Equinix (UK) Limited

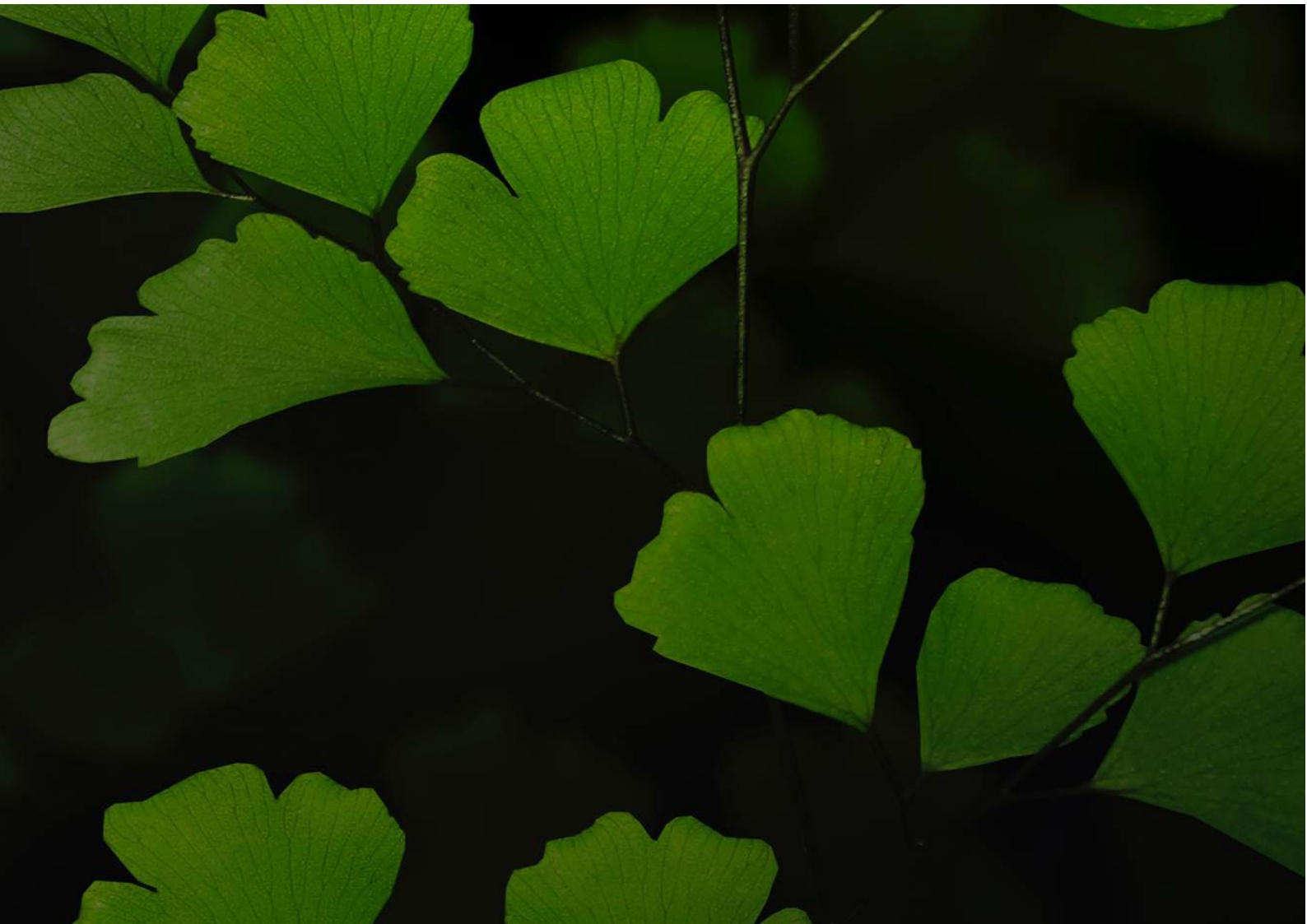
Environmental Permit Variation Application – LD14 Data Centre: Supporting Document

PREPARED FOR

Equinix (UK) Limited

DATE
29 April 2024

REFERENCE
0664507



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SIGNATURE PAGE

Equinix (UK) Limited

Environmental Permit Variation Application – LD14 Data Centre: Supporting Document

0664507

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AEGL	Acute Exposure Guideline Levels
AQA	Air Quality Assessment
AQIA	Air Quality Impact Assessment
AQS	Air Quality Standard
BAT	Best Available Technique
BMS	Building Management System
BREF	Best Available Techniques References document

Breach, breaching, breached	Used here when the predicted ambient concentration of a pollutant at a receptor will not comply with the air quality standard. For example, if the 1-hour mean NO_2 standard is predicted to be exceeded 20 times at a receptor, a breach of the NO_2 1-hour mean is therefore predicted as there would be more than the 18 allowed exceedances of this standard.
CBA	Cost Benefit Analysis
CCA	Climate Change Agreement
CHP	Combined Heat and Power
CO	Carbon Monoxide
DSI	Duct Sorbent Injection
EA	Environment Agency
EGR	Exhaust-Gas Recirculation
ELV	Emission Limit Value
EMEA	Europe, Middle East and Africa
EMS	Environmental Management System
EP	Environmental Permit
EPR	Environmental Permitting Regulations
ESP	Electrostatic Precipitator
Exceed, exceedance, exceeded	Used here when a predicted concentration is above an air quality standard threshold. For example, a 1 hour mean NO_2 predicted environmental contribution of 220µg/m^3 exceeds the 200µg/m^3 air quality standard
FAQ	Frequently Asked Questions
FCDP	Frequency Control Demand Management
GW	Ground Water
kWe	Electrical power in kilowatts
HDPE	High Density Linear Polyethylene
HFO	Heavy Fuel Oil
HV	High Voltage
IED	Industrial Emissions Directive
ISO	International Standards Organisation
Km	Kilometer
LPC	Large Combustion Plant
l	Litre
LAQ	Local Air Quality
m	Meter
MCP	Medium Combustion Plant
MCPD	Medium Combustion Plant Directive
MW_e	Megawatt Electrical

MW_{th}	Megawatt Thermal
NO_x	Oxides of Nitrogen
OTNOC	Other Than Normal Operating Conditions
PM_{10}	Particulate Matter of Diameter Below or Equal to 10µm
PUE	Power Usage Effectiveness
SCR	Selective Catalytic Reduction
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulphur Dioxide
SPZ	Source Protection Zone
STOR	Short Term Operating Reserve
SWIP	Small Waste Incineration Plant
t	Metric Tonne
TGN	Technical Guidance Note
UPS	Uninterruptable Power Supply
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

Equinix (UK) Limited (Equinix) is proposing to develop a new data centre, LD14 (the Site), located on the Slough Trading Estate, Slough. 12 new diesel-powered emergency backup generators and one currently permitted generator from the adjacent existing LD7 data centre are to be installed and operated at the Site, for the provision of back-up power in the event of a grid outage. It is proposed that the Site is included on the current Slough Campus environment permit (EP, ref. EPR/LP3303PR), which was last varied in November 2021. The Slough Campus EP currently comprises four component data centres, these are LD4, LD5, LD6 and LD7 with a combined thermal input capacity of 399 MW across 77 engines. The addition of LD14 will mean five sites are authorized under the combined Campus permit, with an aggregated thermal input capacity of 502 MW from 89 engines.

The following document has been prepared as a Supporting Information Document to support the permit variation for the Slough Campus EP to include LD14 and has been prepared by Environmental Resources Management Limited (ERM) using information supplied by Equinix.

As part of Equinix's drive towards continual improvement, the installation of Selective Catalytic Reduction (SCR) systems will be installed on all 12 of the newly procured generators at LD14 (the generator being transferred from LD7 will be unabated). SCR systems have been reviewed against Best Available Technique (BAT) as per the most recent EA Data Centre FAQ and Large Combustion Plant (LCP) BAT conclusions (BATc), which both consider SCR to be an appropriate abatement technology.

There are no expected emissions to watercourse or groundwater, and waste generation from SCR systems is minimal.

The principal emissions from the Site will be point source emissions to air from the Site's generator stacks. An updated air quality assessment (AQA) has been undertaken to assess the potential impact of air emissions on sensitive nearby potential human and ecological receptors, considering the chosen abatement techniques and testing regime.

The air quality assessment identified that for the testing regime at LD14 there is no potential to breach the hourly nitrogen dioxide (NO_2) standard as a result of the proposed testing regime. Therefore, no further proposals to reduce the risk of exceedance are made.

Although unlikely to occur based on the site's grid connection design and historic grid reliability in the Slough area – emergency power generation scenarios were assessed with all generators of the Campus alone and in combination LD11x and LD13x running concurrently. When the Campus generators are run in combination with the LD11x and LD13x generators there is predicted to be the potential for the hourly NO_2 standard to be exceeded, and with sufficient running hours for a breach to occur.

There were no modelled exceedance of the 24-hour NO_x standard at any of the modelled sensitive habitat areas.

Regarding noise, during the determination of the current Campus EP, the attenuation measures, screening from surrounding buildings and distance of sensitive receptors were considered sufficient to not require a detailed noise impact assessment as the component data centres comprising the Slough Campus do not have any routine sources of noise other than the periodic testing of the generators and their use in an emergency situation. The noise generated from the

12 newly proposed generators at LD14 is anticipated to be of a similar nature and therefore not require a detailed noise impact assessment. The closest residential receptors are also over 50 m away from the Site. On this basis, no detailed noise modelling has been undertaken in support of this variation application.

1. INTRODUCTION

The variation application and supporting information presented in this report for the LD14 Data Centre (located at 9-13 Banbury Avenue, Slough Trading Estate, Slough, SL1 4LH) has been prepared by Environmental Resources Management Limited (ERM) on behalf of Equinix (UK) Limited (Equinix). The supporting information document is based on the description of the proposed data centre provided by Equinix, publicly available environmental data and results of air quality dispersion modelling undertaken by ERM.

1.1 ENVIRONMENTAL PERMIT TO BE VARIED

This variation application pertains to the existing Environmental Permit for the Slough Campus, ref. EPR/LP3303PR. The permit currently comprises four data centres LD4, LD5, LD6 and LD7 which are collectively permitted under a "Campus Style" EP.

This EP was originally issued by the Environment Agency (EA) on the 26th February 2020 and has been subsequently varied two times. The first variation, issued in November 2021, was to remove a data centre previously included in the Campus permit, site name LD10 (now called LD13x). 23 new generators were also added across the LD4, LD5 and LD7 sites as part of this variation. The second variation, issued in September 2022, involved the partial surrender of an area of land that was previously included in the permitted Slough Campus Site boundary.

For reference, Equinix also operates the data centres LD11x and LD13x in Slough Trading Estate, however these are each operated under a separate permit and are not part of this variation application.

1.2 REASON FOR VARIATION APPLICATION

Equinix is requesting to vary the Campus Permit to add 12 newly procured generators at a new data centre named LD14 (the Site). The variation will also seek to transfer one generator that is currently permitted as part of the LD7 data centre, which is to be relocated to the new Site. LD14 will be located immediately to the east of LD7 and will comprise 13 emergency back generator (12 new, one existing).

This variation application makes no changes to any other part of the Campus Permit other than the single generator to be transferred from LD7 to LD14 i.e., there are no changes to data centres LD4, LD5 and LD6.

1.3 LISTED ACTIVITIES

Under this EP variation, the main commercial activity of the Slough Campus does not change and remains being primarily data storage. This will also be the case at the new Site.

The primary activity permitted by the Slough Campus EP under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) is the combustion of diesel in an appliance(s) with an aggregated thermal input of more than 50 megawatts (MW_{th}).

The listed primary activity (AR1) in the Permit Table S1.1 will remain unchanged by this variation, however, the activity description will need amending to refer to the updated thermal input capacity of the Slough Campus, which will increase because of the proposed additional LD14 generators. Details are given in **Table 1-1**.

Bold text within the below table indicates updates to the Slough Campus S1.1 activity table, as proposed by this variation.

TABLE 1-1: LISTED ACTIVITIES

Activity Reference	Listed Activities	Description of Specified Activity	Limits of Specified Activity
AR1	Section 1.1 Part A(1)(a) Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts	Operation of **89** emergency standby generators with a total thermal input of c. **502** MWth comprising: LD4: • 8 x 5.029 MW_{th} • 2 x 5.143 MW_{th} • 3 x 5.140 MW_{th} LD5: • 6 x 5.714 MW_{th} • 8 x 5.200 MW_{th} • 8 x 5.710 MW_{th} LD6: • 24 x 3.829 MW_{th} LD7: • 4 x 5.714 MW_{th} • **1 x 6.900** MW_{th} • 11 x 6.860 MW_{th} • 1 x 8.000 MW_{th} **LD14:** • **1 x 6.900 MW_{th}** • **12 x 8.000 MW_{th} (SCR abated)**	From receipt of raw materials (diesel **and Ad Blue for LD14 generators**) to **consumption by** emergency standby generators for electricity production to dispatch of waste. Electricity produced at the installation cannot be exported to the National Grid. The operational hours of the installation shall not exceed the specifications set out in condition 2.3.5. Generators shall only be operated for on-site emergencies and not for elective power generation, such as Balancing Services, Demand Side Response operations including Frequency Control Demand Management (FCDM) or Triad Avoidance.

