more without the need for replacement. Because of the low usage for planned testing hours in a year of typically 10-12 hours per generator per year, fuel efficiency is not a significant driver for BAT. Based on our experience of permitting 'existing MCP' standby engines, NO_x emissions range in concentration for new plant from about 2000mg/m³ (at 5% O₂ reference) up to 5000mg/m³ (at 5% O₂ reference).

Generally on a typical load a '4g' engine (corresponding to 4000mg/m³ NO_x emissions at 5% O₂ reference) produces twice the mass emission of NO_x per hour compared to a '2g' engine (corresponding to 2000mg/m³ NO_x emissions at 5% O₂ reference). This heightens NO_x peaks both in reaching the Air Quality Standard (AQS) but also the degree to which such a value is exceeded. It extends the area and distance around a data centre where concentrations could adversely impact human receptors, and hence increase the likelihood of breaches of the short term AQS.

Rather than setting an ELV, we instead accept that installation of a '2g' engine is an equivalent technical measure under article 14(2) of the IED. We consider whether the manufacturer's data as the input to the impact assessment and air quality model, is acceptable.

The US EPA have published Acute Exposure Guideline Levels (AEGLs) for air borne chemicals, specifically nitrogen dioxide (NO₂) and nitrous oxide (NO).

AEGLs are expressed as specific concentrations of airborne chemicals at which health effects may occur. AEGLs are calculated for five relatively short exposure periods (10 minutes, 30 minutes, 1 hour, 4 hours, 8 hours) and are different to other air standards which are based on longer or repeated exposure. AEGL levels are dictated by the severity of the toxic effects caused by the exposure with level 1 being the least severe and level 3 being the most severe. Levels are expressed as parts per million (ppm) or milligrams per cubic meter (mg/m³) of a substance above which it is predicted that the general population could experience effects.

AEGLs provide an indication of health impacts of NO₂ for short term high concentration exposure; something that the current short term NO₂ AQS does not address. Although these AEGLs are not recognised standards in the UK, they offer a suitable benchmark of potential harm from acute exposure to NO₂. Short term NO₂ peaks are a key concern in relation to emissions from data centres during emergency operation. As such we use AEGLs to identify the potential for harm to human health.

Environmental equivalence to 2g

The Environment Agency considers BAT to consist of engines that are '2g TA-Luft' or 'EPA Tier 2' (or any international equivalent) standards as set out in our Data Centre FAQ document. Although this is an apparent limit on the engine specification, if a particular data centre configuration requires engines not at these standards then we would accept demonstration of equivalence. This equivalence could be demonstrated through reducing the air quality impacts to local receptors during a power outage with additional abatement technologies such as Selective Catalytic Reduction (SCR) or other manufacturer specific technologies. We would also assess proposals for novel generator designs such as significantly tall combined stacks, reducing testing, limiting run times or mixed diesel and gas-engine based designs.

Availability of '2g' engines

We are aware of four established manufacturers providing '2g TA-LUFT', EPA Tier 2 plant or plant with low emissions.

Article 14(6) of the Directive requires the regulator, after prior consultations with the Operator, to set ELVs (and other permit conditions) on the basis of its own determination of BAT which has to give special consideration to the criteria listed in Annex III of the Industrial Emissions Directive. As set out in section 1 we have engaged with the Applicant on our permitting requirements for data centres. We sent a copy of the draft permit to the Applicant on 11/10/2021 with two weeks to provide any comments or questions.

Engagement with industry

'TechUK' are the trade body representing the UK's data centre sector. We typically use such trade bodies to engage with the wider sector. We began meeting with data centre operators in 2015/16 and met with TechUK on 06/05/16 and subsequently at least annually.

We used the draft Data Centre FAQ document as the basis for facilitating discussion with operators about BAT. The first version we shared with TechUK was in July 2017 included setting the requirement of '2g' for new build data centres. As outlined in section 1 of this decision document, we also conducted pre-application meetings from 2018 in which the operator was informed of our position.

Through the draft Data Centre FAQ document and meetings with TechUK we communicated our sector specific position of new build data centre diesel back up engines being required to meet the 2g build standard for NO_x emissions.

4. Applicant's proposal for engines' specification

Upon application the design for all engines was stated in table 4-2 of the main supporting document 'Environmental Permit Application – Stockley Park DCs LON5 to LON8' (Ref: 70051165/LON5-8/001, dated February 2020) as being 71 Caterpillar 3516C engines, which at 100% output have a NO_x emission of 2,575.8mg/m³ (at 5% oxygen reference condition). This is noted to be 28.8% higher than the emissions of NO_x reported in the referred 'draft Data Centre FAQ' for engines that meet the 2g TA-Luft standard or other equivalent standard that we consider BAT for new data centres. The application supporting document states that engine variant Caterpillar 3516B meets the 2g TA-Luft standard but we see no evidence that supports this. As shown in table 1 below, NO_x emissions are higher from the Caterpillar 3516B engine variant than for Caterpillar 3516C engine variant.

The Air Quality modelling was undertaken on the assumption that all engines are Caterpillar 3516C model. In our second Schedule 5 notice issued on 17/12/20 we sought clarification about the engine specifications across all four data halls and how they compared against the BAT NO_x emission levels set out in the 'draft Data Centre FAQ'.

In the Applicant's response on 15/02/21 they provided a revised engine configuration, including changes to the number of engines, engine model and associated NO_x emission based on the data sheets provided. This revised information is shown in table 1 below.

Table 1 Revised engine configuration

Hall reference	Number of engines	Engine Model	NO _x mg/m ³ (note 1)
London 5	21	Caterpillar 3516 C	2,575.8
London 6	10	Caterpillar 3516 B	2,923.5
	5	Caterpillar 3516 E	3,581.7
London 7	24	Caterpillar 3516 C	2,575.8
London 8	14	Caterpillar 3516 E	3,581.7
Note 1 Reference conditions dry air at a temperature of 273K, at a pressure of 101.3 kPa and 5% O ₂			

The specification of engines is different to that listed in the original application received on 03/03/20. The proposed engines in London 5, 7 and 8, and five of the engines in London 6, do not meet the BAT criteria and emission levels described at the start of section 3 which we consider to be BAT for new standby generators installed in data centres. The deviation in emission levels from the BAT benchmark NO_x emissions ranges between 28.9% in excess (for the proposed engines with the lowest NO_x emissions, i.e. Caterpillar 3516 C model) and 79% in excess (for the proposed engines with the highest NO_x emissions, i.e. Caterpillar 3516 E model).

The air quality assessment submitted with the application models emissions as being from only Caterpillar 3516C engines, which is the least polluting of all proposed engines. Therefore the assessment does not represent worst case.

We sent a request for further information on 03/03/21 seeking clarification on the stage of development each data hall was at. A response was received on 17/03/21 outlining that:

- London 5 engines were already fully installed and commissioned;
- London 6 engines were fully installed and 10 of the 15 engines had already been commissioned;
- London 7 engines were not installed yet and their installation was planned by end of 2021;
- London 8 engines had not been ordered yet. Their installation was planned in two tranches in 2022.

