Environmental Permit Application

GB One, Slough – EPR/CP3042QG/A001

Presented to: **GTR Management Services Limited**

Issued: May 2022

Delta-Simons Project No: 22-0598.01

Protecting people and planet

Report Details

Client	GTR Management Services Limited
Report Title	Environmental Permit Application
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Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
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About Us

Delta-Simons is a trusted, multidisciplinary environmental consultancy, focused on delivering the best possible project outcomes for customers. Specialising in Environment, Health & Safety and Sustainability, Delta-Simons provide support and advice within the property development, asset management, corporate and industrial markets. Operating from across the UK we employ over 180 environmental professionals, bringing experience from across the private consultancy and public sector markets.

As part of Lucion Services, our combined team of 500 in the UK has a range of specialist skill sets in over 50 environmental consultancy specialisms including asbestos, hazardous materials, ecology, air and water services, geo-environmental and sustainability amongst others.

Delta-Simons is proud to be a founder member of the Inogen Environmental Alliance, enabling us to efficiently deliver customer projects worldwide by calling upon over 5000 resources in our global network of consultants, each committed to providing superior EH&S and sustainability consulting expertise to our customers. Through Inogen we can offer our Clients more consultants, with more expertise in more countries than traditional multinational consultancy.

Delta-Simons is a 'Beyond Net-Zero' company. We have set a Science-Based Target to reduce our Scope 1 and Scope 2 carbon emissions in line with the Paris Agreement and are committed to reducing Scope 3 emissions from our supply chain. Every year we offset our residual emissions by 150% through verified carbon removal projects linked to the UN Sustainable Development Goals. Our consultancy services to you are climate positive.

If you would like support in understanding your carbon footprint and playing your part in tackling the global climate crisis, please get in touch with your Delta-Simons contact above who will be happy to help.

Table of Contents

1.0 Introduction

1.1 Appointment

Delta-Simons Limited ("Delta-Simons") was instructed by GTR Management Services Limited (the "Client") to prepare a Part A(1) Environmental Permit application for the GB One data centre (the "Site").

1.2 Context & Purpose

This application document has been prepared for GTR Management Services Limited by Delta-Simons Limited based on information provided by GTR Management Services Limited and its suppliers.

2.0 Site Information

2.1 Site Location

The Site is locate in an industrial and commercial areas of Slough, approximately 1.7km north west of Slough town centre. The Site is accessed from Ajax Avenue in the south. An active train line runs along the northern boundary, just off-Site. The developed datacentre will be predominantly covered by hardstanding including service yards, parking and access roads with limited soft landscaping on the southern boundary of the Site, along the Ajax Avenue frontage.

2.2 Site Surroundings

- **North –** An active railway line runs east to west adjacent to the Site boundary, the railway line itself is raised above the surrounding ground level. Beyond which are light industrial and commercial units including car mechanic and detailing stores, used car dealerships and bakeries.
- **East –** Warehouse units and used car dealerships are east of the Site beyond which the A355 runs approximately north to south. Residential areas are located approximately 0.3km and 0.4km to the south-east and east respectively. A laundrette located approximately 56m east of the Site.
- **South –** Data centres (Cyxtera), packaging manufacturers (Selig) and several other light industrial and commercial units are located to the south of the Site.
- **West –** A food service warehouse and car dealership are located to the west of the Site, beyond which Leigh Road runs approximately north to south

3.0 Regulated Activities

3.1 Schedule 1 Activities

The data centre comprises three warehouse type buildings containing data storage and communications equipment and ancillary equipment including cooling plant and twenty-one (21) diesel fuelled back-up generators. The back-up generators provide power to the data centre in the event of grid supply failure and will not operate as elective generation. The operation of the diesel back-up generators over 50 MWth requires a Part A(1) Environmental Permit under Schedule 1, Part 2 of The Environmental Permitting (England and Wales) Regulations 2016 (as amended)

The activities carried out at the Site which require a Part A(1) Environmental Permit are listed in Table 3.1 below.

Table 3.1: Schedule 1 Activities

Schedule 1 Activity	Description	Extents
Section 1.1 Part A(1)(a) - burning any fuel in an appliance with a rated thermal input of 50 or more megawatts	Combustion of diesel fuel in electrical generators of 8.877 MWth each, with an aggregated thermal input >50 MWth (total thermal input 186.42 MWth)	From receipt and storage of diesel fuel to emissions of combustion products

The GB One Slough datacentre will include 21 diesel-fired generators operating as standby backup generators. The combined net rated thermal input of all diesel backup generators on Site is 186.417 MWTh (21 x 8.877 MWTh standby generators).

3.2 Directly Associated Activities

Directly associated activities (DAA) are defined in Part 2, Schedule 1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) as an operation which:

- (a) has a technical connection with the activity,
- (b) is carried on on the same site as the activity, and
- (c) could have an effect on pollution.

Table 3.2 below details the activities carried out at the Installation which are dire3ctly associated with the Schedule 1 activities in Table 3.2 above.

Table 3.2: Directly Associated Activities

Directly Associated Activity	Description	Extents
Storage, distribution and use of diesel fuel	Receipt of diesel fuel from road tankers into bulk tanks, distribution to generator day tanks and combustion in backup generators	From receipt to point of consumption in generators

4.0 Operating Techniques

4.1 Datacentre Specifications

The datacentre is designed with a total of 3 blocks which operate independently. Each of these blocks has 7 generators operating on an n+1 arrangement, though all 7 generators could be simultaneously operational if required.

Table 4.1 Generator specifications

Installation phase	Generators (all KD4500E)	Standby electrical rating (MWe)	Thermal Rated Input (MWTh)	Combined Thermal Rated Input (MWTh)
Block 1	1-7	3.600	8.877	62.14
Block 2	8-14	3.600	8.877	62.14
Block 3	15-21	3.600	8.877	62.14
Total		**75.600**		**186.417**

The electricity supply arrangements for the site include two 33KV feeds from the National Grid, either of which can serve the 'customer load'.