1.4 DIRECTLY ASSOCIATED ACTIVITIES

The nature of the directly associated activities (AR2 and AR3) in the Slough Campus EP activities table S1.1 remain unchanged. However, Ad Blue will need storing for use by the LD14 generator SCR systems. The overall diesel storage capacity of the Slough Campus will also increase due to the additional generators, which will require additional new diesel tanks. Further details of raw materials stored on site are described in **Section 8** and proposed updates to the EP activities table S1.1 are indicated in **Table 1-2** below.

TABLE 1-2: DIRECTLY ASSOCIATED ACTIVITIES

Activity Reference	Description	Limits
AR2	Storage of raw materials	From receipt of raw material**s** (diesel **and Ad Blue**) to use within the facility.
AR3	Surface water drainage	Input to site drainage system until discharge to surface water drain via interceptors.

1.5 DETAILS OF COMPANY DIRECTORS

As required by application form part A, the directors for Equinix (UK) Ltd listed on Companies House at the time of this variation application are named below.

- Mr Eugenius Antonius Johannes Maria Bergen Henegouwen, Company Director, born [redacted]
- Bruce Owen-Crompton, born [redacted]; and
- Rene Maria Smit, Senior Director (Regional Finance, EMEA), born [redacted]

2. SITE DESCRIPTION

2.1 SITE LOCATION

The location of the four existing Slough Campus data centres (LD4, LD5, LD6 and LD7) remains unchanged and is detailed in **Table 2-1** below along with the location of LD14. **Bold** text within the table indicates the address of the new Site.

TABLE 2-1: LOCATION OF SLOUGH CAMPUS DATA CENTRES

Site	Address	Co-ordinates	Status
LD4	2 Buckingham Avenue, Slough Trading Estate, Slough, SL1 4NB	494777, 181422	Operational
LD5	8 Buckingham Avenue, Slough Trading Estate, Slough, SL1 4RY	495197, 181243	Operational
LD6	52 Buckingham Avenue, Slough Trading Estate, Slough, SL1 4PF	494751, 181453	Operational
LD7	Building 1, Banbury Avenue, Slough Trading Estate, Slough, SL1 4LN	494840, 181566	Building LD7.1: Operational Building 7.2: Construction to be completed by summer 2024
LD14	**9-13 Banbury Avenue, Slough Trading Estate, Slough, SL1 4LH**	**494938, 181594**	**Proposed new data centre, which is currently under construction and expected to operational by Q4 2026**

The locations of all the Equinix operated data centres on the Slough Trading Estate are shown in **Figure 2.1**, along with the proposed LD14 site. This includes LD11x and LD13x, which are permitted separately to the Slough Campus.

2.2 SITE CONTEXT

LD14 is located on land to the west of Dundee Road within the Slough Trading Estate, which surrounds the Site on all sides. The proposed LD14 data centre is located immediately east of the LD7 data centre. The nearest residential receptor is located on Newchurch Road approximately 200 m to the north of the Site.

The residential areas to the north of the Site extends approximately 1.5 km, beyond which the land use becomes rural in nature. There are areas of parkland approximately 500 m north.

To the south, the trading estate extends approximately 500 m beyond the Site, where it meets residential properties. There are areas of parkland and allotments approximately 1.2 km to the south of the Site. The M4 motorway runs east-west approximately 1.9 km south.

To the east, the trading estate extends for another 1.2 km beyond the Site, before the land use becomes residential, interspersed with recreational spaces.

There is an unnamed water course flowing north-south approximately 600m west of the Site. This is located within Haymill Valley Local Nature Reserve, which borders the trading estate approximately 575 m west of the Site.

The Site lies within the total catchment (Zone 3) of a groundwater Source Protection Zone (SPZ).

The context of LD14 is shown graphically in **Figure 2.2** *(*Land Use and Protected Sites), **Figure 2.3** (Water bodies and Groundwater), and **Figure 2.4** (Sensitive Built Receptors).

The site context of the four existing Slough Campus data centres has not changed because of this EP variation as there has been no alteration to their site boundaries.

In May 2022 a permit surrender application was prepared regarding the land to the east of the LD7 data centre, as included in the original Slough Campus EP. The parcel of land that was surrendered was unused and data centre operations had not taken place on the land at the time of the surrender application being made. This area was surrendered as part of the partial surrender application ref. EPR/LP3303PR/S003 and is now being readded to the Slough Campus EP through this permit variation. This land area is where LD14 is being constructed and operated on. The LD14 Site boundary is shown in **Figure 3.2.**

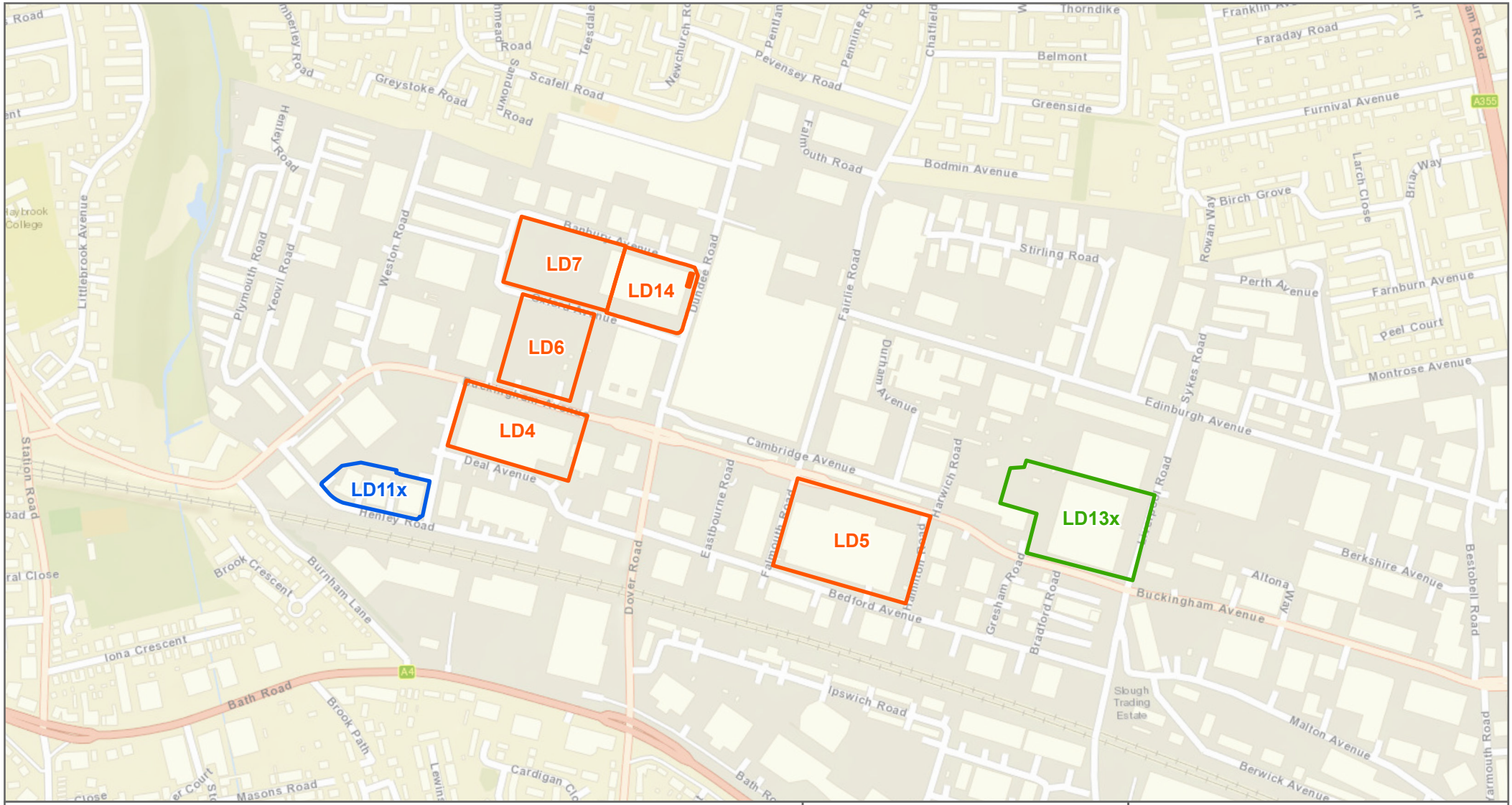

Figure 2.1 - Overview of Equinix Operated Data Centres in Slough
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A02
SIZE: A4	DRAWN: JG
PROJECT: 0664507	CHECKED: RP
DATE: 04/04/2024	APPROVED: DP

Site layout data provided by Equinix

ERM

EQUINIX

Note:
All site installation boundaries and site feature locations are indicative only unless otherwise stated

PROJECTION: British National Grid

OS, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

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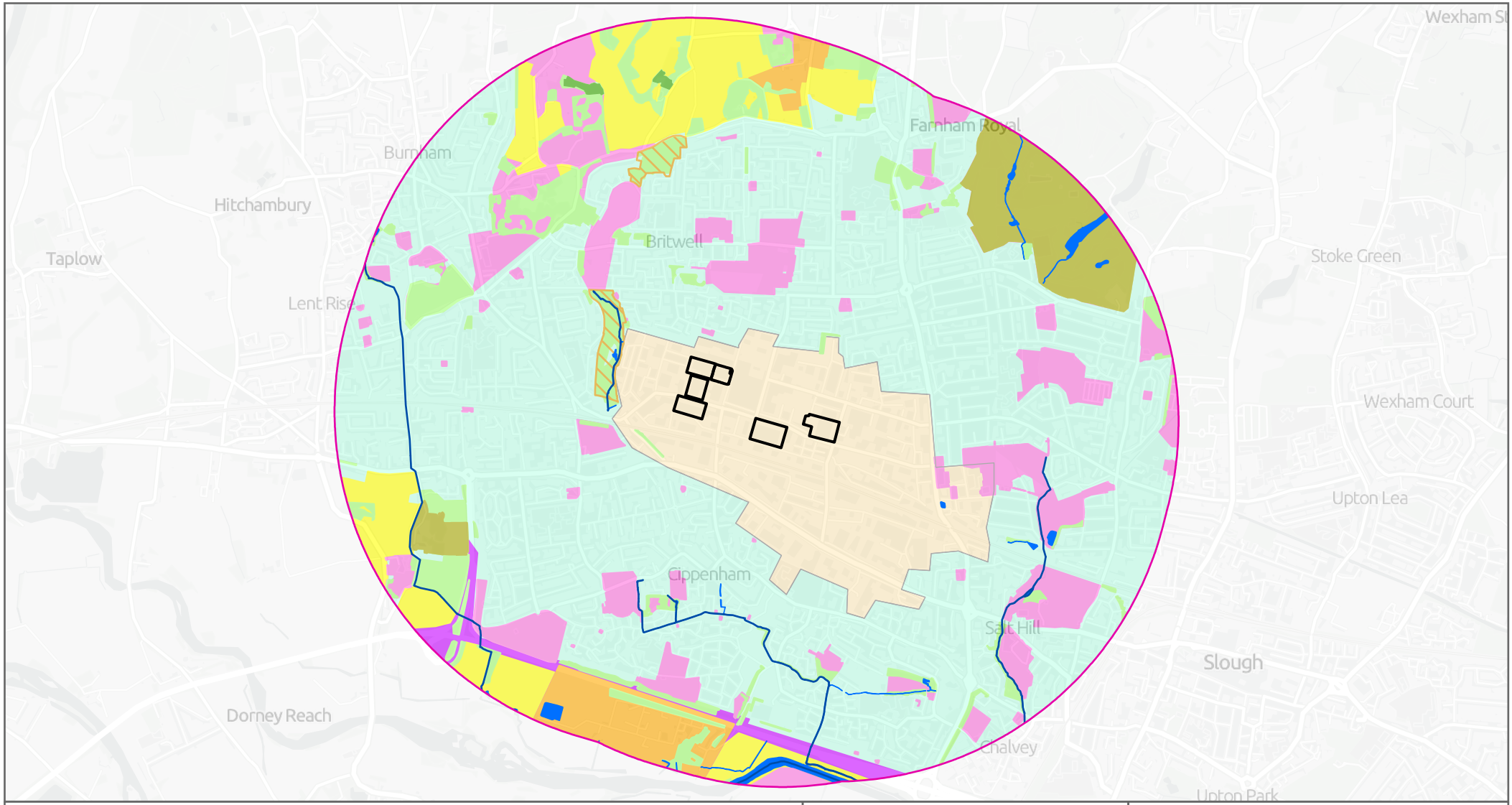

- Site Installation Boundary
- Site Installation Boundary 2km Buffer
- Ancient Woodland Inventory (AWI) (NE)
- Local Nature Reserves (LNR) (NE)
- Parks and Gardens (HE)
- Statutory Main River (EA)
- Surface Water Area (OS)
- Slough Trading Estate
- Agricultural Areas
- Housing Areas
- Industrial Areas
- Other Urban Fabric Areas
- Greenspace/Recreation Areas
- Woodland, Pasture and Parkland Areas

Note:
All site installation boundaries, land use designations and land use delineation boundaries are indicative only unless otherwise stated. Greenspace/Recreation Areas and Woodland, Pasture and Parkland Areas are partially derived from Ordnance Survey and Natural England data.

