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Spring Park, ARK Datacentres: Permit Variation EPR/PP3003PW

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Non-Technical Summary

The Spring Park Data Centre Campus, owned by Ark Data Centres Ltd (Ark) operates in accordance with Environmental Permit EPR/VP3235DJ first issued 27/01/20. Electricity for operation of the data centres is provided by five individual connections to the National Grid. Due to the need to always ensure availability of uninterrupted power supply, and in accordance with the permit the site currently allows for the operation of 54 diesel/Hydrotreated Vegetable Oil (HVO) fired standby generators. Due to demand for data centre capacity, Ark is expanding the site by installing an additional 16 standby generators within a new data substation (SQ19) that will be phased in over time, providing a total of 70 standby generators. Initially, the expansion of the site will concern six generator sets (Gen 01 through Gen 06) at SQ19, which are due to be commissioned in the fourth quarter of 2023. The data centre facility that will be supported by these generators will not be ready for commissioning until mid-2024, therefore the timescale has yet to be set for the delivery of the other units at SQ19.

Ark Data Centres Ltd is an experienced data centre operator and has established specification and management arrangements for the safe and efficient operation of data centres within the UK that are certified to ISO 14001:2015 & ISO 50001:2018. Ark has a rigorous design process to ensure that its data centres remain innovative, progressive, environmentally focussed, secure and energy efficient. The company recognises the importance of the design and development function in ensuring its activities are as energy efficient as possible. This includes the utilisation of free cooling and the specification of energy efficient plant and equipment.

The company employs specialist contractors for the supply of equipment, management and maintenance of the facility to ensure compliance with Best Available Techniques (BAT). The installation is therefore specified and will operate in a manner that is consistent with EU guidance for Large Combustion Plants BREF note. In addition, the operator has been instrumental in consulting with the Environment Agency in advance of permitting regulations being extended to data centre operations and complies with the requirements highlighted within the EA published FAQ Headline Approach V10 agreed with operators and TechUK. Ark remains actively engaged with the data centre sector working group on environmental permitting.

The emergency standby generators associated with SQ19 are new, emissions optimised and are therefore designed to operate within strict emission control standards. As with the other existing and planned generators for the site, HVO will be utilised as main fuel type across the facilities with an option to use diesel as an alternative fuel type in the event of shortages in the supply of responsibly sourced HVO. The generators are tested periodically to ensure they are ready for use in the event of a mains failure and the impact of their operation during normal, test and emergency operation condition has been assessed from a noise and air quality perspective. Fuel specification, handling and containment arrangements are in place and the facility is served by high integrity hard standing with petrochemical interceptors on surface water drains. All personnel on site are inducted and trained in operational control procedures including responding to environmental incidents.

Both the noise and air quality assessments conclude that the impact of routine maintenance operations on air emissions is “insignificant” and with the mitigation and management measures in place, the risk of air quality exceedance arising from emergency operations is low.

1. What operations are you applying to vary?

Table 1 Types of Activities

Schedule 1 listed activities						
Installation Name	**Schedule 1 References**	**Description of the activity**	**Activity daily capacity**	**Annex IIA or IIB (disposal and recovery) codes**	**Hazardous waste treatment capacity**	**Non-hazardous waste treatment capacity**
Spring Park Data Centre	S1.1 A1(a): Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts	Operation of up to 70 emergency standby generators with a total thermal input of approximately 328 MW(th). The generators will burn diesel/Hydrotreated vegetable oil (HVO) solely for the purpose of providing electricity to the installation in the event of a failure of supply from the National Grid.	328 MW(th)	-	-	-

Directly associated activities		
Name of DAA	**Description of the DAA (please identify the schedule 1 activity it serves)**	
Storage of fuel materials	From receipt of fuel to use within the facility.	
Storage of raw materials	From receipt of raw materials to use within the facility.	
Surface water drainage	Input to site drainage system until discharge to surface water drain via interceptors.	
Discharge to sewer	Collection of process effluent from concrete refuelling bays to discharge to sewer connection.	
For installations that take waste	**Total storage capacity**	N/A
	Annual throughput (tonnes each year)	N/A

1.1 Proposed Changes

Spring Data Centre operates in accordance with Environmental Permit EPR/ PP3003PW first issued 07/07/20 and last varied 23/03/22. The permit currently covers operation of 54 HVO fuelled standby generators that serve separate data centre buildings (SQ17, P1, P2, P3 and P4). Data centres SQ17, P1 and P2 have LV standby generators assigned directly to them. Data Centres P3 and P4 are supported by a shared HV standby generation substation (HV Gen). The aggregated total combustion capacity within the whole installation is approximately 237.6 MWth.

In order to meet customer expectations and to provide security of services the operator is required to have resilient, concurrently maintainable standby generator systems on site. Each building is therefore required to be supported by at least "N+1" generators, which means there is one generator more than would be required to provide the total power for that building (or set of building) in the event of an external power failure.

To account for the required expansion of the facility Ark is proposing to install additional facilities with standby generators, providing a total of 70 units. The addition of 16 new generators in the SQ17 substation will serve a new data centre facility P5 that is expected to become operational in 2024.

SQ19 area lies to the southwest of SQ17. The first phase is due in the fourth quarter of 2023 and will include the installation of six generator sets (Gen 01 through Gen 06). SQ19 has been planned to allow the further 10 generator sets to be installed on a future date. All generators are the same model (MTU DS2500). Each of the new generator sets will include a double skinned belly tank, manufactured to BS 799:2010 Part 5 Type J (2010). All the tanks will have a usable capacity of 37,908 litres. The outer tank will have a volume of 52,400 litres, providing secondary containment of 138% of the primary vessel volume to comply with the Oil Storage Regulations.