The Applicant is operating London 5 and London 6 illegally, without a permit. The engines should not have been commissioned until an environmental permit was issued.

5. Refusal of data halls London 7 and London 8

The Environmental Permitting Core Guidance² provides information about the timing of applications for submission (paragraphs 5.9 and 5.10). An operator may begin construction of their site before an environmental permit has been issued, however, the operator risks the regulator not agreeing with the design and infrastructure put in place. Therefore, it is in the operator's interest to submit applications at the design stage. Any investment or construction work carried out by the operator before it has an environmental permit is undertaken at its own risk.

The Applicant is operating London 5 and London 6 illegally, without a permit. The engines should not have been commissioned until an environmental permit was issued. We consider that, notwithstanding this is a situation entirely of the Applicant's own making, it would not be practicable to require the Operator at this stage to replace or upgrade all plant installed within London 5 and London 6 data halls to BAT standards. However, it is not appropriate to take the same approach for London 7 and London 8 which are not at such an advanced stage. Further information on our decision regarding London 5 and London 6 is set out in section 6 below.

Based on the information provided in the application and in the additional information received on 17/03/21, data halls London 7 and London 8 are not yet installed and operational. London 7 comprises 24 engines with a design capacity of 132MWth and London 8 comprises 14 engines with a design capacity of 88MWth. These two data halls are not permitted to operate until a permit is in place and they are not permitted under this permit.

We cannot include London 7 and London 8 in the permit knowing that the Operator is not prepared to meet the requirements set out in our FAQ document. As a result of the above issues we have therefore decided to refuse the part of the application relating to the operation of two additional data halls known as London 7 and London 8.

We engaged with the Applicant on a number of occasions by email and telephone (including video conferencing) to discuss the issue of the engines not being BAT. On 09/06/21 we sent a Request for Further Information to the Applicant explaining that we were willing to consider alternative options for

² Environmental permitting: Core guidance, For the Environmental Permitting (England and Wales) Regulations 2016 (SI2016 No 1154)
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/935917/environmental-permitting-core-guidance.pdf

achieving environmental equivalence. We agreed two extensions to the response period for their response, giving more than five weeks in total. The Applicant didn't submit a proposal for us to consider. Instead the Applicant provided justification for not meeting the required BAT standard.

The Applicant's justification for the deviation from the 2g TA-Luft standard includes the following arguments:

- a) The Applicant does not think the 2g TA-Luft standard represents BAT on the basis of the Environment Agency draft Data Centre FAQ document due to the lack of full stakeholder engagement, DEFRA oversight, sector economic and environmental risk assessment and transparency of the process by which the standards have been derived.

As the Competent Authority, the Environment Agency is required by the IED to determine best available techniques for activities that are not covered by BAT conclusions or BREF notes and to set permit conditions accordingly. This document has been used as the basis for discussion of a common methodology and liaison with individual operators and their industry association. The Environment Agency considers that the process followed to determine BAT for the specification of standby emergency engines operating in regulated combustion plants supporting electronic data centres is consistent with the requirements of IED Article 14(6) and Annex III as detailed in section 2 of this decision document. In particular we have given special consideration to the criteria in Annex III as follows:

- **The nature, effects and volume of the emissions concerned, comparable processes, facilities or methods of operation which have been tried with success on an industrial scale and technological advances and changes in scientific knowledge and understanding:**

We have taken into account the emission levels achievable with the available primary and secondary combustion techniques for the control of NO_x emissions from combustion of diesel fuel in engines. We have set out the BAT expectation for emergency standby diesel engines at around 2000 mg/m³ (at 5% reference oxygen), because this is the lowest emission level normally achievable without secondary abatement techniques, such as selective catalytic reduction. Similar combustion plant would be subject to the emission limits specified in the Medium Combustion Plant Directive, if they were to be operated for longer than 500 hours per year. Compliance with MCPD emission limits may only be achieved by implementing secondary abatement techniques such as selective reduction. By setting BAT emission levels for emergency standby diesel engines, that are achievable with primary combustion techniques only, as opposed to secondary abatement techniques, we have taken into account the typically limited hours of this operation.

- **The commissioning dates for new or existing installations and the length of time needed to introduce the best available technique:**

We have taken into account these criteria by setting an expectation that only new plant should comply 2g TA-Luft or Tier II US EPA, or other equivalent standard, from the onset of permitting. Since 2018 we have retrospectively permitted a number of legacy data centre emergency standby combustion plant that were not previously permitted. We accept that legacy plant may have worse emissions than the TA-Luft 2g (or equivalent standard) because sourced outside a regulatory regime, however we may also specify improvement conditions requiring legacy plant to be improved to reduce the impacts of the engines operations.

- **The need to prevent or reduce to a minimum the overall impact of the emissions on the environment and the risks to it and the need to prevent accidents and to minimise the consequences for the environment:**

We have taken into account the typical impacts of emergency standby power plants. 500 hours is an emergency mode of operation for gas turbines and gas engines included in the Industrial Emissions Directive (IED) under 1.1A combustion Chapter III Annex V. It defines the operational hours above which the Annex V emissions limit values need to apply. There are many practical reasons for this 500 hours threshold: the difficulty in predicting operations; measuring and monitoring emissions for short durations; effectiveness of abatement systems; difficulty in defining stable emissions based on load interval; and the allowance to switch to an alternate fuel in an emergency.

We consider that generation plant at a data centre used solely for back-up and emergency standby for potential grid outages (and on-site power failures) constitutes an emergency 500 hour plant under EPR, IED and MCPD. This allows us to evaluate the likely air quality impacts of needing to improbably operate a data centre in an emergency.

Air quality modelling for data centres looks primarily for any local air quality exceedances of ambient hourly averages, specifically 18 breaches within a 12 month period. Large numbers of diesel generators operating in unison, or operated without appropriate measures in place, are likely to cause breaches to the Air Quality Standard Regulations 2010

(see <http://www.legislation.gov.uk/ukxi/2000/928/contents/made>) implementing EU limit values in ambient air.

- **Information published by public international organisations:**

We have referred to standards set out by international organisations in our 'Data Centre FAQ' document. This was developed by the Environment

Agency in consultation with TechUK, the trade association representing data centre operators in the UK, of which the applicant is a member (source: <https://www.techuk.org/who-we-are/member-company-directory/techuk-member-list.html#list-v>, last access 26/08/2021).

We consider that the consultation carried out with the trade association fulfils the requirements of IED Article 14(6) to determine BAT for production processes carried out within a regulated installation which are not covered by BAT conclusions.

We further consulted with the applicant during the permit determination process and provided the opportunity to propose a deviation from what we consider BAT standard for new engines, as long as they were able to propose alternative measure ensuring an equivalent or better level of environmental protection.