A UPS system is present in each block. These battery arrays can provide almost instantaneous electrical power in the event of a loss of site electrical feed. Sufficient UPS capacity is in place to provide operation of the data centre while the generators are brought online.

Automated systems detect fluctuations in the electrical supply to the site, where such events could negatively impact datacentre operation then the UPS can be automatically utilised and generators brought online as required.

As the datacentre is a new build and is not operational at the time of permit application, there is no operational history and the likelihood of a loss of power from the local transmission system is not possible. However, Slough Heath and Power operates a power station providing power to the wider Slough Estate, in addition to the local generator capacity within the data centre.

4.2 Relevant Technical Standards

Table 4.2 Data Centre FAQ Headline Approach

Ref	Headline FAQ Requirement	Applicant Response
1	We accept that oil fired diesel generators are presently the default technology for standby generators in data centres. However the permit application still requires a BAT discussion detailing the choice of engine, the particular configuration and plant sizing meeting the standby arrangement (e.g. 2n).	The GB One data centre applies a n+1 standby arrangement. The 21 new engines, purchased in 2022 are 2G engines. Each block is operated independently with an n+1 arrangement to allow each block to be operated by separate clients.
2	Standby engine capacities are added together in MWthermal input at the quoted standby rating, being usually 110% of the continuous rating (if >=50MWth the site then needs an EA 1.1A Combustion Activity EPR permit)	Installed capacity of all 21 engines is 186.417 MWth, far in excess of 50 MWth, so a permit is required.
3	If precise MWth figures are unavailable and spec sheets or face-plates are unclear, the calculation for MWth derived from MVA output is based on: power factor 0.8 and an	Thermal input has been taken from manufacturer's data.

	assumed poor conversion efficiency of 0.35 for MWth to MWelec e.g. 3MVA = (3*0.8)/0.35 = 6.86MWth.	
4	The sum of generator plant capacities is based only on MWthermal inputs of all plant 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.	Installed capacity of all 21 engines is 186.417 MWth, far in excess of 50 MWth, so a permit is required.
5	Proximity of data centres with a company campus, adjacent, neighbouring or close-by buildings in urban locations (e.g. within a common trading estate but only separated by a road width or notional distance) may constitute a single site for determining the boundary of the installation as 'same site – same operator' as per RGN02 – see the details in the text	This is a single data centre, operated separately from all other nearby data centres.
6	Permits will include a maximum 500 hour 'emergency/standby operational limit' for any or all the plant producing on-site power under the limits of the combustion activity; and thereby emission limit values ELVs to air (and thus engine emissions monitoring) are not required within the permit.	This 500 hour threshold will not be exceeded as the generators are for emergency standby use only.
7	Emergency hours' operation includes those unplanned hours required to come off grid to make emergency repair of electrical infrastructure associated but occurring only within the data centre itself.	While this may occur, it is considered very rare and the 500 hours threshold will not be exceeded.
8	Each individual generator with its own discharge stack, can be maintained, tested and used in a planned way for up to 500 hours per calendar year each without ELVs (and hence no monitoring) under IED/MCPD. Though clearly the EA expects planned testing and generator operations to be organised to minimise occasions and durations (subject to client requirements). Ideally a target should seek to keep individual generator testing to below 50 hours/annum each as required for MCPD specified generator exclusion.	It is anticipated that each generator will run for fewer than 50 hours per year due to planed fortnightly testing and quarterly and annual testing.
9	In summary 7, & 8 means 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.	This 500 hour threshold will not be exceeded.
10	For the purposes of determining operating hours, data centre diesel generators are regarded as having a minimal start-up or shut-down times. Operational hours start on the first fuel ignition.	This operating regime forms the basis of the air quality assessment (Air Quality Assessment_1)
11	Data Centre permits (unless they apply and justify it in a permit application) will expressly have a limit on the activity to exclude voluntary 'elective power operation' such as demand side response (i.e. on-site use) or grid operating reserve (STOR) (i.e. off-site export of electricity) and Frequency Control by Demand Management (FCDM) for grid support. This is primarily to differentiate data centres from 'diesel arrays or MCPD specified generators' that	No elective generation is proposed including STOR, FCDM or on-site use. Emergency backup generation only.

	voluntarily operate within the balancing market, and importantly a clear way to demonstrate minimisation of emissions to air as 'Emergency plant'.	
12	The default engine specification as a minimum for new plant to minimise the impacts of emissions to air (NOx) is 2g TA-Luft (or equivalent standard). A detailed cost benefit analysis (CBA) is otherwise needed justifying worse emission such as 4g TA-Luft plant or for example a justification under FCDM.	The 21 generators ordered in 2022 are "EPA Tier 2" compliant. Additionally, an SCR NOx abatement system is installed.
13	CBA for improved exhaust emissions, dispersion and mitigations from the plant is expected for the maintenance/testing and the emergency standby roles. We would be looking for improvements particularly if Local Air Quality (LAQ) modelling (under H1) indicates anything other than an insignificant contribution to short term local air quality for the 'planned' maintenance emissions of the plant.	The air quality assessment (Air Quality Assessment_1). Included dispersion modelling. Due to the results of the modelling an SCR abatement system was specified. The SCR system will not function during the generator testing due to the start-up time for the SCR system to be operational.
14	Retrofit abatement techniques for existing installations for engine emissions such as selective non-catalytic or catalytic reduction (SNCR or SCR) would not normally be expected for standby plant to mitigate the emissions for standby/emergency operation. BAT might include improved flue gas dispersion (e.g. stack modifications, increased height) or improved low NOx engine management controls or possibly fuel choice.	SCR systems will be installed as part of the system design. Although not usually expected for standby plant this was required by the outputs of the dispersion modelling and is seen as future proofing the data centre. Low
15	Operations and management procedures should reflect the outcomes of the air quality modelling by minimising the duration of testing, phasing engines into subgroups, avoiding whole site tests and planning off-grid maintenance days and most importantly times/days to avoid adding to "at risk" high ambient pollutant background levels.	The Site is not in an Air Quality Management Area though these are present within Slough. Testing of the generators will be staggered to prevent operation of large numbers of generators simultaneously. Full load and black building tests will be scheduled for weekends where practicable to avoid peak generation of NOx from local road traffic.
16	When AQ modelling the emissions from the engines, the certified technical standard provided by the manufacturer should be used (i.e. likely worst case emissions). However any 'fit for purpose' monitoring (e.g. MCP guide M5) of the actual emissions from installed plant will be considered as evidence of the likely real impacts as part of the permitting decision process.	Worst-case emissions from the manufacturer have been used in the dispersion modelling.
17	The groundwater monitoring of fuel storage tanks and distribution pipework using GW boreholes is risk based for the site condition report (SCR) and IED 5-yearly monitoring. Should GW monitoring be required for underground tanks and/or the SCR, the boreholes should be positioned for whole site surveillance (for the SCR) rather than as a very local control immediately around the buried fuel oil tanks (i.e. not be just an addition to double skinned tanks already	Soil and groundwater report provided as part of application (Baseline Report_1) undertaken prior to site redevelopment. Only above diesel storage tanks are to be used. Although the fuel lines connecting the tank farm and the generators will be below ground, an active vacuum leak