1.2 Standby Generator Capacity

The Spring Park Site Plan (Drawing 1 OPP08375-JCA-PM-ZZ-DR-E-61001- Proposed Masterplan) shows:

- The land ownership boundary of the campus (blue line). This is also the existing installation boundary of the permit.
- The location of each of the emergency standby generators associated with the data centres are indicated by the exhaust stack locations using the references within Table 4. The Generator Data Sheets are presented in Appendix C with details of air emissions from the supplier's datasheet used within the Air Quality Assessment Report (Appendix D) and noise performance data used within the noise assessment (Appendix E).

The provision on site for the deployment of a total of 70 emergency standby generators has been assessed in the attached technical assessments for noise and air quality.

All generating units to be installed within the existing installation boundary will be configured in four banks as follows:

- HV Gen Farm (Buildings P3 & P4): 24 standby generators;
- Building P2: 12 standby generators;
- Building P1: 10 standby generators;
- Building SQ17: 8 standby generators, and;
- Building SQ19: 16 standby generators (Building P5).

Site layout plan is shown in Drawing 2 (Reference OPP08375-JCA-PM-ZZ-DR-E-61002 – Generators Emissions Data) shows the location of each of these units, emission point grid references and associated emissions data.

The total generating capacity and thermal input at the site will increase from the current 54 permitted standby generators with approximately 237.6MWth in total to 70 units comprising approximately 328.2 MWth input in total as summarised in the table below.

Table 2 – Summary of overall standby generating capacity

Campus	Facility	Full IT Capacity (MW(IT))	Generator Capacities		EPR/PP3003PW/V003	
			Rating (e) (kW)	Rating (th) (kW)	No of Units	Rating (th) (kW)
Spring Park	SQ17	4	1,600	3,956	2	7,912
			1,520	3,301	3	9,903
			1,760	4,381	3	13,143
	P1	4.5	1,000	2,717	10	27,170
	P2	9	1,464	3,656	12	43,872
	P3&P4 (HV Gen)	24	2,040	5,650	24	135,600
	P5 (SQ19)	13.5	2,024	5,660	16	90,560
Spring Park		41.5			54	328,160

No individual plant is larger than 15 MWth, the activity falls under Chapter II of the IED. The plants are classed as medium combustion plant as part of a Chapter II installation. Medium Combustion Plant Directive (MCPD) requirements are fulfilled through compliance with Chapter II of Directive 2010/75/EU. The engines are classed at emergency/standby plant.

1.3 Combustion Technology Selection & BAT

At Spring Park, the emergency back-up generators are installed to provide power to the data centres in the unlikely event of a power outage of mains electricity supplies. To meet the requirements of a Tier III concurrently maintainable data centre, emergency back-up generators must:

- Start and take full electrical load in less than 2 minutes to minimise the quantity of batteries deployed in the Uninterruptable Power Supply (UPS) whilst the generators start, synchronise and accept the load.
- Have sufficient fuel stored on site to enable generator running at full load for 72 hours of continuous running.
- Be deployed in a resilient configuration such that if a generator is out of service (under maintenance or unavailable) the remaining generators can support the full facility electric load (i.e. N+1 as a minimum).
- Must be tested regularly to ensure that they will operate in the unlikely event of a mains power outage.
- Must be able to operate at low loads, during early deployments as the IT demand grows and when external ambient conditions dictate very small cooling demand in the facility.
- Must be modular to allow for expansion as the data centre load grows.

As the emergency back-up generators are an intermittent source of power and the data centres use ambient conditions for “free cooling” there is no opportunity for using heat recovery systems on the generators to improve overall operating efficiencies.

In addition, the electric loads in the facility can change very quickly in response to changes in IT processing demands and/or external ambient conditions. The emergency back-up generators must therefore be able to respond quickly to changes in load condition.

The available engine technologies to provide this level of duty are, diesel engines, gas spark ignition engines, gas turbines and fast start aero engine derivatives. A high-level comparison of the attributes associated with these four technologies, bearing in mind the specific data centre requirements, is presented in Table 3:

Table 3 – High Level Comparison of Alternative Engine/Fuel Technologies

Attributes	Engine/Fuel Technologies (no heat recovery)			
	Diesel Engine	Gas Engine	Gas Turbine	Aero-Derivative
Start Time to Full Load	<2mins	7-10mins	10-15mins	2-5mins
Reaction to Load Changes	Immediate	Slow	Slow	Slow
Fuel Volatility and Storage Safety Risk	Low	High	High	High
Fuel Supply	Diesel/HVO	Gas, requires a grid connection	Gas, requires a grid connection	Gas, requires a grid connection
Fuel Storage	Simple tanks and gravity connections	Complex, gas compression, pumps and storage	Complex, gas compression, pumps and storage	Complex, gas compression, pumps and storage
Engine Maintenance	Low Frequency, Standard diesel engine technology	High frequency, Standard Gas engine technology	High frequency, Specialist engineering support	High frequency, Specialist engineering support
Cost per MW installed	Lowest cost	10-20% more costly than diesel engines	20-30% more costly than diesel engines	30-40% more costly than diesel engines

The high-level comparison between the technologies demonstrates that the benefits of fast start, reaction to load changes, simpler and safer fuel supply, storage and handling systems associated with a diesel combustion engine outweigh the benefits of the of the other technologies, particularly given the low anticipated run hours each year for the emergency back-up generators deployed at Spring Park.

The above points along with Ark's experience in developing data centres, goes towards demonstrating that plant sizing, number, configuration along with routine maintenance and testing of emergency back-up generation have all been carefully considered and are aligned with the principles of the BAT process, reducing raw material inputs, reducing fuel consumption, and therefore reducing more than just emissions to air per MW of IT processing capacity.