None of the issues raised by the Applicant engage with the definition of BAT. Engines which meet the standard are available and used within the sector and the standard is clearly better than that proposed by the Applicant.

- b) The Applicant does not think the 2g standard has been suitably defined.

We are satisfied that the standards set out in the Draft Data Centre FAQ are clear and provide enough information to enable an applicant to achieve compliance. We do not intend to mandate numerical standards, but we require the proposed engines to perform to similar emission performance of engines meeting 2g TA-Luft or Tier II USEPA, that we consider BAT for this sector, based on NO_x emission levels. These two standards are examples of standards meeting what we consider the lowest possible NO_x emissions with primary control techniques only, namely a benchmark concentration of 2,000 mg/m³ (dry air at a temperature of 273K, at a pressure of 101.3 kPa and 5% O₂) for emissions of NO_x. Through the permit determination process, we made clear to the Applicant that we were willing to consider any different operating techniques ensuring equal or greater level of environmental protection or minor deviations from the benchmark NO_x concentration with alternative abatement options. The deviations in excess of 2000 mg/m³ NO_x for the engines within London 7 and London 8 are 28.9% and 79% respectively. We consider these to be well in excess and not acceptable.

- c) The Applicant questions whether the wider data centre industry have agreed to the 2g TA-Luft standard as being BAT for the sector. The Applicant state there is a limited supply of 2g TA-Luft standard engines with high costs and long lead times.

The Environment Agency holds evidence that proposals for new engines in new built data centres emergency standby combustion plants have conformed to 2g TA-Luft, Tier II USEPA standards or similar environmental performance.

We therefore consider the technology achieving these emission levels is available and accessible at the prevalent market conditions. The Applicant has not provided any documented evidence showing any attempt made by them to specify and procure engines conforming to 2g TA-Luft, Tier II USEPA standards or similar environmental performance. Nor have they evidenced that any attempt had been made and set aside.

Furthermore, the Applicant received advice through our formal pre-application service on 30/01/19. The advice included the Draft Data Centre FAQ document which clearly set out the Environment Agency's BAT expectations for new built data centres. We consider that, if the Applicant had taken into due consideration the advice received from the Environment Agency at the pre-application stage then, they would have been able to specify and procure conformant engines in time. Being a new bespoke permit application the Environment Agency would have been able to review a technical proposal prior to submission of the application to give consideration to site specific issues. The Applicant did not take into account the advice provided to them when developing the site, therefore any disproportionate costs arising are as a consequence of the Applicant's decision not to follow that advice.

- d) The Applicant ruled out demonstration of environmental equivalence for London 7 and London 8 through installation of Selective Catalytic Reduction (SCR) on 8 engines due to the high cost.

The Environment Agency rejects this argument put forward by the Applicant as any increased cost of compliance with what we consider to be BAT is the result of the decision made by them in the first instance not to specify, procure and install engines whose emissions were conformant with the widely circulated and agreed BAT benchmark emission levels advised by the Environment Agency. As above, the Applicant received pre-application advice from the Environment Agency on 30/01/19. The advice included the Draft Data Centre FAQ document which clearly set out the Environment Agency's BAT expectations for new built data centres.

Furthermore, we are not satisfied that the equivalence scenario considered by the Applicant has addressed all the available options to reduce and offset the emissions from the London 7 and London 8 data halls to achieve an equivalent level of environmental protection to that achieved by 2g TA-Luft or Tier II USEPA compliant engines. For example, assuming based on the information received in the Applicant's letter of 17/03/2021, that the development of London 7 data hall is at a more advanced stage than London 8 (which also entails the use of the most polluting engines), no evidence was provided by the Applicant as to whether they considered the option of amending the specification of engines within London 8 which were not yet ordered according to the response to further information request received on 17/03/21. We take the view that 2g compliant engines could have been

procured for London 8 and if SCR was required to offset emissions for London 7 the cost would have been less than SCR being required to offset emissions for London 7 and London 8.

The Applicant does not appear to have considered steps to make them compliant with the 2g TA-Luft, Tier II USEPA standards or other similar environmental performance from the outset.

- e) The Applicant thinks the Environment Agency should have considered a cost benefit analysis.

The Environment Agency considers that a cost benefit analysis is not an appropriate methodology for emergency standby plants, since Defra damage costs refer to long-term effects, and there is no cost benefit analysis methodology to look at the potential short-term damages caused by the operation of unabated standby plants. The cost benefit approach outlined in the 'Draft Data Centre FAQ' is in respect to the improvement of existing plant. This is in terms of the technical costs of alternative solutions versus achievable levels to reach as near to the new engine BAT as reasonable. The cost benefit analysis referred to in the 'Draft Data Centre FAQ' document was not intended to be applied to new plant and would not accord with the definition of BAT. It is more relevant to justifying why BAT is not appropriate for existing operational plant which London 7 & 8 are not.

We consider it not acceptable to deviate from BAT when the site is in an existing AQMA with known exceedances of NO_x.

In addition to the above five bullet points, our Environmental Permitting Core Guidance³, section 9 explains that complex regulated facilities should have an effective management systems that ensures a high level of environmental protection. We expect such a management system to include a commitment to continuous improvement of environmental performance. London 8 is the final data hall to be designed, yet the emissions from the proposed engines are expected to be higher than the emissions from engines selected for London 5 and London 7. No justification has been provided for selecting engines for London 8 that have higher emissions of NO_x than those previously sourced.

6. Retrospective permitting of data halls London 5 and London 6

Given the status of the site's development as provided by the Applicant on 17/03/21, London 5 and London 6 are being operated illegally without a permit.

³ Environmental permitting: Core guidance, For the Environmental Permitting (England and Wales) Regulations 2016 (SI2016 No 1154)
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/935917/environmental-permitting-core-guidance.pdf

We acknowledge that London 5 and London 6 don't meet the required BAT standard for emissions of NO_x that is applicable to new engines. We consider that it would not be practicable to require the Operator at this stage to replace or upgrade all plant installed within London 5 and London 6 data halls to BAT standards, notwithstanding this is a situation entirely of the Applicant's own making. We are therefore issuing a permit for London 5 and London 6 only. In taking this approach we are being extremely generous. Since we consider that London 5 and London 6 don't meet the required BAT standard, we have decided to set an improvement condition (IC6) requiring the operator to submit a plan to reduce the predicted short term NO_x emissions impacts during the maintenance, testing and emergency operations of the standby generators installed in these data halls.

However, it is not appropriate to take the same approach for London 7 and London 8 which are not at such an advanced stage. The Applicant is already benefitting from its own failure to comply with legislative requirements and guidance for two halls. In the interests of fair competition and treatment with other operators who have not acted so irresponsibly and in respect of plant that has not been installed we are not prepared to allow a reduction in environmental standards. Further detail on our decision to permit London 5 and London 6 is provided in section 7.