	protected by leak detection and hence ignoring distribution pipework etc).	detection system will be installed. Due to the nature of this system, the applicant does not propose to undertake additional groundwater or soil sampling or monitoring.
18	10-yearly soil sampling under IED is normally not needed but still needs some justification.	Soil and groundwater report provided as part of application (Baseline Report_1) undertaken prior to site redevelopment. Due to the nature of fuel system, and operating procedures, the applicant does not propose to undertake additional groundwater or soil sampling or monitoring.
19	The permit application must assess and provide evidence of actual reliability data for the local electricity grid distribution (including data centre internal electrical design) for the EA to judge the realistic likelihood of the plant needing to operate for prolonged periods in an emergency mode (especially if emissions model so as to exceed short term air quality standards).	UK Power Networks figures show reliability of 99.99997% overall reliability. No long term power loss events have been reported in the Slough area in the last 5 years.
20	Optimising grid reliability within the site as part of general BAT to minimise emergency operating hours is required – evaluation is needed within the permit application on the Tier reliability standard under ISO27001 and Uptime.	The site is not yet constructed. Slough Heat & Power station exists to balance local load.
21	Reporting of standby engine operational run hours and discussion of any electrical outages (planned or grid failures regardless of duration) required annually.	The applicant understands that this will form part of the annual reporting requirements of the permit.
22	Assuming AQ modelling, based on operating scenarios, indicates a local air quality risk then notification to the EA of unplanned (and pre-notification of planned) continuous grid outage exceeding 18 hours LAQM (or the otherwise assessed short term interval from modelling) is likely required under a permit schedule 5 notification.	The applicant understands that this will form part of the reporting requirements of the permit.
23	The notification requirement stated in the permit should also indicate the actual number of generators that need to be operating above which the local air quality is at risk e.g. 'notification of continuous emergency operation exceeding 18hours with 5 or more engines operating together is required' (i.e. model shows 4 or less engines unlikely to breach LAQ)	The applicant understands that this will form part of the reporting requirements of the permit.
24	Assuming AQ modelling, based on emergency outage operating scenarios, indicates a very significant risk to local air quality and identified receptors, the EA will ask the operator to have a written 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	It is expected that the permit will include the requirement to develop an Air Quality Management Plan (AQMP) as part of an Improvement Condition, with which the applicant will comply.

	other neighbouring large sites during an outage i.e. data centre hubs.	
25	Due to the emphasis of the permit on electrical (and cooling) systems it is noted that the EA considers the F-Gas regulations as falling under the remit of the EPR permit (for notifications and management) where F-gases (or potentially any polluting potential substance) are used directly under the combustion aspects of the permitted activity (e.g. switchgear). It is important to notify the EA of any significant releases. Other uses of F-gases e.g. for server room cooling are not strictly under the EA permit but are regulated by the EA generally so it may still be prudent to make the EA aware of your F-gas releases.	While F-Gases are expected to be in use at the Site, this is within server equipment cooling and not part of the regulated activity. However, the requirements of the F-Gas regulations will be complied with during operations and maintenance.
26	The permit application should detail the likely quantities of waste engine oil generated annually - EWC 13 02 waste oils following servicing for example. Although unlikely to be huge, the Pollution inventory has a reporting threshold of 1 tonne for non-hazardous waste but technically no lower thresholds for hazardous waste oil.	It is expected that waste lubricating oil will be generated and removed by sub-contractors during maintenance and servicing operations. Manufacturer data states that the lubrication system for each generator is 700 litres including filters. Given the limited operation of the generators, whole system replacement is not considered to be a regular event. The tank farm includes a fuel polishing system, so waste streams from this and the loading bay interceptor are expected. All wastes will be reported as part of the Pollution Inventory.
27	The permit application is for the combustion plant and associated environmental concerns and not for the Data Centre itself. The applicant should be aware that the permitting process and application is accessible to the public so should have regard to 'Commercial in Confidence' and Critical National Infrastructure. In the first instance discuss particular concerns directly with the EA and/or exclude such priority information from the application but indicate that such is 'available on request'.	The applicant notes this requirement.

4.3 Operating Regime

4.3.1 Scheduled Operating

Planned testing and maintenance will take place throughout the year. Typically each generator will be run for approximately 20 minutes every two weeks at 81% load. Only one generator will be tested at a time to minimise impact to the local environment and to ensure sufficient capacity is available in a grid outage.

The total running hours for testing and maintenance for each generator will be below 50 hours per year.

4.3.2 Black Building Test

Annually a full black building test is undertaken where all generators in a Block are started, synchronised and run to take the building load. This is likely to take 1 hour maximum once per year, per Block.

4.3.3 Annual load test

Annually a full in-service test is undertaken on each set of 7 generators. The generators undergo a full load test where the generators are started and run to take the building load. This is likely to take 4 hours maximum once per year, per Block.