The supplier technical datasheets for each of the different generating units installed and planned to be installed as part of this variation are included at Appendix C. All engines are emissions optimised and are capable of being operated with Hydrotreated Vegetable Oil (HVO) in addition to diesel.

The design and configuration of back-up generators at Spring Park has been planned and flexed in response to demand and strategic aims of the campus. Plant sizing, number, configuration along with routine maintenance and testing of emergency back-up generation have all been carefully considered as the data centre campus has developed in line with the principles of the BAT process including technology selection and review of deployment needs, reducing raw material inputs, reducing fuel consumption and reducing more than just emissions to air per MW of IT processing capacity.

2. Emissions to Air, Water and Land

The following table provides an updated inventory of all generator units, their location, reference and capacity. This table should be used in conjunction with site layout drawing (Appendix 1 Drawing 2 Reference OPP08375-JCA-PM-ZZ-DR-E-61002 – Generators Emissions Data). The table below lists all generator exhausts for combustion gases. In addition, each generator unit fuel tank has an associated air breather vent to atmosphere.

Table 4 Emission Points to Atmosphere

Emission Point Reference & Location	Manufacturer & Model	Rated source (kw(e)	Rated source (kw(th)	BAT
GS1 SQ17	SDMO X2000C	1,600	3,956	Emissions Optimised
GS2 SQ17	SDMO X2000C	1,600	3,956	Emissions Optimised
GS3 SQ17	SDMO T1900	1,520	3,301	Fuel Optimised
GS4 SQ17	SDMO T1900	1,520	3,301	Fuel Optimised
GS5 SQ17	SDMO T1900	1,520	3,301	Fuel Optimised
GS6 SQ17	SDMO T1900	1,520	3,301	Emissions Optimised
GS7 SQ17	SDMO T1900	1,520	3,301	Emissions Optimised
GS8 SQ17	SDMO T1900	1,520	3,301	Emissions Optimised
G1 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G2 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G3 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G5 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G6 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G7 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G9 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G10 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G11 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
G12 P1	SDMO X1250C	1,000	2,717	Emissions Optimised
1 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
2 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
4 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
5 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
7 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
8 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
10 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
11 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
13 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
14 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
16 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
17 P2	SDMO X1850C	1,464	3,656	Emissions Optimised
HV 1 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 2 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 3 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 4 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 5 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 6 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 7 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 8 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 9 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 10 HVG	MTU DS2500	2,040	5,650	Emissions Optimised
HV 11 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR
HV 12 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR
HV 13 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR
HV 14 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR
HV 15 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR
HV 16 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR

HV 17 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR
HV 18 HVG	MTU DS2500	2,040	5,650	Fuel Optimised with SCR
HV 19 HVG	MTU DS2500	2,040	5,650	Fuel Optimised
HV 20 HVG	MTU DS2500	2,040	5,650	Fuel Optimised
HV 21 HVG	MTU DS2500	2,040	5,650	Fuel Optimised
HV 22 HVG	MTU DS2500	2,040	5,650	Fuel Optimised
HV 23 HVG	MTU DS2500	2,040	5,650	Fuel Optimised
HV 24 HVG	MTU DS2500	2,040	5,650	Fuel Optimised
SQ19 Gen 01	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 02	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 03	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 04	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 05	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 06	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 07	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 08	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 09	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 10	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 11	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 12	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 13	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 14	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 15	MTU DS2500	2,024	5,660	Emissions Optimised
SQ19 Gen 16	MTU DS2500	2,024	5,660	Emissions Optimised

Note 1: Oxides of Nitrogen and Carbon Monoxide Monitoring method and reference period in line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021e every 1500 hours of operation or once every five years (whichever comes first). No limits set.

There are no changes proposed for the arrangement of discharge of surface water and foul water from the installation.

3. Operating Techniques

3a Technical Standards

Table 5 Technical Standards

Description of the Schedule 1 Activity or DAA	Relevant Technical Guidance Note	Document Reference
S1.1 A1(a): Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts	Best Available Techniques (BAT) Reference Document for Large Combustion Plants	Section 3a Main Application Document Large Combustion Plant BAT Conclusions Appendix B(i)
As above	Data Centre FAQ Headline Approach V10	Section 3a Main Application Document Data Centre FAQ Appendix B(ii)

3.1 Operational Philosophy

The operational control philosophy of the listed activity has not changed as a result of this variation. The emergency backup generator array associated with the facility only operates to produce electricity for the data centre should mains electricity supply be interrupted. There will be seven independent mains feeds to the site so their operation for this purpose is very infrequent. However, the generators are tested to a schedule to ensure they are ready for use in the event of a mains failure and annually during their main service period.

All emergency standby generators are powered by diesel/HVO. The combustion of fuel in the event of a mains electricity supply outage, or for generator testing, are the only activities operated by Ark Data Centres Limited at Spring that give rise to the production of air emissions and additional noise as a result of emergency conditions and planned testing.

3.2 Generator Testing

The emergency generators are tested to a monthly/quarterly/annual regime on a rotating basis at days and times as agreed by customer contracts. The testing regimes for each facility are the same, but the timings are different:

- Off-load Generator tests are carried out monthly by group. Each bank of standby generators is tested monthly when Event 1 (b) and Event 2 are not being undertaken. This involves simultaneous operation of the bank at 0% of full load for 15-minutes;
- On-load generator tests (up to 66% load) where each bank of standby generators is tested three times per annum. This involves simultaneous operation of the bank at up to 66% of full load for 15-minutes;
- Service testing when each generator is connected to a load bank (individually) and run at full load for up to 2 hours. Service testing is carried out annually instead of one of the quarterly on-load tests. No other engines are operational during this testing.