0 0.5 1
Kilometres

N

Figure 2.2 - Site Context - Land Use and Protected Sites
Slough Trading Estate, 765 Henley Road Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JG
PROJECT: 0664507	CHECKED: BC
DATE: 22/09/2023	APPROVED: DP

Site layout data provided by Equinix

ERM

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PROJECTION: British National Grid

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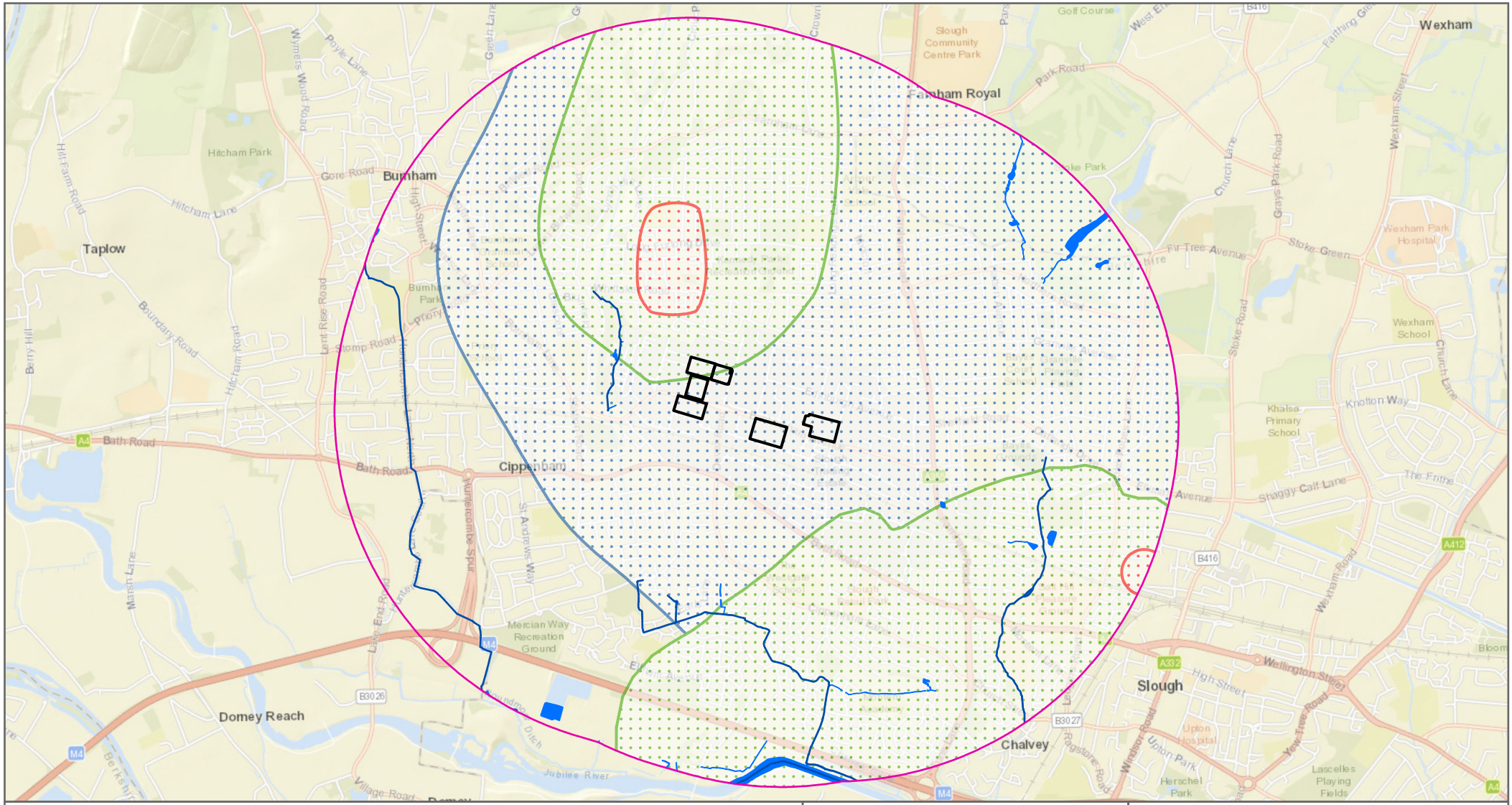

Site Installation Boundary

Site Installation Boundary 2km Buffer

Groundwater Source Protection Zones (SPZ) (EA)

Zone I - Inner Protection Zone

Zone II - Outer Protection Zone

Zone III - Total Catchment

Statutory Main River (EA)

Surface Water Area (OS)

Note:
All site installation boundaries are indicative only unless otherwise stated

0 0.5 1
Kilometres

N

Figure 2.3 - Site Context - Waterbodies and Groundwater
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JG
PROJECT: 0664507	CHECKED: BC
DATE: 22/09/2023	APPROVED: DP

Site layout data provided by Equinix

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PROJECTION: British National Grid

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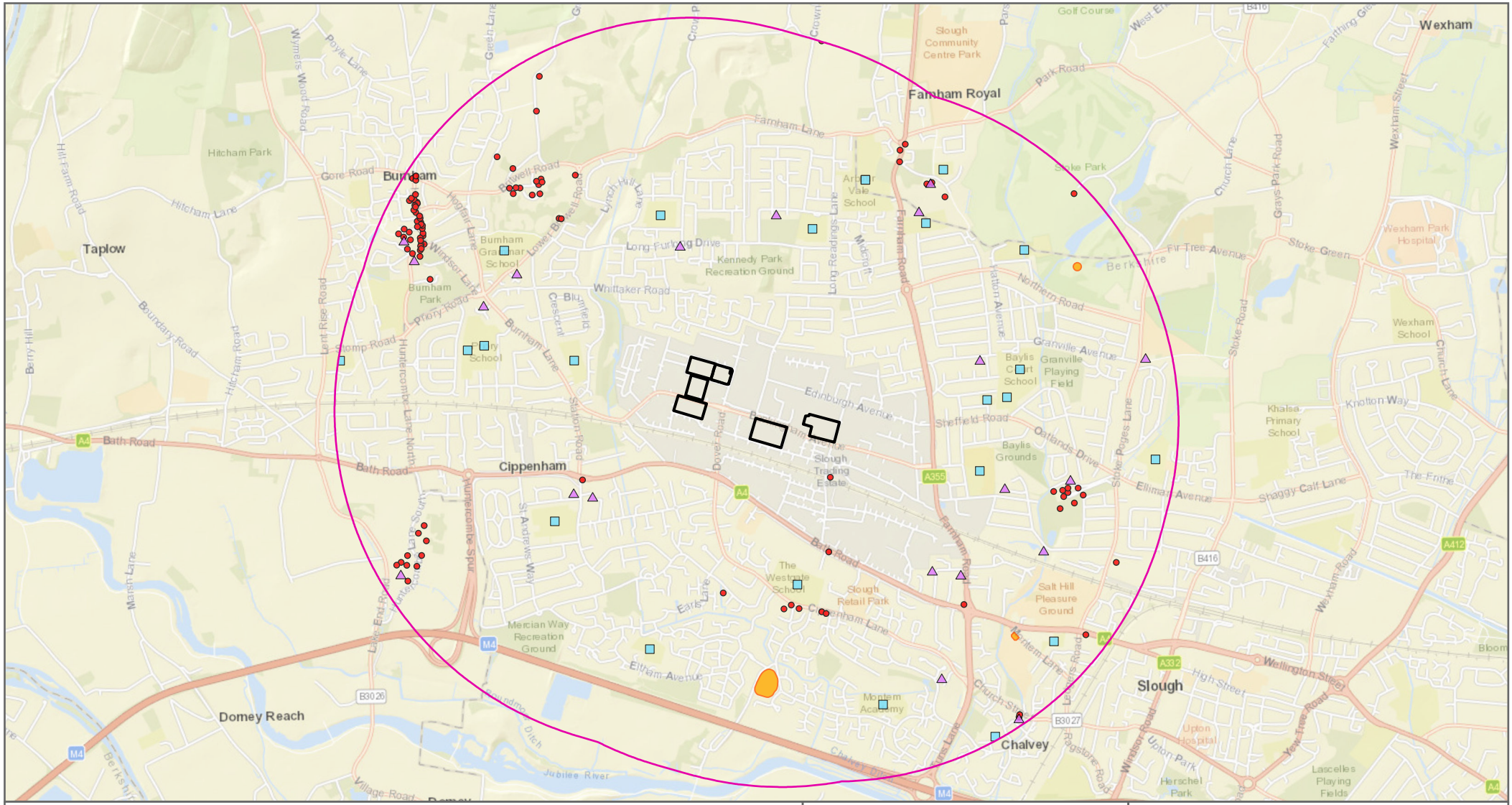

Site Installation Boundary

Site Installation Boundary 2km Buffer

Listed Building (HE)

Scheduled Monument (HE)

Place Of Worship

Education Facility

Note:
All site installation boundaries are indicative only unless otherwise stated

0 0.5 1
Kilometres

N

Figure 2.4 - Site Context - Sensitive Built Receptors
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JG
PROJECT: 0664507	CHECKED: BC
DATE: 22/09/2023	APPROVED: DP

Site layout data provided by Equinix

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PROJECTION: British National Grid

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3. SITE ACTIVITY

3.1 OVERALL SITE ACTIVITY

The overall commercial activity for the Campus is data storage across the four currently permitted Slough Campus data centres (LD4, LD5, LD6 and LD7).

Due to the growth of the data centres, Equinix is looking to expand the Slough Campus by adding a new Site – LD14. LD14 will comprise similar warehouse style buildings as featured in the four other Slough Campus data centre locations and will contain data storage and ancillary equipment to provide power in emergency situations. This EP variation application focuses on combustion activities associated with the 12 new back-up generators and the one generator transferred from LD7, all of which will be located on the proposed LD14 site.

There are currently 77 back-up generators across the Slough Campus, with the addition of the 12 new generators at LD14, the total number of generators covered by the Slough Campus EP will be 89.

Site layout drawings for LD7, where one already permitted generator is being moved to LD14 and LD14, the new Site, are included below – see **Figure 3.1** and **Figure 3.2** respectively.

3.2 BACKUP GENERATORS

The 12 new generators and the transferred generator from LD7 will be for backup generation purposes only i.e. for electrical generation in the event of a failure of the internal or external electrical supplies. The Site will have two separate substation feeds in order that power supply has a good level of redundancy. LD14 is protected from short term brown-outs or black-outs by uninterruptable power supplies (UPS). UPS systems comprise battery arrays that that buffer small fluctuations in electrical supply short-term. If the UPS system detects a power failure or extended reduced power, some, or all the generators within LD14 will start automatically to begin generating sufficient electricity to match the load required by the data centre. The UPS can supply power for approximately six minutes but ordinarily the generators would kick in well before this time elapses.

At the current Slough Campus data centres, no periods of off-grid operation have been recorded since the original permit application, except for a regional power outage mid-2019 during which generators at LD6 and LD7 ran for a short period of time (a few hours). Generator starts have otherwise been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to clients.