5.0 Energy and Resource Efficiency

5.1 Energy Management

GTR does not currently operate an energy management system certified to ISO 50001.

Energy efficiency will be managed via the datacentre's environmental management system (EMS).

The management of energy will form an integral part of the EMS. Energy use will likely form one of the key environmental aspects and within the EMS measurement and reduction targets will likely be established. Training aimed at minimising energy use and developing good housekeeping techniques will form part of staff training.

5.2 Climate Change Agreement

The data centre will not be a participant to a Climate Change Agreement (CAA) on initial operation. This will be reviewed after an initial period of operation. Energy management techniques will be implemented to monitor, record and track energy consumption at the datacentre.

5.3 8.3.2 Energy Efficiency Directive (EED)

The EED exempts "those peak load and back-up electricity generating installations which are planned to operate under 1,500 operating hours per year as a rolling average over a period of five years".

Based on the planned maintenance and testing schedule, in total the generators at the datacentre will be operated for less than the 1,500 hour threshold. For the purpose of this permit application, the datacentre is therefore exempt from the EED requirements and an assessment of energy efficiency in accordance with the Reference Document on Best Available Techniques for Energy Efficiency, February 2009.

5.4 Energy Efficiency Measures

Operation of the generators is for emergency back-up. The generators will be subject to regular maintenance and inspection that will include ensuring the engines are optimised to minimise the heat rate (energy consumption) whilst maintaining the relevant emissions standards.

Energy recovery is not reasonably practicable for engines with such small anticipated operational hours, however, as part of the EMS, assessment of the datacentre's energy usage will be undertaken with a view to identifying measures to reduce energy consumption, where possible.

5.5 Resource Efficiency

There will be no consumption of water associated with the combustion activities and diesel use/storage at the site. Runtimes of the engines will be minimised as much as possible.

The raw materials to be used at the site are:

- Diesel fuel oil: each Kohler KD4500-E generator will require 870 litres per hour of diesel fuel (at 100% load when providing standby generation).
- Lubricating oil: to be used in the engines and other mechanical equipment. Occasional top up or replacement will be required during scheduled or forced maintenance periods only. The lubricating oil for the generators will be stored within the engine enclosure and manually topped up during servicing by an appointed service contractor.
- Transformer oil: transformer oil (as this is a new installation it will free of polychlorinated biphenyls (PCBs)) will be used in oil-cooled transformers. Occasional top up or replacement will be required. Transformers oils will not be stored on-site; the oils will be brought to site and topped up/replaced during scheduled or forced maintenance periods only.

The BAT objective with regard to raw materials is achieved by the appropriate design, operation and maintenance of the SBGs to ensure the lowest possible consumption rate of fuel; by the selection of least hazardous materials; and by the provision of appropriate storage methods.

The diesel engines are designed for the combustion of diesel fuel oil and there is therefore no alternative fuel for use by the site (although selection of alternative suppliers is possible).

Lubricating and transformer oils are typically specified by the manufacturer with limited scope for replacement with alternatives.

Further details of the diesel storage arrangements are provided Section 8.0 Best Available Techniques.

5.6 Waste Minimisation

The site will inherently not produce significant amounts of waste. Waste oil will be generated at the site as a result of generator maintenance. Generator maintenance will be undertaken by an appointed third party specialist who will be responsible for the off-site disposal of this waste. Waste oil will not be stored on site. GTR will ensure that the contracted company is a registered waste carrier.

Waste oil will be managed off-site. In accordance with the waste hierarchy, GTR will seek to ensure that the waste oil is subject to re-use, avoiding the need for disposal.

It is anticipated that waste oils (EWC 13 02) from the generators at the datacentre will be less than 5 m^3/4.5 tonnes per annum.

5.7 F-Gases

Fluorinated gases (F-gases) will not be used at the datacentre in the refrigeration systems for cooling plant as this will be achieved through closed loop water systems.

Any other use of refrigerants at the site will be minimal, e.g. office air conditioning units.

Any units will be subject to regular maintenance and leak testing; these requirements will be included in the site's preventative maintenance system. Maintenance and testing will be undertaken by an GTR approved external specialist contractor; copies of the certificates of the engineers qualified to install, maintain and service refrigeration equipment will be maintained on file by GTR.

GTR will maintain an F-gas register for the datacentre. The register will detail each refrigerant-containing unit, the make, model and serial number, refrigerant type and charge, the global warming potential (GWP), carbon dioxide equivalent (CO2e kg), maintenance/leak test frequency and refrigerant used per year.

6.0 Environmental Management System

GTR commits to developing an Environmental Management System (EMS) which in line with the requirements of the international standard ISO14001:2015. It is not currently proposed that this management system will be certified to the standard.

The structure of the system will include the policies, management principles, organisational structure, responsibilities, standards/procedures, process controls and resources in place to manage environmental protection across all aspects of the business.

The EMS will place particular importance on:

• Reducing risks to the environment to a level that is as low as reasonably practicable using best available techniques;

• Integrating EMS responsibilities within line management;

• A commitment to personnel environmental awareness and competence;

• The ongoing monitoring and review of environmental performance; and

• A commitment to working to achieve continuous improvement in environmental performance.

6.1 Environmental Policy

The EMS will include an Environmental Policy setting out GTR's commitment to managing its operations in an environmentally responsible manner and committing to ensuring continual improvement.

The Policy will be reviewed annually by top management and communicated to all employees.

6.2 Organisation

GTR will establish and maintain documented procedures for identifying and recording environmental aspects for all its activities, products and services. Where significant, the environmental aspects will be considered in the development, implementation and maintenance of the EMS. These will also be considered when introducing new or modified activities and services. GTR will also document in the EMS the process for the setting, managing and reviewing environmental objectives and targets.

GTR will document in the EMS the structure and responsibility within the organisation. Senior management will have overall responsibility for the provision and maintenance of an effective EMS Policy and improvement programme and will ensure that the requirements of the EMS are addressed in all management and business decisions.