The illustrative testing schedule is shown in the last sheet of the 230301_SP_Generator Schedule worksheet provided as Attachment (Appendix C iii). The testing schedule shows that maintenance testing is carried out such that no module testing overlaps, the lowest number of generators for each module are tested for each type of test at any one time. Note that this test is for the generators as deployed and does not account for those not yet installed/operating.

As a consequence of this testing regime, each generator typically runs for 4.08 hours a year with a cumulative run-time of around 286 hours a year for the full deployment of generators.

3.3 Grid Reliability

The Spring Park site is currently supplied via five 33kV supplies from SSEN the local Distribution Network Operator, configured as two independent resilient supply systems. One system comprises 2Nr 40MVA supplies providing 40MVA at N+N; the other has 3Nr 24MVA supplies providing 48MVA at N+1. To support P5 the SQ19 substation will have two new 33kV circuits from the SSEN local distribution network, taking the total number of supplies to the campus to seven, configured as three independent resilient supply systems. It is therefore anticipated this level of mains electrical system redundancy means that the mains generators are unlikely to operate all together for extended periods of operation.

3b General Requirements

Table 6 General Requirements

Are fugitive emissions an important issue?	No
Is odour an important issue?	No
Is noise and vibration an important issue?	Yes – See Appendix E

3.4 Emissions to Sewer, Surface Water and Groundwater

3.4.1 Surface and Foul Water Drainage

The data centre cooling processes employed on the Spring Park Campus are designed and operated to minimise the use of mechanical cooling systems by using adiabatic (evaporative) cooling technology where the process responds dynamically to the actual IT cooling demand and external ambient conditions. This means that when external ambient conditions dictate the site uses:

- the waste heat generated by the servers to heat the incoming cold air.
- water collected by our rainwater harvesters to provide water for evaporative cooling.
- mechanical cooling for limited periods only.

In an "average" year, Ark data centres will use free cooling for around 98% of the time, with mechanical cooling in use for around 2% of the year. There are no changes to the arrangement for the disposal of process effluent arising from the cooling process.

There are no further changes to the site drainage proposed as a result of this variation. The existing secondary and tertiary containment measures have been recently assessed by the local inspector and follow on from the completion of IC2 and IC3 of the current permit. Since then, the operator has updated its spill response procedures to account for the deployment of inflatable pillows in the P1 area (Appendix G - Pollution Control Plan for Major Spills and Fire Water Run Off Plan). This provides emergency tertiary containment before discharges can occur to the infiltration pond. These inflatable pillows were selected for potential use on the lined attenuation pond that receives surface water drainage from P1 and P2. Once deployed, this would enable the use of the attenuation pond as a tertiary containment tank.

In SQ19 the generator sets are to be installed in a hard surfaced area, occupying an area of approximately 2,040m². The generator sets will be installed in two banks running from west to east, either side of a proposed channel drain:

- Gen 01 through Gen 08 will lie to the south of this drain,
- Gen 09 through Gen 16 will lie to the north.

The channel drain will discharge to a soakaway to the south of generators Gen 01 through Gen 08 via a petrol interceptor. The petrol interceptor has been specified as a Klargester NSP8003 Class 1 bypass oil separator or equivalent approved unit. The interceptor will have a 45 litre and 300 litre storage capacity for oil and silt respectively. The interceptor will be fitted with an oil alarm.

The updated CIRIA 736 assessment (Appendix F) indicates that with the measures the operator has in place, as detailed above, plus secondary containment with spill alarm, tank gauging and regular site inspections, that the risk of an uncontrolled release from all generators will remain low and therefore effectively managed. This is in line with the principles discussed an agreed with local EA regulatory officer during site visits.

3.4.2 Fuel Storage and Delivery

To meet customer requirements the operator must maintain sufficient fuel on site to operate the standby generators for 72 hours. To achieve this obligation each generator set (new and existing) has a double skinned belly tank manufactured to BS 799: Part 5 Type J (2010) and meets all requirements as set out in Oil Storage Regulations (2001). Each standby generator therefore can hold up to 72 hours of fuel when running at full load.

The design of SQ17 EC1 differs from the remainder of the installation in that two standby generators are installed side by side in a generator hall with interconnected belly tanks. A remote, above ground integrally bunded tank serve the belly tanks for generators 1 and 2. This tank has a capacity of 18,175 litres and the bund provides 110%

of the capacity of the primary vessel. Fuel is supplied from the remote tanks via 63mm petrofuse twin wall pipework. This pipework runs belowground in 150mm diameter sealed concrete ducts. A fuel work pit is fitted with leak detection. The ducts are fitted with ingress seals with the pits, to prevent losses to soil.

The filling point for the remote above ground tank supplies the vessel via 63mm petrofuse pipework, which runs underground via sealed ducts constructed as described above. The filling points are fitted with level gauges for the tank and an overfill alarm.

The new MTU DS2500 sets for the SQ19 installation will be supplied with an integral fuel polishing system. The double skinned tanks and pipework (compliant with the Oil Storage Regulations) are protected against inadvertent damage by being installed within the secure data centre compound which is a controlled area with limited access to people and vehicles.

Ark operates strict management processes for all work on the live data centres. These processes include Standard Operating Procedures (SOP), Risk Assessments and Method Statements (RAMS), permits to work and change control process. A specialist facilities management contractor oversees the delivery of fuel and maintenance of the associated infrastructure by competent third parties. In addition to SOPs and RAMS for fuel deliveries Ark also has Emergency Operating Procedures (EOP) for fuel spills and leaks. To support the EOP for fuel spills and leaks "Spill Kits" are distributed at every set of generators, with a minimum 1 wheelie bin kit for every two generators. The contents of a "Spill Kit" are listed on the spill kit inspection sheet. Spill kits are inspected monthly as part of the monthly Planned Preventative Maintenance (PPM) schedule.