The type, number and capacity of new generators to be installed at the data centre is shown in **Table 3-1.**

TABLE 3-1: EMERGENCY BACKUP GENERATORS AND FIRE PUMP TO BE INSTALLED AT LD14

Site	Engine	Number of Generators / Fire Pump	Individual Output Rating (MVA)	Individual Output ($MW_{e)}$	Individual Input (MW_{th})	Total Input (MW_{th})
LD14 (existing generator transferred from LD7)	Cummins C3000 D5e (previously at 7) Equinix ID: (LD14_1)	1 (Generator)	3	2.4	6.9	6.9
LD14 (new)	Kohler KD3500-E (KD83V16-5CES) Equinix ID: LD14_2 – LD14_13)	12 (Generators)	3.5	2.8	8	96
LD14 (new)	Clarke JU4H-UF34 Equinix ID: FP1	1 (Fire pump)	0.098	0.078	0.22	0.22
Total		**14**				**103.1**

LD7.1

LD7.2

LD7_1_09
LD7_1_03
LD7_1_04
LD7_1_01
LD7_1_02
LD7_1_05
LD7_1_06
LD7_1_07
LD7_1_08

LD7_2_03
LD7_2_04
LD7_2_01
LD7_2_05
LD7_2_02
LD7_2_08
LD7_2_06
LD7_2_07

Oxford Avenue

LD7_2_09

- Existing Emission Points to Air
- Emission Point proposed to be removed (generator being relocated to LD14 as part of this variation)
- LD7 Site Installation Boundary
- LD6/LD14 Site Installation Boundary
- Data Centre

PROJECTION: British National Grid

0 10 20
Metres

N

Figure 3.1
Emission Points - LD7
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A03
SIZE: A3	DRAWN: JG
PROJECT: 0664507	CHECKED: RP
DATE: 13/06/2024	APPROVED: DP

Site layout data provided by Equinix

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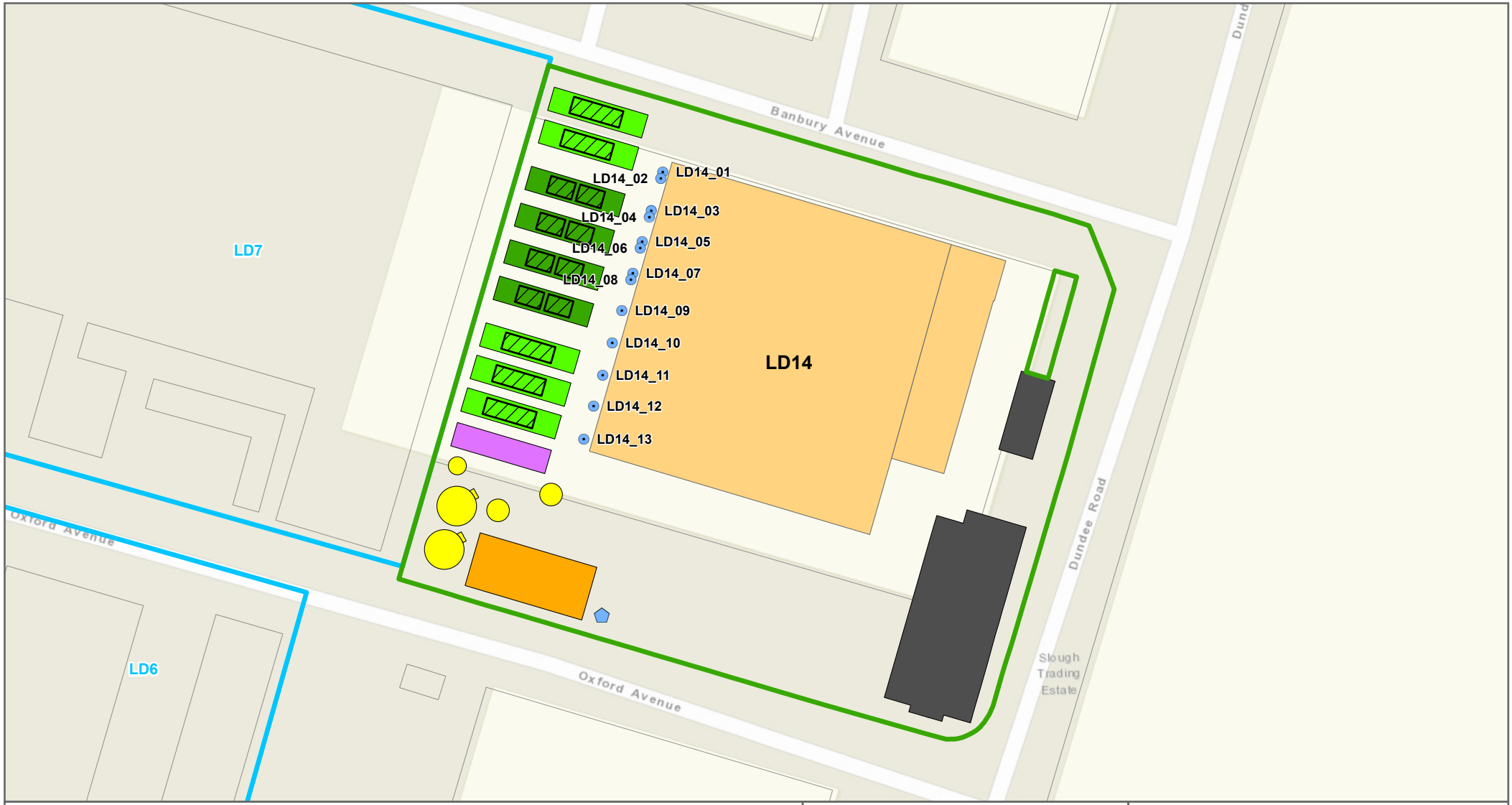

LD14 Site Installation Boundary
LD6/LD7 Site Installation Boundary
Data Centre
Proposed Stack
Proposed Operational Filling Point
Proposed Single Storey Generator
Proposed Double Storey Generator
Proposed Indicative Diesel Day Tank Location
Proposed Electrical Plant MV
Proposed Water Storage and Sprinkler Tank
Proposed Water Treatment Plant
Proposed Car Park

Note:
All site installation boundaries and site feature locations are indicative only unless otherwise stated

0 10 20 30 40
Metres

N

Figure 3.2
Site Layout - LD14
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A02
SIZE: A4	DRAWN: JG
PROJECT: 0664507	CHECKED: RP
DATE: 05/12/2023	APPROVED: DP

Site layout data provided by Equinix

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PROJECTION: British National Grid

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3.3 SCR INSTALLATION

Data centre development in the Slough Trading Estate has grown in recent years and the area is now known to have over 250[1] emergency back-up generators installed. To mitigate Equinix's contribution of NO_x emissions associated with the routine testing and emergency operation of their generators, Equinix has committed to installing Selective Catalytic Reduction (SCR) systems to the 12 new Kohler generators being added as part of the LD14 project.

SCR is identified as BAT as per the most recent Data Centre FAQ and LCP BREF – please refer to **Section 5** for the BAT assessment.

SCR works by reducing NO_x emissions by combining exhaust gases with Ad Blue (urea) and passing it over a catalyst. A chemical reaction occurs converting nitrogen oxides into nitrogen. Generators utilising the SCR system will have associated storage tanks for Ad Blue (see Section 3.6 for further details on Ad Blue storage). **Table 3-2** shows the expected NO_x emission concentrations that can be achieved by the engines to which SCR systems are installed (i.e. the 12 new Kohler engines).

The proposed SCR systems for the 12 new LD14 generators were specified by the engine suppliers, Kohler (UK) Limited (Kohler), as the best available compatible units to achieve the Medium Combustion Plant Directive (MCPD) emission limit value (ELV) of 190 mg/Nm^3 for new engines rated > 5 MW_{th} input and run on diesel fuel. It is noted that whilst the SCR systems have been confirmed to abate NO_x emission to this level, ELVs do not apply to the LD14 generators as they will operate for less than 500 hours per year.

TABLE 3-2: SCR SYSTEM PERFORMANCE SUMMARY

Generators	Engine Model	Unabated NO_x emission concentration (mg/Nm^3)[2]	SCR abated NO_x emission concentration (mg/Nm^3, as confirmed by SCR supplier, Kohler)
LD14_2 to LD14_13	Kohler KD3500-E	1,784	190

3.4 TESTING REGIME

The testing regime for the LD14 data centre will comprise five test types. The generators will be tested regularly to demonstrate that they can fulfill the backup supply requirements at LD14. The testing regime forms part of Equinix's contractual commitment to its customers and will be implemented consistently.

The testing regime is presented in **Table 3-3.** Scheduling of the test runs considers the potential for effect on local air quality. The testing regime detailed in **Table 3-3** is for LD14 only and does not affect the testing regimes of the other data centres included in the Slough Campus.

[1] Based on information provided verbally by the Equinix Slough EA Site Inspector, Guy Elliot, during his annual visit to the Equinix sites on Monday 25th September 2023.
[2] Unabated NO_x emission concentrations is based on engine data sheets, as provided by the engine suppliers – Kohler.

Further details on the assessment of air quality impacts from the testing regime can be found in **Section 12.**

TABLE 3-3: TESTING REGIME FOR LD14

Type of test/ Frequency	Indicative Duration of test	Scheduling	Load of generator at LD14
Off-load test - monthly	5 minutes	All generators will be run independently on LD14	No load
Monthly Load Bank test (8 tests per year)	30 minutes	All generators will be run independently on LD14	100% maximum
Quarterly Load Bank Test (three times year)	1 hour	All generators will be run independently on LD14 This test will only be undertaken three times a year – the fourth time will be replaced by the annual full load test	100% maximum
Annual Load Bank Test (once per year)	2 hours	All generators will be run independently on LD14	100% maximum
Building Load Test – annually	1 hour	All engines will be run together on LD14	78% maximum

3.5 FUEL STORAGE

The Slough Campus EP variation application includes additional diesel fuel day tanks (belly tanks) that will be located below each of the 12 newly procured generators at LD14. The generator transferred from LD7 will also have a belly tank. There are no bulk storage tanks being installed as part of the LD14 development. The 13 belly tanks each have a capacity for approximately 30 hours of generator operation time based on a 700 litres/hour fuel consumption, this equates to c. 21,000 litres capacity per day tank. Each day tank will be of a steel construction and installed within a bund (rupture basin) capable of capturing 110% volume of the primary tank. All external pipework will be insulated, and trace heated with cladding to provide protection from damage. Pipework located outside of an area without physical, secondary barriers shall be double contained (pipe-in-pipe) with drain valves at low points and fitted with a leak detection system which will be raised to the building management system (BMS). Tanks will be in accordance with BS EN 799: Part 5: Type D, and fuel storage will meet requirements specified in the CIRIA C736 manual.

A single remote, centralised fuel filling station with dual connection located within a bunded area will be used to distribute fuel oil to each of the belly tanks via a centralised valved distribution system. All fuel distribution pipework will be double contained (pipe-in-pipe) with leak detection and manually operated sump pump.

A diesel fuelled fire sprinkler pump will be installed at LD14. It is anticipated that the fuel tank associated with the pump will be approximately 700 litres, to enable eight hours operation time. The diesel tank for the fire pump will be located within a bund with 110% containment capacity of the primary tank.

The proposed additional fuel storage tanks at LD14 are listed in **Table 3-4**.

TABLE 3-4: ADDITIONAL FUEL STORAGE TANK CAPACITIES

Location	Quantity	Bulk/day tanks	Tank Capacity (litres)
Underneath each LD14 generator	13	Day	21,000
LD14 diesel fuelled fire sprinkler pump	1	Day	700
Total number of additional tanks	14	---	273,700

The diesel filling procedure is defined and set out in **Appendix A**. It remains the same as the current procedure set out for the Slough Campus. Equinix has an emergency response procedure in place in the event of a release of oil or diesel, and processes for the planning for such eventualities and to audit the response in case such an event occurs. These are provided in **Appendix B.**

3.6 AD BLUE STORAGE

The SCR system will utilise a series of above ground Ad Blue storage tanks, these will form part of a structural slab tank, with the urea storage section being constructed from 304 stainless steel, the overall tank design is in general accordance with BS799: Part 5 2010 Type J.

There will be a total of 12 above ground Ad Blue storage tanks, each with a capacity of 2,000 litres. The Ad Blue storage tanks will be installed to the underside of each of the 12 new Kohler generators with SCR systems and will comprise part of the generator's integrated fuel storage tank. Appropriate secondary containment including bunding to 110% of each tank's maximum capacity will be used. Pipework located outside of an area without physical, secondary barriers shall be double contained (pipe-in-pipe) with drain valves at low points and fitted with a leak detection system which will be raised to the BMS.

The Site operatives will regularly monitor the Ad Blue levels and visual inspections will be carried out when appropriate. Each tank will be furnished with an OLE C2020 tank contents gauge and a combination high level/bund overfill alarm.

When Ad Blue is delivered to Site, Equinix expects contractors to be equipped with spill response equipment and to follow their own response plans. Any handling and storage of Ad Blue on Site will be maintained by Equinix in accordance with the product specification (see **Appendix H** for more information).

4. EMISSIONS

4.1 INTRODUCTION

There will be no changes to the type of activities undertaken across the Campus, therefore the principal emissions from the Campus will remain the emissions to air from maintenance testing of the emergency back-up generators. Actual emergency running of the generators is expected to be infrequent.

There are no new planned material changes to emissions to watercourses, groundwater or land.

Additional waste generation from LD14 is anticipated to be minimal.

4.2 EMISSIONS TO AIR

4.2.1 POINT SOURCE EMISSIONS TO AIR

The only new point source emissions to air for the permit will be from the new LD14 data centre generators and the proposed diesel fuelled fire pump, these are detailed in **Figure 4.1.**

The principal point source emissions to air from the data centres will be from the exhaust stacks associated with the generators. These point source emissions are identified in **Table 4-1** and the locations of each emission point are shown in **Figure 4.1.**

Regarding the proposed SCR systems to be installed to the 12 new generators, typically, some ammonia is expected to 'slip' from the catalyst during dosing of urea. However, the SCR supplier, Agriemach Ltd, has confirmed that the SCRs specified at LD14 will not result in any ammonia emissions. See **Appendix G** for more information.