GTR will maintain an internal audit programme for periodic internal audits of environmental documents, procedures, implementation and compliance status to determine whether the EMS conforms to planned arrangements, and to determine whether it has been appropriately implemented and maintained in accordance with its Environmental Policy.

6.3 Environmental Aspects Evaluation

The environmental significance of the site activities will be determined by means of environmental aspects evaluation. GTR will identify the aspects and impacts (direct and indirect) relevant to its activities, highlighting which substances, activities or incidents related to the aspects that could potentially have a harmful effect on the environment. Any substance, activity or incident that has the potential to cause harm, or under the worst case scenario has a high-risk of potential to harm will be identified as being 'significant'.

GTR's main activities will be identified and recorded, for example in an aspect and impact register; evaluation of these aspects and impacts and the associated implications will be recorded. Environmental aspects will be considered under the following conditions:

- Normal operation (i.e. standard operating procedures and conditions);
- Abnormal operation (i.e. standard operating procedures but non-standard conditions); and

- Emergency conditions.

Aspects which are identified as being 'significant' will be managed by establishing operational controls, process, procedures, training and monitoring activities such audits. The GTR management team will be responsible for reviewing aspects and impacts defined as being significant. All staff will be responsible for working in accordance with procedures relating to environmental compliance.

6.4 Environmental Risk Assessment

Environmental risk assessments, together with the environmental aspect evaluation, will allow routine management system (MS) procedures to manage risks under normal circumstances, and emergency plans to mitigate impacts under abnormal circumstances. Such assessments will cover the implications of material storage, oil transfer, drainage and site security.

Environmental risk assessments will be carried out:

- Under normal operating conditions;
- Under potential abnormal/emergency conditions;
- For existing equipment;
- For existing material storage;
- Before a new substance is introduced;
- Before the installation of new plant on-site; and
- Before existing plant is modified.

All significant risks will be recorded, for example in an aspect and impact register.

GTR will require and will encourage full and open reporting of all environmental incidents, including near misses.

Staff will be encouraged to report environmental incidents and problems which may result from (inter alia) the following factors:

- Pollution incidents;
- Potential incidents;
- Breaches of legislation;
- Supplier non-compliances;
- Contractor non-compliances;
- Non-compliances identified during audits; and
- Management system non-compliances.

Additionally, contractor personnel will be informed of the need to report incidents.

6.5 Monitoring, Control and Change Management

Significant aspects will be managed through procedural controls as necessary to monitor the environmental performance of the datacentre, identify faults, opportunities for improvement and to optimise maintenance routines.

The EMS will provide for the controlled implementation of changes which may have environmental implications, to ensure any environmental risks posed by a proposed change will be adequately managed.

6.6 Accident Prevention and Management

GTR will develop systems for managing accidents and incidents. These systems will take account of requirements within the

Environmental Permit.

GTR will also develop:

- A Disaster Recovery Plan to counteract potential interruptions to its business activities and to protect critical business processes from the effects of major failures of information systems or disasters. Risk assessments will be undertaken to ensure that the Disaster Recovery Plan has appropriate controls in place; and
- A Business Continuity Plan (BCP), which will detail emergency/accident procedures and incident management responsibilities, including management of significant pollution incidents and fire. The plan will include contact numbers for key company personnel and emergency services.

6.7 Training and Competence

GTR recognises that all personnel who work at the site, including employees, clients, visitors and contractors, have the potential to affect the environmental performance. As such, the datacentre will be managed on a 24 hour basis visit and work have an Environmental training will be provided; this will be for both general awareness and job-specific training.

The site will be managed by a sufficient number of staff, who have the competencies to operate the site. In

accordance with the EMS:

- Clearly defined roles and responsibilities for all personnel at all levels of the organisation.
- Maintained records for training and qualifications relevant to the position.
- Records will be maintained of the knowledge and skills required for each post;
- Operations will be governed by standard operating instructions.

Each individual's knowledge and skills will be assessed and matched against the needs of the job position. Additional experience and/or training requirements necessary to enable an individual to undertake their assigned role will be identified, prioritised and planned.

Training records will be maintained and training needs regularly reviewed.

All contractors and sub-contractors will be given appropriate training prior to the commencement of any works or services.

6.8 Management Review and Audit

To ensure continuous improvement, annual review and audit of the EMS will be undertaken. The annual review will ensure that the EMS is fit for purpose and maintains appropriate control of the identified aspects and impacts.

The EMS and site operations will be subject to internal audit at least annually. The auditors will be impartial to the area being considered, with suitably qualified third-parties being incorporated into the audit team where appropriate.

Audit findings and corrective actions will be managed through a robust management of change process to ensure effective records . All changes which relate to changes to key staff, equipment or abatement plant.

7.0 Monitoring of Emissions

7.1 Point Source Emissions to Atmosphere

The generators will operate for fewer than 500 hours per year, as such they will not be subject to emission limit values (ELV) for the substances listed in Annex V of the Industrial Emissions Directive[1].

The generators will not be used for elective generation nor export to the grid and will not be considered specified generators under the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

The minimum number of generators required

For each datacentre block, the Operator will record and report:

- Fuel consumption (total Site)
- Operating hours for each engine – testing and maintenance operation (from start-up to shutdown)
- Operating hours for each engine – emergency operation

When recording operating hours, the generators are regarded as having negligible start-up and shut-down times. Operational hours will therefore be counted from the first fuel ignition. All operating hours will be recorded, including those when all generators are brought online before stopping those not required.

An Air Quality Assessment (Air Quality Consultants report ref: J20/12794A/10/2/F1, 22 October 2021) was undertaken in support of this development. The AQA concluded that:

- The impacts associated with the proposed diesel backup generators at the GB1 Data Centre in Slough have been assessed in relation to the air quality objectives set to protect human health. The assessment has considered an operational scenario of 12 hours testing per generator per year , and an emergency scenario replicating a full power grid failure and 24 hours of continuous operation from all 21 generators.
- The assessment has demonstrated that there will be no impacts in terms of annual mean NO 2 concentrations. The risk of an exceedance of the hourly mean nitrogen dioxide is considered to be low. There is also no risk of an exceedance of the Workplace Exposure Limit.
- Overall, it is considered that the air quality effects associated with the proposed diesel backup generators at GB1 Data Centre , with the generators being tested for 12 hours per year, will be 'not significant', as long as the generators are tested in groups of three and four, or fewer.