7. Key issues in permitting LON5 and LON6

7.1 Air quality

Background

The UK Air Quality Standards Regulations came into force in June 2010; they implement the EU Directive on ambient air quality.

The Air Quality (England) Regulations include air quality objectives that have different compliance target dates by which, in most cases, are numerically synonymous with the limit values. The air quality objectives are for specific use by local authorities in undertaking their local air quality management duties pursuant to Part IV of the Environment Act 1995.

The Environment Act 1995 requires the UK Government to produce a national 'Air quality Strategy' (AQS). The AQS establishes the UK framework for air quality improvements. Measures agreed at a national and international level are the foundations on which the strategy is based.

The air quality objectives in the AQS are a statement of policy intention or policy targets. As such, there is no legal requirement to meet those objectives except in as far as they mirror any equivalent legally binding limit values in EU Directives and English regulations.

The Environment Act 1995 requires that the EA has regard to the AQS in exercising its pollution control functions (Section 81 of the 1995 Act).

The EA has a number of duties related to air quality as follows:

- To ensure that industrial facilities it regulates comply with EU obligations on the UK such as Air Quality Limit Values;
- To ensure that the industrial facilities it regulates do not contribute significantly to breaches of AQS objectives; and
- To support local authorities in improving local air quality.

Under EPR it would not be appropriate for any industrial emission to be the sole cause of a breach of an EU air quality limit value. The EA is also committed to ensuring that BAT and appropriate measures are used to deliver the maximum improvements to air quality where UK exposure reduction objectives or EU air quality target values are being exceeded.

The EA investigates what improvements can be made if a facility it regulates is contributing significantly to the breach of a national objective, or is projected to do so, and will require an operator to carry out ad hoc monitoring of local air quality and to install permanent monitoring stations where necessary. Permit conditions and action plans are required for problem sites.

The installation is within Hillingdon Air Quality Management Area (AQMA), designated for the pollutant nitrogen dioxide in 2003⁴. Hillingdon has observed an overall trend towards improved air quality in the Borough. However, exceedances of the annual mean limit value for NO₂ still remain. The most recent Air Quality Annual Status Report sets that developers are encouraged to introduce clean design and mitigation measure to significantly reduce emissions and their impacts in this air quality sensitive area. Allowing more NO_x than is necessary to be released in this area goes against the purpose of the AQMA. We have a duty to consider this during our determination.

Impact on human receptors

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our Web Guide and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of emissions

⁴ London Borough of Hillingdon Air Quality Annual Status Report, 2018 (July 2019)

The methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The guidance provides a simple method of calculating PCs primarily for screening purposes and for estimating PCs where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the PCs calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology.

A methodology for risk assessment of point source emissions to air is set out in our guidance <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>.

Air dispersion modelling enables the PC to be predicted at any environmental receptor that might be impacted by the emissions from a plant. Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES).

PCs are considered insignificant if:

- the long-term process contribution is less than 1% of the relevant ES; and
- the short-term process contribution is less than 10% of the relevant ES.

The long term 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality; and
- the threshold provides a substantial safety margin to protect health and the environment.

The short term 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions; and
- the threshold provides a substantial safety margin to protect health and the environment.

Where an emission is screened out in this way, we would normally consider that the Applicant’s proposals for the prevention and control of the emission to be acceptable. However, where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedances of the relevant ES are likely. This is done through detailed audit and review of the Applicant's air dispersion modelling, taking background concentrations and modelling uncertainties into account.

Where the PC is greater than these thresholds, the assessment must continue to determine the impact by considering the predicted environmental concentration (PEC). The PEC is the combination of the PC substance to air and the background concentration of the substance which is already present in the environment.

The PECs can be considered 'not significant' if the assessment has shown that both the following apply:

- proposed emissions comply with BAT associated emission levels (BAT-AELs) or the equivalent requirements where there is no BAT-AEL; and
- the resulting PECs won't exceed 100% of the environmental standards.

The Applicant provided an assessment of the impact of emissions to air within the application which is detailed in Virtus Data Centre, Prologis Park, Stockley - Air Quality Assessment' (AQ1 dated January 2020).

The Applicant originally applied for a permit for four data halls referenced as London 5, London 6, London 7 and London 8. The design included 71 diesel fuelled engines of type 'Caterpillar 3516C' which at 100% output have a NO_x emission of 2,575.8mg/m³ (at 5% oxygen reference condition), which is noted to be higher than the emissions reported in the referred 'Draft Data Centre FAQ' for engines. We take the mass emission rate included in the engine specification associated with the concentration. However the Applicant's air quality assessment assessed emissions from 75 engines at this emission level, which was their worst case possible scenario in their planning permission.

The assessment comprises:

- Dispersion modelling of emissions to air from the operation of the installation.
- A study of the impact of emissions on nearby sensitive conservation sites.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the installation and its impact on local air quality. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS (Atmospheric Dispersion Modelling System) dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at Heathrow Airport which is 3.5km south of the installation between 2014 and 2018. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

The Applicant used the values from the London Borough of Hillingdon's diffusion tube monitoring sites as background concentrations. Information on these monitoring sites (HD204 and HD206) is available in the Council's latest 'Air Quality Annual Status Report'⁵ from 2019 as background concentrations.

The consultant has considered the following testing scenarios and emergency operation:

- Scenario 1, monthly testing: This scenario involves each generator being tested off load for 15 minutes per month for 11 months with an on load test undertaken for one engine at a time in 1 month, once a year. The on load test is each generator running for 20 mins 'ramp up time³' plus 2 hours of operational time
- Scenario 2, monthly testing with mains failure: this scenario assumes that in addition to the monthly testing schedule outlined in scenario 1, all generators will operate continuously for four hours once a year, in the event of a mains electrical power cut.

The Applicant conclusions are as follows.

Scenario 1:

- There would be no exceedances of the annual mean NO₂ and particulate matter air quality standard (AQS) for human receptors at locations where the objectives would apply, and the increase in concentrations was insignificant.
- Exceedances of the hourly mean NO₂ objective are unlikely in areas where members of the public will be present for an hour. At the specified human receptors the probability is less than 1% and therefore exceedances are unlikely.

Scenario 2:

- There would be no exceedances of the annual mean NO₂ and particulate matter AQS at locations where the objectives would apply, and the increase in concentrations was insignificant.
- Due to the short operating time of the mains failure (<4 hours) it will not exceed the short term objective, furthermore Ofgem data says that for the last three years there has been an average annual power outage of less than 50 minutes.

The results at the most impacted human receptor can be seen in table 2 below.