Overfilling the diesel belly tanks is prevented by an overfill prevention valve attached to the fuel delivery point of each tank. Sight gauges at the fuel delivery point also facilitate the management of the fuel filling process. These sight gauges are in addition to the fuel gauges and alarms displayed by the energy management system on screens in the data centre operating centres.

The containment design taking account of the site infrastructure, materials storage and technical specification of the generators and associated fuel/oil delivery infrastructure has been assessed and updated (Appendix F). to include the SQ19 installation. The report concludes that the measures in place, together with those planned as part of existing permit improvement conditions, are considered adequate to eliminate the risk of secondary containment failures or overflow under the 'total loss' scenario.

3.4.3 Waste
There will be no change to the types of waste generated, how they are stored and arrangements for collection and recovery.

3.4.4 Fugitive Emissions to Air
There is no change in the potential for fugitive releases to atmosphere as a result of this variation. The only source of fugitive release is from the vents associated with each of the fuel storage tanks that will occur only during refuelling operations. There is no risk of dust release from the installation through the handling of raw materials or waste. There is no potential for fugitive emissions to air from chillers as cooling requirements are met using a Direct Air Evaporative Cooling plant.

3.4.5 Odour
There are no sources of odour at the site.

3.4.6 Noise
There is very little potential for offsite noise nuisance from the site under 'Normal Operations' when the main sources of noise will be plant which will normally be running, such us the internal plant rooms with associated

ventilation inlet and outlet louvers at the buildings' facades and the external roof plant associated with P5 ancillary block and SQ17 extension.

In 'emergency backup' situations the ground level backup electricity generators associated with main power failure will be the main sources of noise together with operation of roof mounted air-cooled condensing units associated with emergency cooling system that could lead to off-site impact. The acoustic acceptability of the installation has been assessed following a baseline sound survey out at the closest noise-sensitive receptors and through a comprehensive noise modelling exercise (See Appendix E).

3c Types and Amounts of Raw Materials

The type of raw materials handled and stored at the installation will not change as a result of this variation. Table 7 summarises these together with the increase in the maximum potential amount stored and annual throughput as a result of the increased number of generators covered by this variation.

Table 7 Raw Materials Inventory

Schedule 1 Activity	*Description of raw materials and Composition*	*Max Amount (litres)*	*Annual Throughput (ltrs each year)*	*Description of Use*
S1.1 A1(a)	*HVO/Diesel*	*2,961,000*	*<105,,000*	*Fuel*
*S1.1 A1(a) **	*Oil*	*21,000*	*<680*	*Lubricant*
*S1.1 A1(a) ***	*Ethylene Glycol*	*3,500*	*<65*	*Coolant*
S1.1 A1(a)	*UREA/AdBlue*	*9,000*	*<200*	*Selective Catalytic Reduction on HVGen*

The levels of all raw materials are quoted as maximum and would vary over time as a result of operational activities and maintenance.

* Calculations are based on maximum values and based on full site capacity (70 generators x 300 litres per generator (16,200 litres). No additional substances are stored on site as spares in relation to the maintenance of the Standby Generators as all servicing and maintenance is done by a supplier who brings all materials onto site.

** Calculations are based on maximum values and based on maximum capacity (70 generators x 50 litres per generator (2,700 litres)). No additional substances are stored on site as spares in relation to the maintenance of the Standby Generators as all servicing and maintenance is done by a supplier who brings all materials onto site.

3d Management Systems

There will be no change in Ark's management system as a result of this variation.

3d Accident Management

The Pollution Control Plan for Major Spills and Fire Water Run Off (Appendix G) has been updated and extended to:

- Include the SQ19 site
- Address the use and storage of UREA/Adblue used in by the Selective Catalytic Reduction units (SCR) on generators HV11 – HV18 in the HVGen Farm.

Other than this there is no change to the accident management plan for the installation as a result of this variation. The other control measures previously described in the original application are sufficient.

4. Monitoring

4a Describe the measures you use for monitoring emissions

In line with Data Centre FAQ Headline Approach V10 (agreement point 6) as the individual or groups of generators will not run more than 500 hours in either emergency or standby operational mode (including repair and testing) the emission limit values ELVs to air (and thus engine emissions monitoring) are not required within the permit under the IED/MCPD.

There is no requirement for continuous emissions monitoring from the process. The operator does not propose any continuous emissions monitoring. However, monitoring ports will be included in the exhaust stacks for emissions monitoring during the annual full load test once every five years as required by the existing Permit and the regulations.

4b Point source emissions to air only

As above.

5. Environmental Impact Assessment

5a Have your proposals been the subject of an EIA under Council Directive 85/337/EEC?

No

6. Resource Efficiency and Climate Change

6a Describe the basic measures for improving how energy efficient your activities are?

Ark has a rigorous design process to ensure that its data centres remain innovative, progressive, environmentally friendly, secure and energy efficient. The company recognises the importance of the Design and Development function in ensuring the organisations activities are as energy efficient as possible.

Energy planning activities are undertaken by Ark on an ongoing basis and are included in regular energy reviews. The aim of these activities is to create a method through which energy usage is continually reviewed to create achievable, yet challenging energy objectives which will lead to more effective energy use and consumption. In carrying out these activities, Ark will live by the values stated in their Energy Policy and fulfil the pre-determined requirements stated in their Climate Change Agreement.