Air dispersion modelling has been undertaken by ERM to estimate how emissions from the generators may disperse in the surrounding environment, and to understand the significance of those emissions. More details can be found in **Section 11** and the air quality impact assessment report in **Appendix C.**

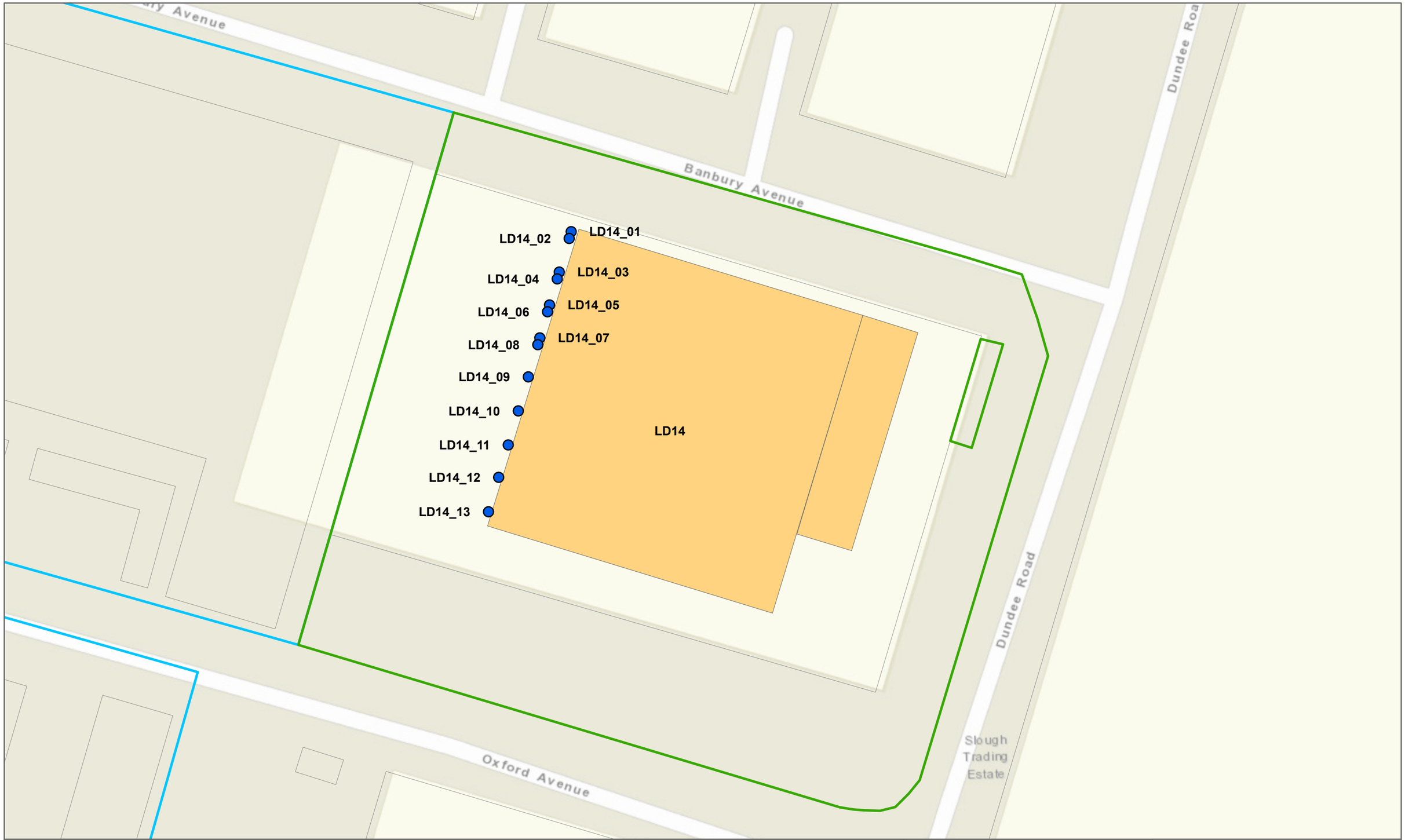

Figure 4.1
Proposed Emission Point Locations – LD14
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A02
SIZE: A3	DRAWN: JG
PROJECT: 0664507	CHECKED: JE
DATE: 05/04/2023	APPROVED: DP

Site layout data provided by Equinix

PROJECTION: British National Grid

Path: \\UKSPRDGISFS01\Data\London\Confidential Projects\0664507 Equinix UK LD14x application\MAPS\0664507 - Equinix UK LD14x\0664507 - Equinix UK LD14x.aprx\0664507_EmissionPointsToAir_LD14_A02

Emissions from the generators to be installed at LD14 are listed in **Table 4-1**.

Air dispersion modelling has been undertaken for these sources. The air quality assessment considers the potential impact of the 12 new generators in combination with the transferred generator from LD7 and the 77 generators from the remainder of the Slough Campus which are covered in the existing EP. More details can be found in **Section 12** and the air quality impact assessment report in **Appendix C.**

TABLE 4-1: NEW POINT SOURCE EMISSIONS TO AIR

Data Centre	Emission Point ID	Emission Source	Use	Parameter	Limits
LD14 (existing generator transferred from LD7)	LD14_01[3]	Cummins C3000-D5E	Emergency back-up generation	NOx, SO_2, CO, Particulates	No limits set, backup generation only
LD14 (new)	LD14_02 to LD14_13	Kohler KD3500- E (KD83V16-5CES)	Emergency back-up generation	NOx, SO_2, CO, Particulates	No limits set, backup generation only
LD14 (new)	LD14 fire pump (FP1)[4]	Clarke JU4H-UF34	Sprinkler type pump for use in the event of fire	NOx, SO_2, CO, Particulates	No limits set, emergency use only

4.2.2 FUGITIVE EMISSIONS TO AIR

There is the potential for localized fugitive emissions to air of hydrocarbon vapour from the diesel storage tank breathers.

4.3 EMISSIONS TO WATER

4.3.1 POINT SOURCE EMISSIONS TO WATER

There will be no point source emissions to water as part of this permit variation.

4.3.2 FUGITIVE EMISSIONS TO WATER

No material fugitive emissions to water are expected from the permitted activity.

The only anticipated, potentially significant fugitive emission to surface water from the permitted operation would be in the event of a leak or spill from the above ground diesel fuel tanks or Ad Blue tanks.

The Site currently has emergency response procedures in place in the event of a release of oil, diesel, or Ad Blue. This includes processes for the planning for such eventualities and checklists to audit the response in case such an event occurs. The emergency procedures are provided in

[3] The generator for point LD14_01 was formerly location at LD7 but will be relocated to LD14 as part of this permit variation

[4] The location of the fire pump is yet to be decided, it is therefore not currently shown on the emission points plan, however, can be added once the install location is known.

Appendix B. A spill from the chemical storage area would follow similar procedures, as determined by the responsible site operative at the time of such a spill.

All diesel, Ad Blue and bulk chemical storage tanks will be contained within bunds that can contain 110% of their maximum capacity. Any water that accumulates in external bunds is to be tested prior to discharge into rainwater drains. Any contaminated water will be removed using a vacuum pump and recycled or disposed using an appropriate waste disposal company. The Site consists of hard standing in good condition both inside and outside of the building.

4.4 EMISSIONS TO SEWER

4.4.1 POINT SOURCE EMISSIONS TO SEWER

The listed activities will not generate any discharges to sewer other than uncontaminated surface water runoff from roof areas and bunds/tanker unloading areas. All discharges to surface water sewer will be routed via appropriately maintained pollution control devices to manage the risk of pollution.

4.4.2 FUGITIVE EMISSIONS TO SEWER

No fugitive emissions to sewer are expected from the permitted activity.

The only anticipated, fugitive emission to sewer from the permitted operation would be in the event of a leak or spill from above ground diesel fuel tanks or Ad Blue tanks entering the drainage system.

The drainage plans are presented in **Appendix F**. The tanks will be equipped with leak detection systems and will be inspected regularly.

4.5 EMISSIONS TO LAND AND GROUNDWATER

4.5.1 POINT SOURCE EMISSIONS TO LAND AND GROUNDWATER

There are no emissions to land and groundwater as part of this permit variation.

4.5.2 FUGITIVE EMISSIONS TO LAND AND GROUNDWATER

The key potential for any fugitive emissions to land and groundwater would be in the event of a leak or spill from the on-site above ground fuel tanks. Likewise, in the event of loss of integrity from the above ground Ad Blue tanks, which also penetrates through hard standing or spill from the water treatment chemical storage area.

There are no expected changes to fugitive emissions to land and groundwater as part of the operational changes described in this EP variation application. The 12 new generators and the transferred generator from LD7 are situated within acoustic containers with bolted on inlet and outlet attenuators, a roof mounted silencer, and soundproof walls consisting of mineral wool covered with a glass fiber fabric in a steel frame. The generators are on steel gantries on hard standing adjacent to the main warehouse building. The Site surfaces will comprise hard standing which will be maintained in good condition to prevent ingress to the underlying land and groundwater.

The 13 new day tanks associated with the LD14 generators will be integrally bunded with 110% containment capacity of the primary tank and fitted with leak detection alarms that will be raised

to the BMS, such that discharge of diesel to land is expected to be avoided in the event of a loss of primary containment.

As described in **Section 3.4**, the maintenance and inspection procedures remain the same as set out in the original EP application; and the diesel filling procedure remains the same as the procedure set out for the existing EP (which has been reproduced in **Appendix A** for ease of reference).

Equinix has an emergency response procedure in place in the event of a release of oil, diesel, chemicals or Ad Blue. This includes processes for the planning for such eventualities and to audit the response in case such an event occurs. These are provided in **Appendix B.** The drainage drawings for the site are provided in **Appendix F.**

5. OPERATING TECHNIQUES

5.1 APPLICABLE TECHNICAL STANDARDS

To demonstrate that the site will operate using Best Available Techniques (BAT) for the relevant permitted activities proposed at the site, a review of the European Commission's relevant BAT Reference Documents (BREFs) has been carried out. In addition the relevant sector Technical Guidance Notes (TGN) and industry guidance has also been reviewed. The documents reviewed are:

- Data Centre FAQ, 15/11/2022-DRAFT version 21.0 to TechUK for Discussion presented in **Table 5-1**;
- Best Available Techniques (BAT) Reference Document for Large Combustion (LCP) plants, 2017 presented in **Table 5-3**;

At present, the Data Centre FAQ, dated November 2022, is not an official release, but forms the basis for discussion of a common methodology and liaison with individual operators and their industry association. For this application and the selected abatement, this guidance is considered to represent the current EA position of BAT for data centre back-up generation systems.

It is noted that the LD14 Site does not contain any Large Combustion Plants (LCP) under the meaning of Chapter III of the Industrial Emissions Directive (2010/75/EU). The LCP BREF has therefore been reviewed for general measures appropriate to data centres.

The individual LD14 generators meet the definition of Medium Combustion Plant (MCP) under the meaning of the Medium Combustion Plant Directive (2015/2193/EU) (MCPD), being in the 1-50 MW_{th} size range. The Medium Combustion Plant Directive states: *(19) In order to take account of certain specific circumstances where the application of emission limit values would lead to disproportionately high costs compared to the environmental benefits, Member States should be able to exempt medium combustion plants used in cases of emergency and operated during limited time periods from compliance with the emission limit values set out in this Directive.* For this reason, the generators are considered MCPs but do not have to comply with emission limit values due to their limited operating hours of less than 500 hours per year.

5.2 OTHER TECHNICAL GUIDANCE CONSIDERED

Other documents reviewed include the EA's Medium Combustion Plant Directive and Specified Generator Regulations page (Specified generator: when you need a permit – GOV.UK (www.gov.uk) and Medium combustion plant: when you need a permit – GOV.UK (www.gov.uk). **Table 5-2** summarises the applicable MCP guidance.

The generators will not be classed as *specified generators* under Schedule 25B of the Environmental Permitting (England and Wales) Regulations 2016 (as amended), as emergency generators only used to provide power at a site during an emergency are excluded.

5.3 OPERATING TECHNIQUES REVIEW TABLES

Each of the documents considered above are presented in tabular form on the following pages. Best Available Techniques that are not considered applicable are greyed out.