⁵ London Borough of Hillingdon Air Quality Annual Status Report, 2018 (July 2019)

Table 2 Maximum predicted impact of NO_x at human receptor (Busy Bees Nursery)

Pollutant	ES / EAL	Back-ground	Process Contribution (PC)	PC as % of ES	Predicted Environmental Concentration (PEC)	PEC as % ES
Scenario 1						
NO _x Annual (µg/m ³)	40	-	0.17	0.42	-	-
PM ₁₀ Annual (µg/m ³)	40	-	0.001	0.003		
Scenario 2						
NO _x Annual (µg/m ³)	40	-	0.27	0.7	-	-
PM ₁₀ Annual (µg/m ³)	40	-	0.002	0.004	-	-

We have reviewed the Applicant's original air quality assessment.

The Applicant has not provided an assessment of potential acute effects associated with the emissions of NO_x from the proposed operation. We made a comparison to the US EPA Acute Exposure Guideline Levels (AEGLs). Our review found that for emergency operation there is likely to be an exceedance of the NO₂ 10 minute AEGL-1 outside the site boundary at the Busy Bee Nursery and a bus stop located northwest of the site. There is likely to be an exceedance of the hourly NO ES outside of the site boundary at the Busy Bee Nursery during the emergency operation. The emissions are potentially significant during an emergency scenario when these exceedances could occur for the duration of the emergency. This has contributed to our decision to refuse London 7 and London 8 which we consider should have been designed to meet BAT.

As explained in section 4 above, on 15/02/21 the Applicant provided revised engine variant details which consisted of a change in number and type of engines from 75 Caterpillar 3516C, to a mixture of Caterpillar 3561C along with Caterpillar 3516B and Caterpillar 3516E which have higher emissions than type C. Due to these changes, PCs could be up to 21% higher for London 6 and London 8.

Given our decision to partially refuse the application, we did not ask the Applicant to re-do their air quality impact assessment. Instead, we assessed an increase of 21% for all four data halls as a conservative measure and the impact remains not significant. Overall this could result in 45% higher emissions compared to installing all engines as 2g at the outset. BAT is about preventing, and where that is not practicable minimising, emissions and the proposals do not achieve this as it is possible for emissions to be significantly lower than those proposed.

Based on a 21% increase in emissions there is likely to be a greater area of exceedance of the NO₂ AEGL-1 for emergency operations. However, despite PCs being higher the exceedances are predicted to occur at the same two human health receptor locations the Busy Bee Nursery and the bus stop. However, we have decided to refuse London 7 and London 8 for the reasons set

out in section 5, meaning, the PCs associated with the permitted operations will be lower as we are only permitting London 5 and London 6.

We are not satisfied with the emergency scenario covering only a 4 hour period. We typically require modelling of a 72 hour period on a more conservative basis. However, this is unlikely to change the conclusions of the assessment and we have decided to specify an improvement condition, IC1, requiring the Operator to update the model to cover 72 hours emergency operation in order to inform the Air Quality Management Plan (AQMP) required under IC2. Any residual risk associated with the emergency operation of London 5 and London 6 will need to be addressed in the AQMP.

Impact on Habitats sites, SSSIs and non-statutory conservation sites

We have checked the location of the application to assess if it is within the screening distances we consider relevant for impacts on nature conservation, landscape, heritage and protected species and habitat designations.

The following Habitats sites are located within 10km of the installation:

- South West London Waterbodies SPA (UK9012171)
- South West London Waterbodies Ramsar (UK11065)

There are no SSSIs located within 2km of the installation.

The following non-statutory local wildlife and conservation sites are located within 2km of the installation:

- Little Britain
- St George's Meadow's, Southlands Art Centre
- River Pinna and Manor Farm Pastures
- The Grove
- Stockley Park Country Park
- Stockley Road Rough
- Iron Bridge Road Railsides
- Stockley Business park Lakes & Meadows
- Bolingbroke Way Sunken Pasture
- London's Canals'
- Lower Colne
- Wall Garden Farm Sand heaps
- Carp Ponds and Broads Dock
- Lake Farm Country Park

The South West London Waterbodies SPA and Ramsar consists of multiple locations, the closest of which is approximately 6.3km south-south-west of the installation. It comprises a series of embanked water supply reservoirs and former gravel pits that support a range of man-made and semi-natural open-water habitats.

Many of the non-statutory sites also contain wetland features.

We have assessed the application and its potential to affect sites of nature conservation, landscape, heritage and protected species and habitat designations identified in the nature conservation screening report as part of the permitting process.

The original air dispersion modelling carried out by the Applicant assessed emissions from all four data halls.

Scenario 1:

The results are presented in table 1 below. At the two receptors positioned at the location of the Southwest London Waterbodies Ramsar and SPA, the PCs to annual mean NO_x concentrations are at most 0.006µg/m³ for each of the five years of meteorological data modelled, which is less than 1% of the AQS objective of 30µg/m³ and therefore insignificant.

The model runs undertaken to predict the 100th percentile of daily mean NO_x concentrations, assuming continuous operation of 8 generators positioned at indicative locations within the banks of generators, showed that the PCs at the Southwest London Waterbodies SPA and Ramsar was less than 7.5µg/m³ (10% of the objective) for each of the five years of meteorological data modelled. Therefore, the operation of the generators is insignificant at these sensitive ecological sites.

Scenario 2:

The results are presented in table 1 below. At the two receptors positioned at the location of the Southwest London Waterbodies Ramsar and SPA, the PCs to annual mean NO_x concentrations are at most 0.009µg/m³ for each of the five years of meteorological data modelled, which is lower than 1% of the AQS objective of 30µg/m³.

Based on the daily mean NO_x concentrations predicted for the monthly testing scenario, the less sensitive nature of the nearby ecological sites and the limited hours of operation of the generators during a mains failure event, it is considered unlikely that a mains failure event would result in a different conclusion to that reached for the daily mean NO_x concentrations predicted for the monthly testing scenario.

Nitrogen deposition:

To calculate the change in nitrogen deposition that the annual mean NO_x PC could result in, the Applicant undertook a conversion using our guidance 'AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment of emissions to air' (October 2011, Environment Agency). The Applicant concluded that the nitrogen deposition at the SPA and Ramsar was insignificant with PCs <1% of the critical load. We have reviewed the Applicant's assessment and agree with their conclusions. The Applicant's air quality assessment report gives a poor summary of the impact of nitrogen deposition on the SPA and Ramsar. No numerical data is presented specifically for the SPA and Ramsar. We have reviewed the Applicant's assessment and although we are unable to present the numerical data, we agree with the Applicant's findings.

Table 3 Maximum predicted impact of NO_x at South West London Waterbodies SPA and Ramsar

Pollutant	ES / EAL	Back-ground	Process Contribution (PC)	PC as % of ES	Predicted Environmental Concentration (PEC)	PEC as % ES
Scenario 1						
NO _x Annual (µg/m ³)	30	-	0.006	0.02	-	-
NO _x Daily Mean (µg/m ³)	75	-	<7.5	<10	-	-
Scenario 2						
NO _x Annual (µg/m ³)	30	-	0.009	0.03	-	-
NO _x Daily Mean (µg/m ³)	75	-	-	-	-	-

For our additional assessment of a 21% increase in emissions across all four data halls the conclusions presented above remained unchanged. Furthermore, we are only permitting two data halls, and not the four originally applied for. This is therefore highly conservative.