7.2 Point Source Emissions to Foul Sewer

The Installation will be connected to the municipal foul sewerage network. There are no cesspits or septic systems present on Site.

Discharges to foul sewer will comprise only sanitary effluent from domestic facilities present on site and no process effluent will be generated. The Operator will not hold a trade effluent consent.

7.3 Point Source Emissions to Surface Water

The Installation will be connected to the municipal surface water sewer network. There are no proposed soakaways present on Site.

Discharges to surface water include:

[1] Directive 2010/75/EU on industrial emissions

- Uncontaminated rainwater from roof areas.
- Uncontaminated runoff from paved yard and car parking areas.
- Discharge of water from the oily water interceptor associated with the tanker loading bay.

Monitoring of the surface water discharges from the datacentre is not considered necessary given the planned preventative maintenance system which includes regular emptying and maintenance of the oily water interceptor.

7.4 Point Source Emissions to Land

There will be no point source emissions to land from the Installation.

8.0 Best Available Techniques (BAT)

8.1 Introduction

Implementation of Best Available Techniques (BAT) at the GTR datacentre considers the following guidance:

- "Data Centre FAQ Headline Approach, Draft Version 10.0 H. Tee 01/06/18 – Release To Industry", provided by the Environment Agency EA prior to application; and
- Department of Energy & Climate Change, Developing Best Available Techniques for Combustion Plants Operating in the Balancing Market, Final Report, June 2016.

8.2 Operating Regime

8.2.1 Elective Electricity Generation

The generators at the site are for critical backup purposes only and will not be operated for elective electricity generation.

8.2.2 Testing and Planned Preventative Maintenance

During operation for planned testing/maintenance at the datacentre, the generators will each operate for less than 50 hours per year.

In the event that electricity is not available from the local transmission network the SBGs will be operated to deliver the required datacentre customer load. It is noted that Slough is frequently chosen for datacentre operations given the communications links, but also the presence of the Slough Heat and Power station which supports local network resilience.

While emergency operation would increase total operational hours for each generator, it is considered extremely unlikely that operation of any single generator would exceed 500 hours per annum.

The N+1 arrangement for each datacentre Block means that in the event of power loss, all 7 generators would start up. As the customer load was met, generators would disengage sequentially to the level of demand. Should a generator fail, the backup (+1) generator would engage.

Emergency operations would also include unplanned hours required to come off grid to make emergency repair to critical electrical infrastructure within the datacentre, where such works are unavoidable.

The Operator commits to notify the EA:

- In advance of planned outage/maintenance of the local transmission system that is expected to exceed 18 continuous hours; and
- Upon an incident of unplanned continuous outage that exceeds 18 hours.

8.2.3 Choice of Backup Engine

Diesel-fired generators have been chosen for the provision of emergency back-up electricity in the event of failure of grid supply. An options appraisal has been undertaken which compares diesel generators to other available technologies.

The following key requirements for the generators to provide emergency back-up electricity have been considered for the selected technologies:

- Start-up time;
- Reliability;
- Independence of off-system services; and
- Causing the least environmental impact.

A comparison of these technology types is presented in the table below. Start up, efficiency and emissions data has been obtained from a report prepared by DECC (Department of Energy & Climate Change, Developing Best Available Techniques for Combustion Plants Operating in the Balancing Market, Final Report, June 2016) unless otherwise stated. Figures are reported at oxygen reference values of 15%.

	Diesel Engines	**Gas Turbines**	**Aero Engine Gas Turbines**	**Gas Engines**
Start up time	<5 mins	>1 hour	<5 mins	1-10 mins
Thermal efficiency	35-37%	38-60%	35-39%	35-45%
Fuel	Stored liquid diesel	Mains or stored gas	Mains or stored gas	Mains or stored gas
Notes	Fast start up time and does not require off-site provision of fuel	Requires constant gas supply	Requires constant gas supply	Requires constant gas supply
BAT?	Yes, short start up times, fuel tanks allow running without mains gas supply.	No, due to large size, long start up times, high cost.	No due to large size and high cost.	Yes, equivalent to diesel engines but requires off-site fuel supply.

As stated in the table above, Diesel Engines are able to operate at short notice, with variable load, with sufficient redundancy and able to run from stored fuel on-site. Diesel engines also benefit from the easier sourcing of spares and engineering capability, meaning that running costs are lower.

For turbines and gas engines, it is not considered safe nor feasible to store large quantities of compressed natural gas on site.

8.3 Emissions to Air

The 'Data Centre FAQ Headline Approach' specifies the BAT emissions specification for new diesel-fired reciprocating engines as 2g TA-Luft (or equivalent standard). All the generators will be Kohler KD4500-E engines, the manufacturer specification for which states that these engines are EPA Tier 2 compliant. The Datacentre FAQ states that Tier II USEPA is the minimum appropriate for new generators, as such the KD4500-E are considered to be compliant.

While selective catalytic reduction (SCR) is not generally applicable to emergency/standby plant, a Urea-based SCR system will be installed on all SBGs.

The system as specified by the manufacturer (Kohler) expects the following NOx levels:

NOx after engine @ 81% ESP	≤2,244 mg/mn^3 @ 5%O2 (equal to 77.5% NOx reduction)
NOx after engine @ 100% ESP	≤3,981 mg/mn^3 @ 5%O2 (equal to 87.3% NOx reduction)
NOx Limit after SCR system	≤506 mg/mn^3 @ 5%O2 (equal to 190 mg/Nm^3 @ 15% O2)

The expected urea consumption (32.5% solution AdBlue) for 100% engine load is approximately 74 litres per hour and at 81% engine load is approximately 40 litres per hour.