TABLE 5-1: DATA CENTRE FAQ HEADLINE APPROACH, 2022

	EA Summary Requirement	Equinix 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). But TBC there are now site-specific issues where abatement (SCR) is now the default for new plant – see the details in the text.	The proposed LD14 data centre will work to a 2n standby arrangement, where n is the load requirement of the data centre. The 12 newly procured engines have emissions that are aligned to TA Luft emissions, they also have SCRs installed for further abate NOx emissions in the exhaust gas. Air dispersion modelling (see ***Section 11***), indicates that predicted impacts on air quality from the testing regime are acceptable.
2	Standby engine capacities are added together in MW_{th} input at the quoted standby rating, being usually 110% of the continuous rating (if >=50MW_{th} the site then needs an EA 1.1A Combustion Activity EPR permit).	The proposed capacity of the 13 LD14 generators will be in excess of 50 MW_{th}.
3	If precise MW_{th} figures are unavailable and spec sheets or face-plates are unclear, the calculation for MW_{th} derived from MVA output is based on: power factor 0.8 and an assumed poor conversion efficiency of 0.35 for MW_{th} to MW_e e.g. 3MVA = (3*0.8)/0.35 = 6.86MW_{th}.	See **Table 3-1**. This methodology has been followed. The MWe outputs quoted are assumed to include power factor correction from MVA. MW_{th} figures are not generally available from generator manufacturers. Where generators have a power rating of <1MW an efficiency of 33% has been used and for generators with a power rating between 1-5 MW an efficiency of 35% was used.
4	The sum of generator plant capacities is based only on MW_{th} inputs of all plant regardless of the standby configuration. MW_e output constraints such as realistic customer load or other practical output limiting factors do not constitute a limit to the MW_{th} input as defined in the EA's guide RGN02.	As noted above, the installed capacity of LD14 is over 50 MW_{th}, irrespective of calculation methods.
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	The LD14 data centre will occupy one building, however LD14 is part of the Slough Campus and will operate under the Slough Campus EP. This will include combining the management of emissions from generator testing, to include scheduling of testing to avoid the generators on separate sites testing on the same days.

	EA Summary Requirement	Equinix Response
	'same site – same operator' as per RGN02 – see the details in the text	
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.	See **Table 3-3** for testing durations. Based on the prescribed test regime, each LD14 generator is expected to operate for up to 11 hours per year. Emergency operation is highly unusual and is not expected to exceed 500 hours.
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.	This is likely to occur very rarely. The Slough Campus data centres have two substation feeds so there is a good level of redundancy in power supply. No periods of off -grid operation were recorded since the original permit application except for a national power outage mid-2019 during which generators at LD6 and LD7 ran for a short period of time (few hours). See **Section 4.2** for details of measures in place to protect against the need for emergency operation of the generators.
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. Accepting <50hours/gen/annum as a default upper limit for bespoke large data centres, the EA regards a BAT aspiration to aim for a more routine 1hour/month per generator.	Individual generator run times are expected to be well under 50 hours per year. During monthly testing, each generator will be fired for approximately 5 minutes, and will be operated between an hour to two hours during quarterly and annual tests. Each generator is expected to be tested for about 11 hours each per year, a detailed regime is presented in **Table 3-3.** The generators do not meet the definition of a specified generator under MCPD.
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	Noted. See **Table 3-3** for details of the proposed maintenance testing regime and durations.

	EA Summary Requirement	Equinix Response
	part of its non-emergency role under maintenance and testing.	
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 has been assumed in the air quality assessment found in **Appendix C.**
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 voluntarily operate within the balancing market, and importantly a clear way to demonstrate minimisation of emissions to air as 'Emergency plant'.	No voluntary elective power operation for on-site use, STOR or FCDM is proposed.
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 EPA Tier 2 or equivalent standard A detailed cost benefit analysis (CBA) is otherwise needed existing, old plant justifying worse emission such as 4g TA-Luft plant or for example a justification under FCDM. TBC There are now site specific issues where abatement (SCR) is the default for new plant – see details in the text.	The proposed LD14 data centre will work to a 2n standby arrangement, where n is the load requirement of the data centre. The 12 newly procured engines have emissions that are aligned to TA Luft emissions, they also have SCRs installed for further abate NOx emissions in the exhaust gas. Air dispersion modelling (see ***Section 11***), indicates that predicted impacts on air quality from the testing regime are acceptable and that there are no predicted exceedances of the air quality standard.
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	The EA has recommended the use of the Guidance on Specified generators: dispersion modelling assessment (https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment).

	EA Summary Requirement	Equinix Response
	(under H1) indicates anything other than an insignificant contribution to short term local air quality for the 'planned' maintenance emissions of the plant.	An air dispersion model has been prepared to assess the impact of the Site's air emissions (**Section 11**). The detailed report is presented in **Appendix C.**
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 abatement systems for generator emissions have been proposed at the Site to mitigate NOx emissions. See **Section 3.3.**
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.	100% load generator tests will be restricted to one hour per generator. Further details on the testing regime are provided in **Section 3.4.** These tests represent part of Equinix's commercial offering to guarantee maximum uptime to clients.
16	When AQ modelling the emissions from the engines, the certified technical standard provided by the manufacturer should be used (i.e. likely worst case emissions). However any 'fit for purpose' monitoring of the actual emissions from installed plant will be considered as evidence of the likely real impacts as part of the permitting decision process.	Expected 'reasonable worst case' emissions have been used for 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	Equinix does not operate or plan to operate underground storage tanks for fuel oil and consider that their operational approach to prevention of releases to land minimises this risk to site condition. Intrusive baseline survey data was provided by Delta Simons for use by ERM in the H5 reporting in October 2023, to determine the current condition of the LD14 Site.

	EA Summary Requirement	Equinix Response
	local control immediately around the buried fuel oil tanks (i.e. not be just an addition to double skinned tanks already protected by leak detection and hence ignoring distribution pipework etc.).	
18	5-yearly GW sampling & 10-yearly soil sampling under IED is normally not needed but still needs some justification.	10 yearly repeat sampling is not considered warranted on the basis of the nature of the permitted operation and its low potential for emissions to land.
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).	The LD14 site is not expected to operate for a prolonged period in emergency mode. The extent of back-up power generation capacity and fuel storage reflects the Equinix business model of providing customers with a high assurance of continuity, not an expectation of loss of grid supply in practice. The Slough Campus data centres have two substation feeds so there is a good level of redundancy in power supply. See **Section 4.2** for details of measures in place to protect against the need for emergency operation of the generators.
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.	Equinix does not subscribe to Uptime Institute Tier Levels per se but the Equinix equivalent tier level rating is Tier 3 for each data centre. Each site is certified to ISO27001:2013.
21	Reporting of standby engine operational run hours and discussion of any electrical outages (planned or grid failures regardless of duration) required annually.	Equinix notes that this is the expectation for annual reporting to the EA.
22	AQ modelling for permitting split into two parts: 1) for the routine planned testing regime , including scheduled on-load use supporting maintenance works like UPS or HV – if no other details are known the default is 50 hours/gen/year; Commissioning of significant new plant may be included or	The test regime, as defined in **Table 3-3**, has been considered in the AQ modelling assessment. A reasonable worst case emergency scenario (all generators running simultaneously for 1-hour) and worst case emergency scenario (all generators running simultaneously for 72-hours) have also been considered by the AQ model.

	EA Summary Requirement	Equinix Response
	possibly assessed separately as a 'one off' under a permit 'pre-op condition A prolonged reasonable maximum full load outage (so accepting not all installed engines will run) which the default is assumed 72 hours. Looking at ambient AQ and potential areas for Acute exposure (AEGL).	Equinix acknowledges that should any planned works that are additional to this test regime be required during the operational phase of the permit, then specific permission is to be sought from the EA for approval on a per-event basis.
23	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.	Equinix will notify the EA of any planned or unplanned interruptions to both the grid supplies relating to LD14. The Site will update its existing internal AQMP for the Slough Campus to assess the potential air quality impact from the prolonged operations of the proposed generators at the Slough Campus, including LD14.
24	The notification requirement stated in the permit should also indicate the actual number of generators that need to be operating above which the local air quality is at risk e.g. 'notification of continuous emergency operation exceeding 18 hours with 5 or more engines operating together is required' (i.e. model shows 4 or less engines unlikely to breach LAQ)	As above, Equinix will notify the EA of any planned or unplanned interruptions to both the grid supplies relating to LD14. The Site will update its existing internal AQMP for the Slough Campus to assess the potential air quality impact from the prolonged operations of the proposed generators at the Slough Campus, including LD14.

	EA Summary Requirement	Equinix Response
25	Assuming AQ modelling, based on emergency outage operating scenarios, indicates a very significant risk to local air quality and identified receptors, the EA will ask the operator to have a written action plan to manage the issue for prolonged emergency running of the plant (including sensitive receptors list and mitigations, assessments and impacts evaluation against modelled risk conditions i.e. occurrence at periods of most concern in the year, possibly ambient air monitoring surveillance at very sensitive receptors). An AQ outage action plan is also likely required for sites which might operate in conjunction with other neighbouring large sites during an outage i.e. data centre hubs. A template AQMP is available.	The Site will update its existing internal AQMP for the Slough Campus to assess the potential air quality impact from the prolonged operations of the proposed generators at the Slough Campus, including LD14.
26	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.	LD14 does not use gas-based cooling systems for the data centre.

	EA Summary Requirement	Equinix Response
27	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.	For LD14, waste oil will be removed by the same appointed subcontractors who perform servicing and maintenance of the generators at Slough Campus. The zero threshold will be noted and the data collected from the sub-contractor as part of the annual EA reporting process. Given the lack of routine operation anticipated at LD14, lubricating oil degradation is not expected, therefore bulk replacement is unlikely. An external company would be brought to LD14 annually to test the stored diesel fuel and would test a variety of parameters, including clarity, adenosine triphosphate, water content and particle count. If required, the fuel would then be cleaned on site by the same company (fuel polishing). Samples will be taken after the polishing to ensure that the quality of the cleaned fuel is acceptable. The same process is carried out across the Slough Campus data centres.
28	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'.	Noted.

TABLE 5-2: MEDIUM COMBUSTION PLANT AND SPECIFIED GENERATOR REGULATIONS GUIDANCE, UPDATED 27 MARCH 2023

Key Definitions and Scope		Comments
Excluded Generators	Excluded Generators are generators that are exempt from Schedule 2 5B of the Permitting Regulations. Excluded generators are not included when determining capacity of the permitted specified generator site. Excluded generators are those that meet the following condition – Are part of an IED installation under Chapter II or III. BAT applies to these installations so air quality is protected. It should be noted that a generator which is a Part B (1.1 or 5.1) or permitted Waste Facility (Small Waste Incineration Plant, SWIP) is not excluded. Have a defined nuclear safety role under a nuclear site licence issued by the Office for Nuclear Regulation. Emergency 'backup generators' (see definition below) that are not tested for more than 50 hours a year. Data centres that use an on-site emergency backup generator when the transmission frequency is unstable are excluded. Are operated offshore Generators installed on a gas storage or unloading platform (as defined in Regulation 2 of the Offshore Combustion Installations (Pollution Prevention and Control) Regulations 2013.	The Campus generators are to serve the data centres as emergency 'backup generators' and will not be tested for more than 50 hours per generator per year.
Backup Generator	Means a generator that is operated for the sole purpose of providing power at a site during an onsite emergency from the 1 January 2019. Balancing Services, and Demand Side Response operations, whether procured or not, such as Triad Avoidance or Fast Frequency Response are not on site	The proposed generators at LD14 are emergency 'backup generators' that will not be tested for more than 50 hours per generator per year.

Key Definitions and Scope		Comments
	emergencies and a generator that provides these services is not excluded.	
Emergency Operation	There is no restriction on the total operating hours in the event of an onsite emergency. How ever operators should make best endeavours to reduce the period and frequency of emergencies. Similarly there is no restriction on the hours of operation by 'black start' backup generators.	No periods of off-grid operation were recorded since the original permit application except for a national power outage mid-2019 during which generators at LD6 and LD7 ran for a short period of time (a few hours).
Testing Backup Generators	Operators must not carry out more than 50 hours testing a year for each backup generator. Operators must get agreement in writing from your regulator if you want to increase this limit. The regulator can exclude commissioning time within the written agreement. For each backup generator, operators must record the number of hours you test during the year. This is to demonstrate that you meet the exclusion criteria. If the limit of 50 hours testing a year is exceeded without written agreement the regulator will take appropriate enforcement action.	The testing regime is described in **Section 3.4**. The generators will be tested for less than 50 hours per year. Equinix will continue to record, for each generator/data-centre as applicable: • Number of test/maintenance running hours per year; • Number of emergency generation events and running hours – per year; and • Quantity and type of backup generation fuel used over the period.
Best practices in testing Backup generators	Operators should aim to minimise the environmental impact from emissions to air wherever feasible when testing emergency backup generators. The regulators considers the following are best practice: With multiple backup engines, testing should be staggered. The period and frequency of testing should be kept to the minimum sufficient to demonstrate the reliability at the appropriate load. Testing should be scheduled to periods	The testing regime is described in **Section 3.4** The generators will be tested for less than 50 hours per year.

Key Definitions and Scope		Comments
	when ambient background NOx can be expected to be low i.e. not during peak traffic periods. It is considered appropriate to utilise the electricity generated during testing for onsite use. Good practice when installing backup generators include the careful placement away from sensitive receptors, exhaust flues terminating vertically without obstructions to increase dispersion and not below residents windows or venting onto car parks etc.	