Our audit of the applicant's assessment showed that acid deposition is not required to be assessed at the site as it is not sensitive to acid deposition. The Air Pollution Information System (APIS) identifies acid deposition as having no expected negative impact on the features identified in this assessment or any expected impact on the species' broad habitat.

In conclusion, whilst we do not necessarily agree with the Applicant's precise numerical predictions, we agree with the overall conclusions for ecological receptors. Our review concludes that there will be no exceedances at non-

statutory sites and no likely significant effect at the SPA and Ramsar. Furthermore, we have only permitted London 5 and London 6 and refused London 7 and London 8 based on the reasons set out in section 5 of this permitting decision document.

We consider that the application will not affect any site of nature conservation, landscape and heritage, and/or protected species or habitats identified.

We have informed Natural England on the outcomes of our decisions and sent a copy of our assessment of the impact on 20/09/21 for information only.

The decision was taken in accordance with our guidance.

Improvement conditions relating to air quality

Due to the change in engine variant (see table 1 in section 4), we have set improvement condition IC1 requiring the Operator to carry out detailed air dispersion modelling of emissions from the generators in London 5 and London 6. This should be carried out at their loading rates while in testing and emergency operation modes for a 72 hour outage.

We are satisfied with the overall conclusions of the application air dispersion modelling assessment, but given the change in engine model, and location within an AQMA we want additional assurance that London 5 and London 6 are operating as expected. This modelling shall be used to produce a revised air quality modelling report to be submitted to the Environment Agency for approval. In the event that the report identifies any concerns about the impact on air quality the Operator will be required to consider further abatement of their emissions.

The results of the revised modelling and findings of the assessment shall be used to inform the Air Quality Management Plan required under improvement condition IC2. This should outline response measures to be taken in the event of a grid failure and is a standard improvement condition included for all data centre permits.

The Operator is also required, under improvement condition IC3, to submit a report confirming that the maintenance testing requirement of the generators in London 5 and London 6 are consistent with the maintenance testing schedule stated in the response to the second Schedule 5 received on 15/02/21.

7.2 Emissions to water, site drainage and containment

Each data hall has a yard which contains the generator arrays and gantries supporting the cooling plant. Integrated drainage channels convey surface water to the below ground drainage system which is gravity fed through a sediment sump/catch pit and alarmed interceptor before discharge via attenuation tanks to the central spine drain. The central spine drain runs north to south through the installation with final discharge to the Grand Union Canal. Spill kits are located in

areas where fuel oil is stored or delivered and there are standard operating procedures for fuel delivery.

In the second Schedule 5 Notice we requested an annual preventative maintenance, inspection and cleaning schedule for all surface water drainage structures. We also sought clarification about the procedures in the event of a large volume of diesel entering the site's surface water drainage system. The Applicant responded on 15/02/21 stating that procedures are in place to address potential local spills or overflow including alarm systems, supervised delivery and protection of 'at risk' drains during deliveries. In addition to an alarm system each of the site drainage systems is fitted with a penstock valve to isolate drains in the event of an incident. A spill procedure was attached to the second Schedule 5 response in chapter 6, section 6.7.3, but the finer detail is lacking. For example, type of penstock and method of operation. It states that the Operator will ensure such procedures are developed and built into the site management systems.

Although we are satisfied with the general principles of the drainage proposals we require detailed and definitive information, in one consolidated document in order to be satisfied that adequate systems are in place to prevent harm to the environment. We have therefore set an improvement condition IC4 requiring the submission of a written drainage management plan.

Diesel fuel is stored in aboveground tanks that sit below each of the 36 engines. London 5 has 21 tanks (each holding 28,000 litres) and London 6 has 15 tanks (5 holding 30,000 litres and 10 holding 28,000 litres). Each tank provides sufficient fuel capacity to run the generator for 48 hours at full load. The fuel tanks are internally banded (double skinned) steel tanks with leak detection alarms. Diesel oil is pumped from tankers to the storage tanks via double skinned pipes which include a leak detection system. We are satisfied that this type of diesel tank is BAT for data centres, but we require more information about the capacity of the tertiary containment system and the operational controls. This should be provided through completion of IC4.

7.3 Protection of Groundwater and Soil

The proposed installation lies on the outskirts of west London approximately 3km north of Heathrow Airport, in the London borough of Hillingdon. The site is bounded by Horton Road and Stockley Park Golf Course to the north, Ironbridge Road North and the rest of Stockley Business Park (Phases 1 and 2) to the east, the Grand Union Canal and Mainline railway to the south, and the Horton Industrial Area to the west.

The underlying solid geology is comprised of the Thames Group – clay, silt, sand and gravel. The bedrock is unproductive aquifer with a principal aquifer (Lynch Hill Gravel Member) overlaying the bedrock.

The Operator has submitted a Site Condition Report (SCR) which identifies a history of contaminative land uses, including a historic landfill, a scrap metal

works and a depot. The SCR identifies that 22 pollution incidents have occurred to controlled waters within 1km of the installation.

Previous site investigations in 2000 discovered hydrocarbon contamination in two different areas which were subsequently remediated. However it is noted that localised hotspots of hydrocarbons remained present on site.

The Applicant provided baseline data from August 2014 which included soil, leachate and groundwater monitoring data. With the exception of elevated ammonium in groundwater, most contaminant concentrations were relatively low. In the second Schedule 5 Notice sent on 17/12/20 we requested more information on subsequent site investigation or remedial works with respect to these high levels of ammonium.

The Applicant's response on 15/02/21 provided a further report which showed between August 2014 and October 2015 there was a general site-wide trend of decreasing ammonium concentrations within groundwater samples. This indicates that attenuation has occurred and is likely to continue further. We are satisfied that no further remedial works are required and that the newly supplied data should be used as a general baseline for ammonium on site. The Operator may want to collect soil and groundwater data during the operational phase.

The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.

The installation will operate an Environment Management System in line with the requirements of ISO 14001.

We are satisfied that appropriate management systems and management structures will be in place for this installation, subject to the completion of improvement conditions.

7.4 Noise

We have reviewed the Applicant's noise and vibration management plan and accompanying noise impact assessment report in accordance with our guidance on noise assessment and control. Noise is not a significant issue for data centres as sustained operation of the engines should be infrequent which limits the potential for impact.

The noise impact assessment report, which identified sensitive receptors, potential sources of noise from the installation and their noise attenuation measures.

Noise assessments for permit applications should be carried out to British Standard BS4142. BS4142 assesses the impact of industrial and commercial sound on residential receptors by subtracting the measured background from the rating level. BS4142 states: "A difference of +10 dB or more is likely to be an

indication of a significant adverse impact, depending on the context.” and “A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.”