In addition, Ark actively engages with their clients to ensure that their activities also support the energy efficiency of the data centres.

6b Provide a breakdown of any changes to the energy your activities use and create

The estimated energy use for a typical 12-month period when the data centre will be at full capacity.

Table 8 Energy Use

Period	*Electricity (MWh/yr)*	*Natural Gas (MWh)/yr*	*HVO (litres)/yr*	*Total Emissions (tCO2e)/yr*	*Carbon Intensity (gCO2e)/kWh*
Full Capacity	*~348,998*	*0*	*<98111*	*<267*	*<0.77*

6c Have you entered into, or will you enter into, a climate change levy agreement?

The operator will remain within its current climate change levy agreement.

6d Tell us about, and justify your reasons for, the raw and other materials, other substances and water you will use

There are no changes to the raw and other materials inventory as result of this variation.

6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste

The existing measures to avoid waste and documented waste management plan are unchanged as a result of this variation.

7. Installations that include a combustion plant (excluding waste incinerators)

Is the aggregated net thermal input of your combustion plant more than 20MW(th)?

Yes

8. Environmental Risk Assessment

The following sensitive receptors have been identified as being potentially affected by operations at the site. A desk-top study was undertaken to identify any sensitive human receptor (such as residential properties, schools, care homes, health facilities, leisure facilities etc.) in the vicinity of the Site that required specific consideration due to the potential impact at these locations from emissions from the standby generators. These are summarised in Table 9 and shown in Figure 1.

Table 9a Sensitive Receptors - Human

ID	Location	Coordinates		Emission which may impact on the receptor and their relevant pathways
		X	Y	
R1	68 Westwells	385239.6	168903.8	Noise, Air Emissions
R2	26 The Links	384544.3	169404.9	"
R3	The Retreat, Bradford Road	384256.3	169104.3	"
R4	Glenhaven, Bradford Road	384249.1	168680.2	"
R5	31 Moor Park	385443.6	168781.5	"
R6	Jaggards House	385435.2	168536.8	"
R7	Westwells Road	384781.7	169169.0	"
R8	Roundwood Cottage	384785.0	168498.2	"

Emissions from the facility also have the potential to impact on receptors of ecological sensitivity within the vicinity of the Site. A desktop study was undertaken to identify the following sites of ecological or nature conservation importance:

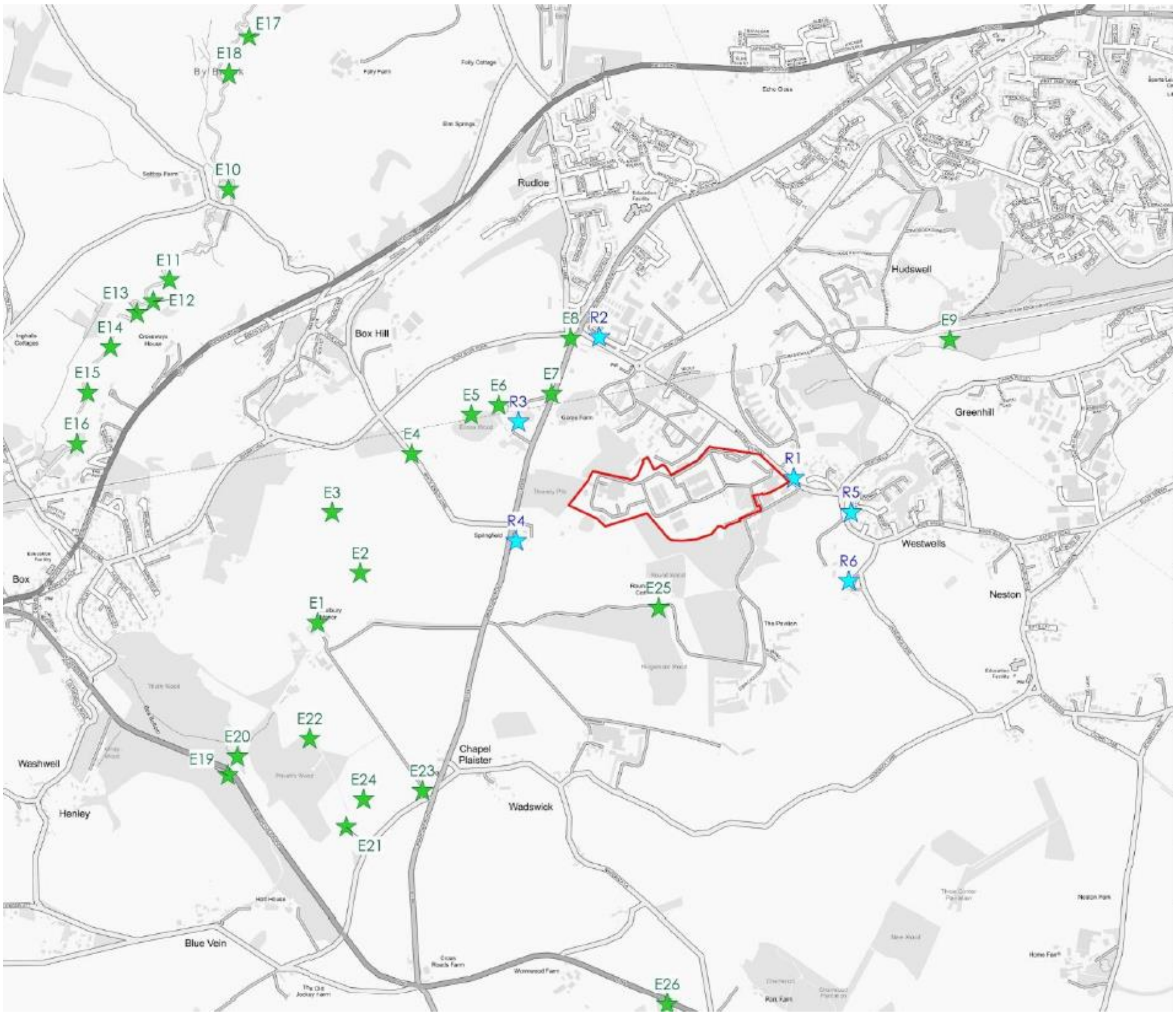
- Special Areas of Conservation (SACs), Special Protected Areas (SPAs) or Ramsar sites within 5km of the standby generators;
- Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), local wildlife sites and ancient woodlands within 2km of the standby generators.