TABLE 5-3: BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT FOR LARGE COMBUSTION PLANTS, 2017

Section	Subsection	BAT #	BAT Text	Requirements	Comment
General BAT Conclusions	Environmental Management System EMS	BAT 1	In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates the features presented in the BREF.	See BREF for detailed requirements	An ISO 140001 accredited environmental management system (EMS) is in operation for the Slough Campus data centres and will be extended to include LD14 once operational (see **Appendix** **D**)
	Monitoring	BAT 2	BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load (1), according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	(1) In the case of CHP units, if for technical reasons the performance test cannot be carried out with the unit operated at full load for the heat supply, the test can be supplemented or substituted by a calculation using full load parameters	As the 12 new and one transferred generator are considered individually to be medium combustion plant and for the purpose of emergency generation, they are only required to comply with the MCPD requirements for monitoring instead of LCP BREF.
	Monitoring process parameters for emissions to air and water	BAT 3		• Fuel gas • Flow • Oxygen content, temperature and • Pressure • Water vapour content	Normal operating conditions for the data centre will be grid supply of electricity. As Other than Normal Operating Conditions

Section	Subsection	BAT #	BAT Text	Requirements	Comment
				• Waste water from flue-gas treatment • Waste water from cooling treatment and process wastewater	(OTNOC) conditions will occur only in an emergency situation, there is no opportunity to schedule monitoring. To monitor during testing regimes would extend the running period of engines, thus worsening any air quality impact they may have. Not required to monitor as MCP. See BAT2 above, i.e. is required to comply with MCPD requirements only.
	Monitoring of emissions to air	BAT 4	BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	• NH3 • NO2 • N2O • CO • SO2 • SO3 • Gaseous chlorides • HF • Dust • Metals and metalloids • Hg • TVOC • Formaldehyde • CH4 • PCDD/F	As the 12 new and one transferred generator are considered individually to be medium combustion plant and for the purpose of emergency generation, they are only required to comply with the MCPD requirements for monitoring instead of LCP BREF.
	Monitoring emissions to water from flue-gas treatment	BAT 5			No flue-gas gas treatment

Section	Subsection	BAT #	BAT Text	Requirements	Comment
	General environmental and combustion performance	BAT 6	In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure optimised combustion and to use an appropriate combination of the techniques given below.	Techniques: • Fuel blending and mixing • Maintenance of the combustion system • Advanced control system • Good design of the combustion equipment • Fuel choice	Equinix has an extensive preventative maintenance regime, which includes maintenance and good design of the combustion equipment to deliver the requirement of an emergency back-up generator. This will not change as a result of this EP variation application. Refer to **Table 5-1** response to items 7, 15 and 26.
	General environmental and combustion performance	BAT 7	In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NOx emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NOx ratio, homogeneous reagent distribution and optimum size of the reagent drops).		SCR systems will be used on the 12 new Kohler generators, see **Section 3.3** for further details.
		BAT 8	In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the	(No requirements specified)	Details of the testing regime can be found in **Section 3.4.**

Section	Subsection	BAT #	BAT Text	Requirements	Comment
			emission abatement systems are used at optimal capacity and availability.		
		BAT 9	In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):	i. Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; ii. Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters chosen from the table below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed);	Fuel supply will be ultra-low-sulphur diesel from commercial supply. Usage will be low due to normal operations for the data centres being powered by grid supply. As a result the fuel selected is optimal for the use intended, i.e. emergency supply.

Section	Subsection	BAT #	BAT Text	Requirements	Comment
				iii. Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system (see description in Section 10.8.1)).	
		BAT 10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements:	• Appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines) • Set-up and implementation of a specific preventive maintenance plan for these relevant systems; • Review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary;	Normal operating conditions for the data centre will be grid supply of electricity. In the event of emergency generation being required, the number of running hours will be recorded and reported to the EA.

Section	Subsection	BAT #	BAT Text	Requirements	Comment
				• Periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary	
		BAT 11	BAT is to appropriately monitor emissions to air and/or to water during OTNOC	The monitoring can be carried out by direct measurement of emissions or by monitoring of surrogate parameters if this proves to be of equal or better scientific quality than the direct measurement of emissions. Emissions during start-up and shutdown (SU/SD) may be assessed based on a detailed emission measurement carried out for a typical SU/SD procedure at least once every year, and using the results of this measurement to estimate the emissions for each and every SU/SD throughout the year.	Normal operating conditions for the data centres will be grid supply of electricity. As Other than Normal Operating Conditions (OTNOC) conditions occur in an emergency situation, there will be no opportunity to schedule monitoring of emergency operations. Monitoring of the testing regime is as per BAT2 above, i.e. is required to comply with MCPD requirements only.
	Energy Efficiency	BAT 12	In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500	• Techniques • Combustion optimisation • Optimisation of the working medium conditions	Not applicable. The engine/generator sets will provide backup generation only and do not run for >1,500 hr/yr.

Section	Subsection	BAT #	BAT Text	Requirements	Comment
	Water usage and emissions to water	BAT 13 - 15	h/yr, BAT is to use an appropriate combination of the techniques given below	• Optimisation of the steam cycle • Minimisation of energy consumption • Preheating of combustion air • Fuel preheating • Advanced control system • Feed-water preheating using recovered • heat • Heat recovery by cogeneration (CHP) • CHP readiness • Flue-gas condenser • Heat accumulation • Wet stack • Cooling tow er discharge • Fuel pre-drying • Minimisation of heat losses • Advanced materials • Stream turbine upgrades • Supercritical and ultra-supercritical steam conditions	
	Waste Management	BAT 16	In order to reduce the quantity of waste sent for disposal f rom the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking: (a) waste prevention, e.g. maximise the proportion of residues which arise as by-products;	Techniques: • Generation of gypsum as a by product • Recycling or recovery of residues in the construction sector • Energy recovery by using waste in the fuel mix • Preparation of spent catalyst for reuse	Waste produced by the permitted activity will be managed by subcontractors. If left over a long period of time the fuel in the tanks will degrade and becomes less pure. Once a year a subcontractor will attend

Section	Subsection	BAT #	BAT Text	Requirements	Comment
			(b) waste preparation for reuse, e.g. according to the specific requested quality criteria; (c) waste recycling; (d) other waste recovery (e.g. energy recovery)		site and accesses each diesel storage tank analysing the quality of the fuel. Depending on the results, they will undertake fuel polishing improving its quality, taking any waste diesel off -site with them. Mineral lube oil is also brought and taken off site by the subcontractor changing the oil.
	Noise Emissions Flaring	BAT 17	In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below .	Techniques • Operational measures • Low -noise equipment • Noise attenuation • Noise-control equipment • Appropriate location of equipment and buildings	Extended running will only occur in an emergency situation. The proximate receptors are commercial and industrial premises. See details in **Table 14-1.**
BAT conclusions for the combustion of solid fuels	BAT conclusions for the combustion of coal and/or lignite	BAT 18 – 23			Not applicable
	BAT Conclusions for the combustion of solid biomass and/or peat	BAT 24 – 27			
BAT conclusions for the	HFO- and/or gas-oil-fired boilers	BAT 28 – 30			Not applicable

Section	Subsection	BAT #	BAT Text	Requirements	Comment
combustion of liquid fuels	HFO- and/or gas-oil-fired engines Energy efficiency	BAT 31	In order to increase the energy efficiency of HFO and/or gas oil combustion in reciprocating engines, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.	*Techniques* • Combined cycle	The purpose of the proposed diesel generators is for emergency supply only. There is no opportunity for combined cycle operation.
	HFO- and/or gas-oil-fired engines NOx, CO and volatile organic compound emissions to air	BAT 32	In order to prevent or reduce NOx emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.	*Techniques* • Low -NOx combustion concept in diesel engines • Exhaust-gas recirculation (EGR) • Water/steam addition • Selective catalytic reduction (SCR)	SCR systems on the 12 new Kohler generators, see **Section 3.3** for further details.
		BAT 33	In order to prevent or reduce emissions of CO and volatile organic compounds to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or both of the techniques given below.	*Techniques* • Combustion optimisation • Oxidation catalysts	The purpose of the proposed diesel generators is for emergency supply only. Combustion is optimised for this purpose. As the engines are considered individually to be medium combustion plant and for the purposes of emergency generation, they are not required to comply with emission limits in the MCPD.

Section	Subsection	BAT #	BAT Text	Requirements	Comment
	HFO- and/or gas-oil-fired engines SOx, HCl and HF emissions to air	BAT 34	In order to prevent or reduce SOX, HCl and HF emissions to air from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below.	Techniques • Fuel choice • Duct sorbent injection (DSI) • Wet flue-gas desulphurisation (wet FGD)	Ultra-low sulphur diesel is the primary fuel source. Actual annual purchase of diesel is expected to be relatively low as the engines are considered individually to be medium combustion plant and for the purpose of emergency generation, they are not required to comply with emission limits in the MCPD.
	HFO- and/or gas-oil-fired engines Dust and particulate bound metal emissions to air	BAT 35	In order to prevent or reduce dust and particulate-bound metal emissions from the combustion of HFO and/or gas oil in reciprocating engines, BAT is to use one or a combination of the techniques given below .	Techniques • Fuel choice • Electrostatic precipitator (ESP) • Bag filter	As the engines are considered individually to be medium combustion plant and for the purposes of emergency generation, they are not required to comply with emission limits in the MCPD.
	Gas-oil-fired gas turbines	BAT 36 – 40			Not applicable
10.4 BAT conclusions for the combustion of gaseous fuel		BAT 40 – 54			Not applicable
10.5 BAT conclusions for multi-fuel-fired plants		BAT 55 – 59			Not applicable

Section	Subsection	BAT #	BAT Text	Requirements	Comment
10.6 BAT conclusions for the co-incineration of waste		BAT 60 - 75			Not applicable

6. ENVIRONMENTAL MANAGEMENT SYSTEMS

6.1 ISO 14001

Equinix operates an ISO 14001 accredited environmental management system (EMS) for the Slough Campus Site. The current ISO 14001 certificate is provided in **Appendix D**. The EMS will be reviewed and updated to include the LD14 site once operational.

6.2 SUMMARY OF EQUINIX ENVIRONMENTAL MANAGEMENT SYSTEM

The following is a summary of the contents of the Equinix EMS. Further detail on any aspect is available on request.

Contents:

1. Purpose
2. Scope of Document
3. Management Systems Elements
    - 3.1. Health Safety and Environment Policy
    - 3.2. Health Safety and Environment Organisation and Roles and Responsibilities
    - 3.3. Health Safety and Environmental Communications
    - 3.4. Compliance with Legislation
    - 3.5. Scope of the Health Safety and Environment Management System
    - 3.6. Health Safety and Environment Objectives
    - 3.7. Health Safety and Environment Training
    - 3.8. Employee Health Safety and Environment Competence
    - 3.9. Monitoring
    - 3.10. Record Management
    - 3.11. Visitors
4. Health and Safety Section
5. Occupational Health
6. Environmental Management Section
    - 6.1. Significant Environmental Aspects
    - 6.2. Environmental Incident Reporting
    - 6.3. Environmental Spill Response Process
    - 6.4. Environmental Emergency Preparedness
    - 6.5. Water Quality and Legionella Management
    - 6.6. Waste (incl. licences and permits, waste documentation and List of wastes codes)
    - 6.7. Hazardous Waste (incl. fluorescent light tubes, lead batters, printer cartridges and toner,

7. WASTE MANAGEMENT

7.1 WASTE GENERATION

Minimal additional waste is expected to be generated because of this EP permit variation. Waste generated from the permitted activities will include waste lubricating oil, off spec Ad Blue and diesel fuel waste.

As per the original EP application, waste oil is generated in only limited amounts during the maintenance of the diesel engines, the same is anticipated of the proposed generators at LD14. The maintenance will be undertaken by an external subcontractor who collects and disposes of the waste oil generated.

The SCR design is expected to use Ad Blue which will be used during operation. Waste will be generated from routine cleaning and disposal of expired Ad Blue. The Ad Blue will be taken offsite by the subcontractor and a waste transfer note obtained.

An external company will be brought on site annually to test the stored diesel fuel. The company will test a variety of parameters and if required the fuel will then be cleaned on site using the site's fuel polishing system which will be fitted on each fuel tank. Minimal waste will be generated through this cleaning process, which is managed through the external company. Annual serving of the generators may also result in waste engine oils, which will be disposed of appropriately by appointed subcontractors.

7.2 WASTE MINIMISATION

Waste minimisation measures are already in place, as per the original Slough Campus EP application (December 2018) and the same measures will be applied at LD14 once permitted. Waste generation is principally from front of house operations, including the unboxing of customer equipment. Waste minimization efforts at LD14 will therefore mainly focus on the level of packaging consumed and the requirement for a tidy workplace to prevent the unnecessary generation of waste.