The generators will only be tested during day time hours of 07:00 to 19:00, however as wind speeds were generally higher during the day, measurements outside of this time period have also been considered to avoid use of background sound levels artificially increased by leaves rustling. We are satisfied that these background sound levels represent a slightly conservative yet representative level.

The proposed generators are to be installed in the data hall buildings, using the buildings to provide as much acoustic screening as possible between the generators and receptors. The generators are also installed within acoustic enclosures based on a shipping container type structure that include attenuators on the air inlet, outlet and flue.

Whilst sound power level data are available from the manufacturer for each generator type, no data are supplied for the acoustic enclosure. Sound level measurements were therefore made on-site to derive sound power levels that can be used to model the propagation of sound from the enclosed units.

The Applicant concludes that the rating level would exceed the background level by 7 – 10dB if generators across all four data halls were operated at the same time. A difference of + 10dB or more is likely to be an indication of significant adverse impact.

The context of the operations needs to be taken into account. We are only permitting two of the four data halls. Furthermore the generators are only likely to be operational infrequently, less than 4% of the year for maintenance and national grid failure of both data halls London 5 and London 6. Maintenance is scheduled to be 1 hour for each unit per year and is likely to be during daytime hours. Grid failure is most likely due to overload during peak periods, which is normally daytime hours, or due to extreme weather conditions which are rare, difficult to predict and will change the soundscape significantly. Therefore, although the assessment indicates the potential for significant adverse noise impact, the probability of this occurring is likely to be very small because we are refusing London 7 and London 8 and consider the probability low and the impact acceptable.

A 4.5m noise barrier has been installed near the south boundary of the site comprising a close-boarded 15mm thick pine timber fence from ground to 2m height as well as a green wall from 2m to 4.5m formed of approximately 100mm thick soil-containment and plants. This will further attenuate noise.

The Applicant has provided a Noise Management Plan dated 24 September 2020 which sets out how BAT has been employed to reduce the noise impact. We are

satisfied that there will be no significant pollution/harm to human health from noise.

We have approved the noise and vibration management plan as we consider it to be appropriate measures based on information available to us at the current time. The Applicant should not take our approval of this plan to mean that the measures in the plan are considered to cover every circumstance throughout the life of the permit.

The Applicant should keep the plans under constant review and revise them annually or if necessary sooner if there have been complaints arising from operations on site or if circumstances change. This is in accordance with our guidance 'Control and monitor emissions for your environmental permit'.

7.5 Emission limits and monitoring requirements

The generators are only planned to operate for routine testing and maintenance, subject to the schedule required by improvement condition IC3. Based on this mode of operation, we have not set any emission limits.

The permit will include a maximum 500 hours per annum 'emergency/standby operational limit' for any or all the plant producing on-site power under the limits of the combustion activity. Therefore emission limit values (to air) and generator emissions monitoring are not required within the permit. This is set out in the MCPD, Article 6 (8). 'Emergency hours' operation includes those unplanned hours required to come off grid to make emergency repair of electrical infrastructure. The limit on the emergency use of 500 hours is for the installation as a whole, meaning that as soon as one generator starts operating the hours count towards the 500 hours.

In addition the permit allows each individual generator unit to be tested for maintenance. The BAT requirement is that individual generator testing is below 50 hours per year. This is in line with BAT and below the level at which ELVs would be needed. We expect the number of and duration of planned testing and generator operations to be minimised as much as possible. The planned testing operations of the generators shall be limited to the maximum testing hours as confirmed through improvement condition 3.

The Operator is required to monitor NO_x and CO every 1500 hours of operation or once every five years, whichever comes first in line with MCPD and web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021 (formerly known as TGN M5). We have set improvement condition IC5 which requires the Operator to submit a monitoring plan for approval detailing their proposal for the implementation of monitoring requirements specified in Table S3.1 of the permit. The purpose of the improvement condition is to agree a timeline for the installation of sampling ports

where these are not currently installed, and to take into account relevant safety, cost and operational constraints.

7.6 Reliability of site infrastructure and connection to the grid

The installation operates in one of two modes:

- Normal operation: operating from supplied utilities to power tenant equipment and service supporting equipment including chillers, air conditioning, building management systems and power management systems. This normal operation includes testing and maintenance of the standby generators.
- Emergency operation: operating from emergency standby generators in the event of a main-supply failure. The standby generators provide for both tenant equipment and service supporting equipment.

The incoming power system to the installation is designed such that only a major power interruption event would trigger the need for the generators to be used to support the data centre outside of maintenance activities.

The incoming power system to the site consists of three substations on-site, three separate cables from the Iver Heath sub-station in Buckinghamshire to the site, and three electrical feeder breakers at Iver. The system is designed such that in the event of any one of the three power feeds being accidentally or maliciously damaged, undergoing a fault, or being shut down for maintenance, the on-site power system could be realigned without needing to engage the back-up generator sets. The power originates from the Iver grid connection point owned and run by National Grid. There have been no outages at the Stockley or Virtus Slough campuses in the five years prior to this application.

The installation is installed to Uptime Institute Tier III standards, meaning that there is no interruption to the operation of the computer hardware during routine maintenance of power and cooling systems. The generators are only utilised as a back-up emergency provision hence the routine operation is for testing and maintenance only. Whilst the use of the engines may be infrequent and limited, air quality is an issue in this area and emissions should still be reduced.

8. Other Decision considerations

The following sections explain how we have considered other aspects of the determination not covered in key issues, in section 7.

Confidential information

A claim for commercial or industrial confidentiality has not been made.

Identifying confidential information

We have not identified information provided as part of the application that we consider to be confidential.

The decision was taken in accordance with our guidance on confidentiality.

Consultation

The consultation requirements were identified in accordance with the Environmental Permitting (England and Wales) Regulations (2016) and our public participation statement.

The comments and our responses are summarised in the consultation responses (Annex 1) section.

The application was publicised on the GOV.UK website.

We consulted the following organisations:

- Food Standards Agency
- Local Planning Authority (Hillingdon Council)
- Environmental Health (Hillingdon Council)
- National Grid (Cadent Gas, Plant Protection)
- Health and Safety Executive
- Director of Public Health (Hillingdon Council)
- Public Health England

The comments and our responses are summarised in the consultation responses section.

Operator

We are satisfied that the Applicant (now the Operator) is the person who will have control over the operation of the facility after the grant of the permit. The decision was taken in accordance with our guidance on legal operator for environmental permits.

The regulated facility

We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN2 'Defining the scope of the installation'.

The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.

The site

The Operator has provided plans which we consider to be satisfactory.

These show the extent of the site of the facility including the discharge points.

Given the refusal of data halls London 7 and London 8 the plan has been amended by the Environment Agency to include only data halls London 5 and London 6 within the installation boundary.

The plan is included in the permit.

Environmental risk

The Operator's risk assessment is unsatisfactory and required additional Environment Agency assessment.

See section 7.1 above for more information on how we assessed the Applicant's air quality modelling.