A pre-application request was submitted to the EA in order to identify relevant sites of ecological or nature conservation importance for inclusion in the assessment. The response indicated the following designations within the relevant distances referenced within the table and the closest point from the installation to each designation given.

Table 9a Sensitive Receptors – Ecological (statutory only see Air Quality report for non0-statutory sites E10-27)

ID	Location	Coordinates		Emission which may impact on the receptor and their relevant pathways
		X	Y	
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383540.9	383540.9	Air Emissions
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383693.2	168564.8	"
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383593.2	168780.9	"
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383877.4	168990.1	"
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	384088.9	169128.8	"
E6	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	384186.7	169162.9	"
E7	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	384375.5	169203.9	"
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	384443.7	169401.7	"
E9	Corsham Railway Cutting SSSI	385794.5	169394.9	"

Figure 1 Sensitive Receptors – Human and Ecological in the immediate area of the installation.



Impact of Emissions to Air

The principal sources of emissions to atmosphere from the installation are identified in Table 4. This section presents the approach to the assessment of the impact of these emissions on the local receiving environment.

An air quality assessment has been undertaken based on data for the standby generators provided by the equipment suppliers. The pollutants associated with the generators, as provided by the generator manufacturers are nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM10) and sulphur dioxide (SO_2) plus Formaldehyde (CH_2O); therefore the assessment focuses on these pollutants.

In accordance with Data Centre FAQ Headline Approach V9 the assessment considers the potential impact from the operation of the standby diesel generators under the following operating scenarios:

- Event 1 (a) - Standby generator test (no load). Each bank of standby generators is tested monthly when Event 1 (b) and Event 2 are not being undertaken. This involves simultaneous operation of the bank at 0% of full load for 15-minutes;
- Event 1 (b) - Standby generator test (80% load). Each bank of standby generators is tested three times per annum. This involves simultaneous operation of the bank at 80% of full load for 15-minutes;[1]
- Event 2 - Annual service test. Each generator is tested once per annum. This involves operation of a single generator at 100% of full load for 2-hours. No other engines are operational during this period; and,
- Event 3 – Grid Outage Event. In the event of a power outage all standby generators would operate at 50-88%% of full load depending on location until supply is resumed. As agreed with the EA it is assumed that operation would occur for a maximum of 72 hours. This is based on the resilience of the grid connection Standby duty will only occur in the event of a power failure. A Grid Outage Event of up to five days loss of grid power at a frequency of once per five years has been assumed, as a worst-case event.

A detailed air quality assessment is presented at Appendix D that assessed releases of nitrogen dioxide, particulate matter, sulphur dioxide and formaldehyde. Based on the modelling results and the existing baseline conditions, the results show that the predicted pollutant concentrations for Event 1, representing standby generator bank testing, were below the relevant Environmental Quality Standards (EQSs) at all receptor locations, with the exception of 10-minute NO2 concentrations at three receptors and 30-minute NO_2 concentrations at one receptor. However, this was based on an extreme worst-case scenario of the standby test coinciding with the worst-case meteorological conditions. Given the tests are only undertaken over a period of 15-minutes three times per annum, this is very unlikely to occur and can be avoided through timing of the event during periods of appropriate weather which can be controlled through implementation of the Air Quality Management Plan for the site. The AQMP has been updated to take account of the full design capacity of the site introduced by this variation (Appendix H). As such, impacts during Event 1 are not considered to be significant, subject to control of timing of HV Gen Farm testing.

Predicted pollutant concentrations for Event 2, representing annual standby generator testing, were below the relevant EQSs at all receptor locations. As such, impacts are not considered to be significant.

Predicted pollutant concentrations for Event 3, representing a 72-hour grid outage, were below the relevant EQSs at all human receptor locations, with the exception of the 1-hour mean AQO for NO2 and 1-hour mean EAL

[1] Event 1 (b) results in higher emissions than Event 1(a) as the generators are operated at a higher load. As such, this was the scenario considered throughout the modelling assessment and this document as 'Event 1' for brevity.

for CH2O. However, following further results analysis with the AQA and consideration of the risk of potential EQS exceedence, impacts are not deemed to be significant.

The risk of EQS exceedence at sensitive ecological receptors during Event 3 was predicted to be below 1%. As such, impacts are not considered to be significant.

Impacts on long-term pollutant concentrations were not predicted to be significant at any human or ecological receptor.

Point Source Emissions to Sewer, Surface Water and Groundwater

Sections 3b Fugitive Emissions and 3d Accident Management outline that there is no change in the risk to sewer, surface water and groundwater as a result of this variation. The outcome of the review required by IC2 and IC3 within the current permit confirms the sites existing approach to managing the risk posed by storage of potential pollutants on the site is considered appropriate. This is summarised in the risk assessment below in Table 10.

Odour

The installation has no discernible odour sources and does not present an odour nuisance risk.