GTR will report the following to the EA (annually):

- the operating hours /minutes and number of runs of each generator for planned maintenance and testing;
- the total number of hours of operation of all generators for testing and planned preventative maintenance;
- the total operating hours of all generators for emergency use and the number of emergency occurrences; and
- the annual amount of fuel used.

8.4 Exhaust Stacks

The Data Centre FAQ Headline Approach states that datacentres usually have very low profile sites and as such can have short, below roof level emission stacks and that this can impact on the efficiency of dispersion of emissions and BAT is that release stacks are vertical to aid the dispersion of emissions from the SBGs.

Elevating stack heights aids dispersion of exhaust gases as a result of mixing with the surrounding air once the plume of exhaust gases leaves the stack.

Each generator will have its own dedicated stack to aid the dispersion of the engine flue gases (for further details, please see the Air Quality Assessment (Air Quality Consultants report ref: J20/12794A/10/2/F1, 22 October 2021). The stack release heights for the SBGs at the datacentre will be 23.0m above ground level (agl). These stacks will be vertical and located on the roofs of the SBG container units. The vertical stacks will terminate above datacentre roof level and so are considered to be BAT.

The AQA has taken into account the profiles and heights of all the stacks and building downwash impacts at the datacentre and has concluded that:

- The impacts associated with the proposed diesel backup generators at the GB1 Data Centre in Slough have been assessed in relation to the air quality objectives set to protect human health. The assessment has considered an operational scenario of 12 hours testing per generator per year , and an emergency scenario replicating a full power grid failure and 24 hours of continuous operation from all 21 generators.
- The assessment has demonstrated that there will be no impacts in terms of annual mean NO 2 concentrations. The risk of an exceedance of the hourly mean nitrogen dioxide is considered to be low. There is also no risk of an exceedance of the Workplace Exposure Limit.
- Overall, it is considered that the air quality effects associated with the proposed diesel backup generators at GB1 Data Centre , with the generators being tested for 12 hours per year, will be 'not significant', as long as the generators are tested in groups of three and four, or fewer.

8.5 Air Quality Emergency Action Plan

GTR will develop an Air Quality Emergency Action Plan (AQEAP) once the permit is issued. The AQEAP will detail the management actions to be taken in the event of an emergency outage of the national electricity transmission system that could result in the prolonged usage of the generators which could potentially result in adverse impacts on local air quality.

8.6 Fuel Storage

Diesel will be stored at the datacentre in belly tanks which are integral to the individual generator. There will also be a centralised bulk above ground tank storage farm for diesel in the north western corner of the installation boundary.

The site will be provided with security fencing to restrict access and will have secure access arrangements to minimise the risk of unauthorised access.

The fuel storage arrangements for diesel at the datacentre are summarised below.

8.6.1 Generator Day Tanks

Each generator will be housed within proprietary steel container units located outside each Block. Within the container unit for each generator will be a day tank integral to the container unit, this will automatically supply diesel to the generator. The day tanks are bunded (110% capacity) to meet the Control of Pollution (Oil Storage) (England) Regulations 2001.

The day tanks are 1,000 litres for each generator (21 generators @ 1,000 litres = 21,000 litres).

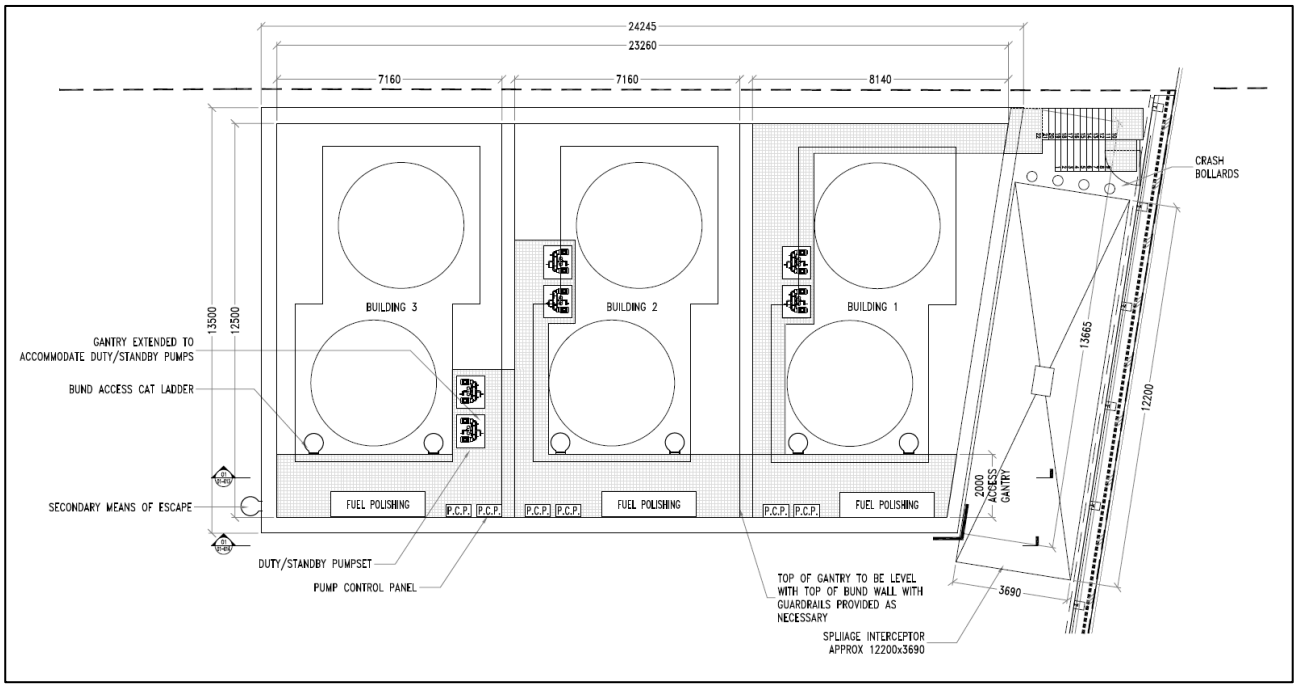
The generator container units will be raised off ground level on steel frames, which will act to protect the container units from vehicular damage.