We assessed London 5, London 6, London 7 and London 8.

We were not satisfied the risk was not significant during emergency operations. Furthermore we were not satisfied that London 7 and London 8 meet BAT.

Hence we have decided to refuse London 7 and London 8. Therefore, the permitted operation will consist of approximately 50% less installed thermal input compared to the original application.

Applying the conservative criteria in our guidance on environmental risk assessment or similar methodology supplied by the Operator and reviewed by ourselves we are satisfied that the residual risk associated with the emissions from London 5 and London 6 is unlikely to be significant, when considering the operating envelope of the emergency generators, the reliability of the connection to the grid and the improvement conditions we have specified, including the requirement to develop an AQMP to manage and mitigate the risks associated with the emergency operations of the diesel generators.

Climate change adaptation

We have assessed the climate change adaptation risk assessment.

We consider the climate change adaptation risk assessment is satisfactory.

General operating techniques

We have reviewed the techniques used by the Operator and compared these with the relevant guidance notes.

Excluding the parts of the application relating to London 7 and London 8 which are subject to a refusal, we consider them to represent appropriate techniques for the facility. Refer to the key issues section for:

- Our considerations on retrospectively permitting London 5 and London 6 data halls as legacy plant;
- The reasons for a partial refusal of London 7 and London 8 that we consider do not represent BAT for new build data centres.

The operating techniques that the Operator must use are specified in table S1.2 in the environmental permit.

National Air Pollution Control Programme

We have considered the National Air Pollution Control Programme as required by the National Emissions Ceilings Regulations 2018. By setting permit conditions that limit the operating hours, and by refusing London 7 and London 8 we are minimising emissions to air. This will aid the delivery of national air quality targets. We do not consider that we need to include any additional conditions in this permit.

Raw materials

We have specified limits and controls on the use of raw materials and fuels.

Ultra low sulphur diesel is included in this table S2.1. This is usually not used up very quickly due to minimal emergency use. Operators will usually get this cleaned occasionally to ensure the quality remains high. This is not a key issue for determination as they need to do this to ensure they run smoothly so economic incentive not environmental.

Improvement programme

Based on the information on the application, we consider that we need to include an improvement programme.

We have included an improvement programme relating to:

- air quality, maintenance testing and Air Quality Management Plan – see section 7.1
- drainage – see section 7.2
- monitoring requirements – see section 7.5

Emission Limits

We have decided that emission limits are not required in the permit. The Operator is required to monitor NO_x and CO every 1500 hours of operation or once every five years, whichever comes first, in line with MCPD and web guide

'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021 (formerly known as TGN M5). See section 7.5 for more information.

Monitoring

We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. In particular:

We have specified monitoring of emissions of carbon monoxide from emission points A1 to A36 (new medium combustion plant), with a minimum frequency of once every 1500 hours of operation or every five years (whichever comes first). This monitoring has been included in the permit in order to comply with the requirements of Medium Combustion Plant Directive, which specifies the minimum requirements for monitoring of carbon monoxide emissions, regardless of the reduced operating hours of the plant.

We have also specified monitoring of emissions of nitrogen oxides from emission points A1 to A36 (new medium combustion plant), with the same frequency specified for the monitoring of carbon monoxide emissions. In setting out this requirement, we have applied our regulatory discretion, as we consider that this limited monitoring, to happen in concurrence with the carbon monoxide monitoring, is proportionate to the risk associated with the emissions of NO_x from the installation.

Taking into account the limited hours of operation of the engines operating at the installation, and the fact that we are not setting emission limits for NO_x and carbon monoxide, we consider this monitoring can be carried out in line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021' (formerly known as TGN M5).

We have set a requirement for the first monitoring to happen within 4 months of the issue date of the permit or the date when each new medium combustion plant is first put into operation, whichever is later, or the date agreed in writing with the Environment Agency as the result of Improvement Condition IC5.

Reporting

We have specified reporting in the permit.

The Operator will be required to report on NO_x and carbon monoxide as specified in table S3.1 of the permit. They are also required to report on generator operation for testing and maintenance as set out in table S4.2. We made these decisions in accordance with 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021' (formerly known as TGN M5).

Management System

We are not aware of any reason to consider that the Operator will not have the management system to enable it to comply with the permit conditions.

The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.

We only review a summary of the management system during determination. The Applicant submitted their full management system. We have therefore only reviewed the summary points.

A full review of the management system is undertaken during compliance checks.

Previous performance

We have assessed operator competence. There is no known reason to consider the Applicant will not comply with the permit conditions.

We have checked our systems to ensure that all relevant convictions have been declared.

No relevant convictions were found. The Operator satisfies the criteria in our guidance on operator competence.

Financial competence

There is no known reason to consider that the Operator will not be financially able to comply with the permit conditions.

Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-

compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit and the partial refusal are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the Operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

9. Summary

The engines across all four data halls are new plant which we consider should have met the 2g standard or equivalent. We have given the Applicant the benefit of the doubt regarding London 5 and London 6 due to the stage in the permit determination at which we became aware of the situation and that there is no likely significant pollution or harm to the environment. For London 7 and London 8 the situation was different. Air quality is important, particularly in an AQMA. Environmental protection is all about avoiding and reducing emissions and the potential breaches of air quality standards. We are not prepared to accept their proposals for London 7 and London 8 not least because of the precedent effect of people knowing our position and then consciously deciding not to follow our advice and seeking to present us with a fait accompli.

Annex 1: Consultation Responses

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section:

Response received from: National Grid (Cadent Gas, Plant Protection)

Brief summary of issues raised: Searches identified there is apparatus in the vicinity of the installation which may be affected by the activities in the application. Cadent Plant Protection should be informed prior to the commencement of any works to ensure apparatus is not affected.

Summary of actions taken: It is the responsibility of the Applicant to ensure all necessary third parties have been informed of the commencement of operations. The Environment Agency has informed the Applicant of the response from National Grid (Cadent Gas, Plant Protection).

Response received from: Public Health England

Brief summary of issues raised: Potential concerns are point source emissions to atmosphere from the combustion of diesel. The Environment Agency should satisfy itself that the modelling assumptions used are appropriate and valid. In particular that the worst-case scenario identified by the Applicant is a reasonable one and consistent with how the risks have been assessed in the London Resilience Forum's *London Risk Register* (Version 9, February 2020)⁶.

Summary of actions taken: The Applicant provided an assessment of the impact of emissions to air within the application which is detailed in 'Virtus Data Centre, Prologis Park, Stockley - Air Quality Assessment' (AQ1 dated January 2020).

We are not fully satisfied with the Applicant's assessment. A summary of our assessment is in section 7.1 of this decision document including an explanation of the improvement conditions that have been set to ensure the Operator remodels the outage scenario to better inform the Air Quality Management Plan. We have refused the part of the proposal including data halls London 7 and London 8.

⁶ https://www.london.gov.uk/sites/default/files/london_risk_register_v9.pdf