Noise

A noise assessment has been undertaken to assess the impact of noise associated with full Data Centre site operations at Spring Park including for the future P5 data centre, the associated SQ19 substation to support of this Permit variation application.

The acoustic acceptability of the full Data Centre operation has been demonstrated utilising a baseline sound survey carried out at the nearest noise-sensitive receptors and a comprehensive noise modelling exercise. The assumptions of the noise model are based on source noise measurements carried out at existing and operating Data Centre P1, P2, P3, SQ17 and technical performance datasheet information from suppliers for new equipment for P5 and SQ19 together with the sound reduction measures to be employed.

Detailed assessment of operating scenarios have been assessed including 'Normal Operation' scenario assesses acoustic impact of plant which will normally be running, such us the internal plant rooms with associated ventilation inlet and outlet louvers at the buildings' facades and the external roof plant. Further scenarios included different 'Emergency Backup' scenarios to assess the acoustic impact of the different situations, including the extremely unlikely event of roof-mounted air-cooled condensing units associated with emergency cooling system operation and backup electricity generators operation associated with main power failure occurring simultaneously.

The report details that taking account of the noise reduction measures underway and in place that the assessment shows that 'Normal Operations' are expected to have No Impact or a Low Adverse Noise Impact at the nearest and most exposed noise-sensitive receptors, when assessed in accordance with BS4142:2014. The 'Emergency Generators Backup Operations' and 'Emergency Cooling Backup Operations' have both shown to have a Low to Significant Adverse noise impact when assessed in accordance with BS4142:2014. However, considering the emergency, short duration and very occasional occurrence of this scenario, it is considered appropriate to extend the Assessment to comply with BS8233:2014/WHO Guidelines. The assessment has found that in the worst-case scenario of all emergency power generators from all buildings operating at the same time, the BS8233:2014/WHO Guidelines at external amenity areas and the Indoor Ambient Noise Levels targets are achieved at all nearby properties. This scenario operation will not produce a significant adverse noise effect at the nearest noise sensitive receptors. The 'Emergency Generators Maintenance Tests Operations' have shown to have a Low to No Adverse noise impact when assessed in accordance with BS4142:2014.

The emphasis in the management of noise from the site is on prevention during 'normal' day to day data centre operations, and as such preventative maintenance, management, monitoring and inspection of all routine potential sources of noise. No additional measures are considered necessary at this time.

Table 10 Environmental Risk Assessment

Hazard	Receptor	Pathway	Risk Management Technique	Probability of Exposure	Consequence (Severity)	Overall Residual Risk
Emissions to air – generator emission from Standby and Service generator testing	See Tables 9a and 9b	Air dispersion	Selection, operation and maintenance of combustion units in line with BAT for the sector. Rotational time limited testing (each generator <5hrs and cumulative <100 hrs per year).	Low	Low	Low - See Air Quality Dispersion Assessment and Management Plan
Emissions to air – generator emission points Grid outage	See Tables 9a and 9b	Air dispersion	High level of mains electrical system redundancy, selection, operation and maintenance of combustion units in line with BAT for the sector	Low	Medium	Low - See Air Quality Dispersion Assessment and Management Plan
Noise – Normal Data Centre operations	See Tables 9a	Airborne	Specification and selection of equipment. PPM, monitoring and inspection of all routine potential sources of noise	High	Low	Low – See Noise Assessment.
Noise – Grid Outage operations	See Tables 9a	Airborne	Selection, operation and maintenance of combustion units in line with BAT for the sector High level of mains electrical system redundancy,	Low	Low	Low – See Noise Assessment.
Fugitive Emissions to Air – dust, litter etc.	See Tables 9a and 9b	Air dispersion	Housekeeping Standards	Low – no dusty materials	Low	Negligible

Hazard	Receptor	Pathway	Risk Management Technique	Probability of Exposure	Consequence (Severity)	Overall Residual Risk
Fugitive emissions to air – process	See Tables 9a and 9b	Air dispersion	Contracted maintenance programme.	Low - Potential for emissions during maintenance or in the event of a breakdown	Low – No impact	Negligible
Emissions to sewer from discharge point	Water Waste Water Treatment Works	Sewerage drainage system	Specification and selection of equipment. PPM, monitoring and inspection of all routine potential sources of noise Compliance with trade effluent discharge consent	Low (low volumes)	Low – No consent required compliant with consent	Low – site operates within existing consent levels.
Fugitive Emissions to surface water, sewer and groundwater – accidental minor leaks and spills – bulk fuel delivery and storage	Controlled Waters; Water Waste Water Treatment Works	Drainage system; overground.	Tank integrity checks; Containment alarms; Delivery procedures; Spill procedures and training;	Low	Medium – minor impacts with no pollution occurring	Low – minor leaks and spills routinely cleared up with no impact.

Appendices

Appendix A – Site Plans

i) **Drawing 1 OPP08375-JCA-PM-ZZ-DR-E-61001- Proposed Masterplan**

ii) **Drawing 2 (Reference OPP08375-JCA-PM-ZZ-DR-E-61002 – Generators Emissions Data)**

iii) **Drawing 3 Drainage Plan**

Appendix B – BAT Assessment

i) **Large Combustion Plant BAT Conclusions**

ii) **Data Centre FAQ Headline Approach V10 Operator Response**

Appendix C – Generator Specification

i) **Generator Technical Data Sheets**

ii) **230301 SP Generator Schedule**

Appendix D – Air Quality Assessment

Appendix E – Noise Assessment

Appendix F – CIRIA 736 Assessment: 2023 update

Appendix G - Pollution Control Plan for Major Spills and Fire Water Run Off Plan

Appendix H – Air Quality Management Plan (updated)