These tanks will be filled directly through underground lines fed from the tank farm. Each Block is fed from two tanks, using two underground fuel supply lines, to ensure maximum redundancy.

- Block A will be fed from two underground lines from Tank 1 and Tank 2;
- Block A will be fed from two underground lines from Tank 3 and Tank 4;
- Block C will be fed from two underground lines from Tank 5 and Tank 6;

8.6.2 Bulk tank farm

There will also be a centralised bulk above ground tank storage farm for diesel in the north western corner of the installation boundary. The layout of the bulk tank farm is as shown below.



Each tank is approximately 155,000 litres capacity. Therefore, there is a total of 930,000 litres of diesel (6 tanks @ 155,000 litres = 930,000 litres) stored in the tank farm.

The tank farm will have the following protection measures:

- Bund capacity of at least 110% of the largest container. The bund is designed to hold groups of tanks, i.e. Tank 1 and 2 are together in the same bund, to maintain independence from the other Blocks.
- Poured concrete walls with appropriate joints to prevent weak points and seepage.
- Fill points located in a lockable cabinet provided with a drip tray designed to capture minor spillages during hose connection/disconnection. The fill point cabinet will be kept locked shut when deliveries are not taking place.
- High and low level alarms.
- Overpressure valves.

- Fuel polishing systems, to maintain fuel quality.
- Manually operated pumps to remove uncontaminated rainwater.

8.6.3 Underground Pipelines

The underground pipelines connect each Block to the tank farm. Given the space constraints on the site an above ground pipeline system was not considered practical, and could increase the likelihood of a vehicle collision with the pipeline.

The underground fuel lines are Brugg Secon -X pipes. These are flexible, double-walled and bendable composite piping system with an inner pipe made of stainless steel and an encasing mantle pipe made of PE separated by struts. This pipe system was specially developed as a fuel carrier pipe for petrol stations. An example of the pipeline system and manifold is shown in the photograph below.

Each pipeline is connected to a vacuum system which can detect leaks at very low concentrations. Should a leak be detected, the pipeline can be isolated and the secondary pipeline remain operational while the leaking pipeline is drained and investigations are undertaken.

Each length of pipeline is expected to be one continuous piece of pipeline, with no joints. Should an intermediate jointing pit be required, it will be a sealed chamber with manhole access above.

8.6.4 Tanker unloading bay

The tanker loading bay is an engineered concrete area which drains to a central point, where a sealed collection sump is present. The sump beneath the loading bay is sized at 7,000 litres, equal to a single compartment of a multi-compartment fuel delivery tanker.

A tanker unloading procedure will be documented within the EMS which includes the process for draining the sump of uncontaminated rainwater, and processes to deal with fuel spills and leaks.

8.6.5 Fuel Storage BAT conclusions

The datacentre will be manned 24 hours a day by facilities management personnel. Based on the above, it is considered that GTR will operate the generators and associated diesel storage and distribution arrangements at the datacentre in accordance with all relevant BAT.

9.0 Odour and Noise

9.1 Odour

There are no significant sources of odour from the Installation, and so odour is not considered further in this permit application.

9.2 Noise Assessment

An assessment of the potential for impact on sensitive receptors from the 21 new generators in terms of noise has been undertaken and is presented in an attached report (Noise Report_1).

9.2.1 Assessment Report

This assessment (Report J20-12794A-20/F2) was undertaken by Noise Consultants Ltd dated 29th October 2021. The assessment of noise impact at residential receptors followed the procedure described in British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (BS 4142:2014+A1:2019). The assessment of noise impact at non-residential receptors is not covered within the scope of BS 4142:2014+A1:2019 so reference was made to British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings' (BS 8233:2014).

The assessment considered impact due to normal operations and emergency conditions separately.

9.2.2 Conclusions of the Assessment – Normal operations

Residential receptors - The assessment showed that noise is at or below the existing background sound level during the day at both residential receptors, but slightly exceeded existing night-time background sound level at R2. A BS 4142:2014+A1:2019 outcome of "**Indication of low impact depending on the context**" was considered appropriate for the residential receptors during both the day and night.

Commercial receptors - The Proposed Development could result in a 2 dB increase in external daytime ambient sound levels at the nearest commercial receptor during normal operations. However, when considering the typical sound attenuation provided by a modern sealed façade, internal sound levels are expected to be below the guideline internal sound levels of 35 – 40 dB LAeq,T for an 'executive office' as presented in BS 8233:2014. Therefore, it is considered that impact at the nearest commercial receptors is **not significant**.

9.2.3 Conclusions of the Assessment – Emergency operations

Residential receptors – The noise exceeds the existing background sound level during the daytime and the night-time periods. The emergency generators would only be expected to run concurrently during power outages. The frequency of occurrence is therefore anticipated to be very low. A BS 4142:2014+A1:2019 outcome of "**Indication of low impact depending on the context**" is considered appropriate for the residential receptors during both the day and night.

Commercial receptors – The Proposed Development could result in a 3 dB increase in external daytime ambient sound levels at the nearest commercial receptor during emergency operations. However, when considering the typical sound attenuation provided by a modern sealed façade, internal sound levels are expected to be below the guideline internal sound levels of 35 – 40 dB LAeq,T for an 'executive office' as presented in BS 8233:2014. Therefore, it is considered that impact at the nearest commercial receptors is **not significant**.

9.3 Noise Management Plan

Although the Noise Impact Assessment does not predict significant adverse effects, a Noise Management Plan will be developed as part of commissioning works.

10.0 Site Condition Report

- A Site Condition Report has been prepared and is appended to this application (Site Condition Report_1).
- A Site Baseline Report has been prepared and is appended to this application (Site Baseline Report_1).