7.3 WASTE STORAGE

The management of waste storage will be as previously applied for and determined as per the existing Slough Campus EP. The majority of the waste arising from the proposed LD14 data centre will be packaging materials, waste will be removed to storage/collection areas.

Any hazardous waste arising from LD14 will be segregated from non-hazardous waste and is stored depending on the nature of the waste in either a hazardous container, covered, caged or bunded.

8. RAW MATERIALS

LD14 will use the raw materials detailed in **Table 8-1**. Typical consumption values are given but are only indicative, as all raw material usage is intermittent and variable year on year.

TABLE 8-1: RAW MATERIALS USAGE

Substance	Approximate Annual Consumption	Typical Storage Capacity	Use	Risk
Water	Variable	• 2x 128,000 l sprinkler tank for firefighting purposes	Firefighting	None
Diesel	700l/hour per generator, total expected consumption	700l/hour per unit, total expected for site is anticipated to be approximately 273,000l Fire pump diesel stored in approximately 700 l double skinned tank.	Generator fuel	Flammable liquid and vapour, toxic to aquatic life with long lasting effects
Mineral lube oil	Anticipated there will be no routine consumption and that use will be periodic consumption according to service requirements	<1,000l per site	To lubricate the proposed generators	None
Ad Blue (Urea)	Low routine consumption; delivered as needed. This will be dependent on engine usage and load (consumption of Ad Blue per generator is expected to be 59l/hr at 100% load when operational)	The Site is expected to have 12 Ad Blue tanks, each with a capacity of 2,000 litres (total capacity of 24,000 litres).	Injection to exhaust stack of generators to reduce NOx emissions in synergy with a reaction catalyst.	Low. Some occupational exposure risks but not classified as a hazardous substance to health or the environment Composition is a mixture of urea (~30%) and water (see safety data sheet in **Appendix H).**

9. ENERGY

9.1 ENERGY USAGE

The LD14 data centre will be supplied by the national grid during normal operation. Emergency power generation from the new diesel generators, will consume diesel to produce electricity. The quantity of diesel required will depend on the running time each year.

9.2 ENERGY EFFICIENCY

The newly installed SCR units will be powered using mains power and so the operation of these systems will increase overall demand to a degree. Equinix uses the power usage effectiveness (PUE) metric to measure the energy efficiency of a data centre's infrastructure under normal operating conditions.

$$PUE = \frac{total\ energy\ entering\ the\ data\ centre}{energy\ used\ by\ IT\ equipment\ inside\ data\ centre}$$

Each of the data centres has a target PUE set against a 2015 baseline to accomplish an 8-10% improvement in energy efficiency against that baseline.

9.3 ENERGY MANAGEMENT SYSTEM

There is no expected change in the Energy Management System because of the operational changes described in this EP variation application. Equinix operates an ISO 50001 accredited energy management system for their Slough Campus data centre, at the latest review date of 5 June 2020. The 12 new generators and the generator from LD7 are to be included in the management system. The current ISO 50001 certificate is presented in **Appendix D.**

9.4 CLIMATE CHANGE AGREEMENT

The LD14 Site will be entered into a Climate Change Agreement (CCA), however Equinix is required to have 12 months of Power Usage Effectiveness data (PUE) prior to engaging in the scheme.

10. NOISE

As per the existing Slough Campus EP, noise emissions from permitted activities will occur during the generator testing or emergency operation, however, are considered low risk.

10.1 LD14

12 new generators and one generator transferred from LD7 are due to be installed at the LD14 site to accommodate the new data centre. The new generators will be installed on the western side of the site. The generators are situated within acoustic containers with bolted on inlet and outlet attenuators to treat noise, and soundproof walls consisting of mineral wool covered with a glass fiber fabric in a steel frame. Additionally, the roof mounted silencer/SCR system will also assist with noise reduction of the exhaust system. The closest residential receptors are also over 50 m away from the Site.

During the determination of the current Campus EP, the attenuation measures, screening from surrounding buildings and distance of sensitive receptors were considered sufficient to not require a detailed noise impact assessment as the data centres on campus do not have any routine sources of noise other than the periodic testing of the generators and their use in an emergency situation. The noise generated from the 13 proposed generators at LD14 is anticipated to be of a similar nature and therefore not require a detailed noise impact assessment.

11. DETAILED AIR DISPERSION MODELLING

An Air Quality Impact Assessment (AQIA) report has been prepared by ERM using information supplied by Equinix as part of Equinix's application to vary the Slough Campus permit. The full report can be found in **Appendix C.** A summary is provided below.

The assessment principally considers the impacts of the emissions of the LD14 generators alone. However, data on in-combination impacts with the other Equinix operated data centres is provided.

FINDINGS – ROUTINE TESTING

The assessment findings are that there is no potential to exceed the hourly nitrogen dioxide (NO_2) standard in any testing scenario for LD14. Therefore, no further mitigation is required.

The assessed testing regime scenarios were not predicted to have the potential to exceed the annual mean NO_2 standard for the protection of human health, including at the Air Quality Management Areas in Slough Borough. LD14 does not significantly contribute to in-combination effected with the other Campus or Extended Campus data centres.

There are no significant impacts predicted on any protected conservation areas.

FINDINGS – EMERGENCY OPERATIONS

At the current Slough Campus data centres, no periods of off-grid operation have been recorded since the original permit application, except for a regional power outage mid-2019 during which generators at LD6 and LD7 ran for a short period of time (a few hours).

When operating in isolation, the emergency operations of LD14 are not predicted to result in an exceedance of any of the relevant air quality standards considered by the assessment.

Emergency power generation scenarios were also assessed with LD14 generators running, and all generators assumed to be running on all seven data centres concurrently. In this scenario, there is predicted to be the potential for the hourly NO_2 standard to be exceeded. More than 18 running hours would however be required for a breach of the AQS to occur. Furthermore, the AEGL-1 thresholds (10 minute, 30 minute, 1 hour, 4 hour and 8 hour) are predicted to be exceeded by approximately 500%. However, the AEGL-2 threshold is not (approximately 12% of the AEGL-2).

There were no predicted exceedances of the 24-hour NO_x standard at any of the assessed sensitive habitat areas.

PM_{10} AND SO_2

The assessment found that the particulate emissions from the LD14 engines are not predicted to breach the AQS for PM_{10} or $PM_{2.5}$.

Sulphur dioxide (SO_2) emissions were not assessed since the Extended Campus uses ultra-low-sulphur diesel. As such, SO_2 impacts are anticipated to be insignificant.

12. SITE CONDITION REPORT

The Slough Campus was varied in September 2022 to surrender an area of land to the east of the present LD7 site. This area of land was removed as it was not previously operated on by Equinix, however, is where the LD14 Site is now proposed to be developed. As the LD14 Site will be constructed on land not currently included in the Slough Campus EP site boundaries, an additional plot of land is being proposed to be included as part of this variation. Soil and groundwater baseline data has been collected to establish the site baseline and was provided by Delta Simons for use by ERM in the H5 reporting in October 2023. A Site Condition Report has been produced for this permit variation application and has been included in **Appendix E.**

13. MONITORING

13.1 EMISSIONS TO AIR

No change is proposed because of this permit variation in the way Equinix reports to the Environment Agency the following metrics in relation to the backup generation activity at each of the Campus data centres:

- Number of test/maintenance running hours per year;
- Number of emergency generation events and running hours – per year; and
- Quantity and type of backup generation fuel used over the period.

The annual report and emissions inventory will incorporate details for the 12 new generators as well as the currently permitted 77 generators.

It is anticipated that monitoring for NOx and CO, in line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators,' published 16 February 2021 will be required for the 12 new generators at LD14. The monitoring frequency is expected to be every 1,500 hours of operation or once every five years (whichever comes first).

14. ENVIRONMENTAL RISK ASSESSMENT

14.1 IDENTIFY AND CONSIDER RISKS FROM THE SITE

The environmental risk assessment of the original Campus Permit application has been updated for this variation. This has included identification of sources, pathways and receptors and is presented in **Table 14-1.**

Separately, the EA's H1 tool has been updated as a screening exercise for emissions to air. The database file is supplied with this application via OneDrive as "H1TOOL_2.78.LD14.mdb". Detailed modelling of emissions to air is described in **Section 11** of this document. The EA's H1 methodology has also been used as a screening exercise for emissions to sewer as detailed in **Section 4.4.**

TABLE 14-1: ENVIRONMENTAL RISK ASSESSMENT

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
Emission to air (NOx, CO, SO_2, particulates)	Testing	See detailed air quality modelling, **Section 11**	Dispersion through the air	Proposed testing regime scheduled for minimum practicable impact – see detailed air quality modelling in **Appendix C.**	High	High	High
	Emergency operation	See detailed air quality modelling, **Section 11**	Dispersion through the air	LD14 will have uninterruptable power supply (UPS) units designed for up to 6 minutes autonomy. During a utility failure it is expected that generators will start and take load within 1 minute of the failure occurring. Brown outs mitigated by dual supply and UPS.	Low	High	Medium
	In case of fire	See detailed air quality	Dispersion through the air	Each generator container or room will have a fire	Low	Low	Low

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
		modelling, **Section 11**		alarm panel (c/w manual break glass call point, heat detection, flame detection) interfaced to the site wide fire alarm system. A fusible link interfaced with fire alarm system and drop valves on both the fuel transfer and feed line to the generator will also be provided to terminate the flow of fuel to the engine. When the fusible link melts, it isolates the fuel feed to the engine which shuts the generator down in the event of the fire which triggers the fire alarm.			
Emission to water (bulk	Accidental	Surface water course flowing	Run-off from hard standing and/or	Diesel belly storage tanks will	Low	Medium	Low

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
fuel from diesel belly tanks)		north-south approximately 600m west of the Site	drainage routes and then to the surface water via surface water drains	be situated in a bund of 110% storage capacity. Any water that accumulates in external bunds is to be tested prior to discharge into rainwater drains. Any contaminated water will be removed using a vacuum pump and recycled or disposed using an appropriate waste disposal company. The areas in which the day tanks will be located will be subject to a daily site housekeeping walk around to look for issues. The Site ground surface will consist of hard			

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
				standing maintained in good condition both inside and outside of the building. Equinix has emergency response procedures in place in the event of a release of oil or diesel, processes for the planning for such eventualities and checklists to audit the response in case such an event occurs. These are provided in **Appendix B.**			
Emission to water (bulk Ad Blue)	Accidental	Surface water course flowing north-south approximately	Run-off from hardstanding and/or drainage routes and then to the surface	Ad Blue storage tanks will be situated in a bund of 110% storage capacity.	Low	Medium	Low

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
		600m west of the Site.	water via surface water drains	Any water that accumulates in external bunds is to be tested prior to discharge into rainwater drains. Any contaminated water will be removed using a vacuum pump and recycled or disposed using an appropriate waste disposal company. The areas in which the day tanks will be located will be subject to a daily site housekeeping walk around to look for issues. The Site ground surface will consist of hard standing maintained in good condition			

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
				both inside and outside of the building. Equinix has emergency response procedures in place in the event of a release of oil or diesel, processes for the planning for such eventualities and checklists to audit the response in case such an event occurs. These are provided in **Appendix B.**			
Emission to sewer (bulk fuel from diesel belly tanks)	Accidental	Waste water treatment plant (WWTP)	Combined sewer following a direct spill onto hard standing and entry to the drainage system following catastrophic failure of tank / pipework, overfill or bund failure and/or failure of and	As above with emission to water	Low	Medium, WWTP may need to quarantine the affected flow	Low

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
			site wide hard surfacing.				
Emission to sewer (bulk Ad Blue)	Accidental	WWTP	Combined sewer following a direct spill onto land through catastrophic failure of tank/pipework/overfill, bund and site surfacing.	As above with emission to water	Low	Medium	Low
Emission to sewer (firefighting water)	In case of fire	WWTP	Combined sewer	The proposed generator containers are designed to withstand the fire within and do not use water as a means of fire suppression.	Low	Low	Low
Emission to land (bulk fuel from diesel belly tanks)	Accidental	Land within or adjacent to the installation boundary	Direct spill onto land through catastrophic failure of tank / pipework or overfill, bund failure and/ or failure of site hardstanding	As above with emission to water. The proposed generator containers do not use water as a	Medium	Low – Site clean-up and possible remediation required	Medium – low

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
				means of fire suppression. In the event the fire services are required to use water in the generator container area, firefighting water would be collected by the surface water drains and isolated manually. Any firewaters captured in the drainage system would be pumped out and discharged of by a licensed waste character. The surface water drains of LD14 would connect to the Slough Trading Estate sewer system via oil interceptors as mitigation to any fuel leak.			

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
Emission to land (bulk Ad Blue)	Accidental	Land within the installation boundary and surrounding commercial and residential land	Direct spill onto land through failure of tank/ pipework / overfill, bund and site surfacing	As above with emission to water.	Low	Low	Low
Emission to groundwater (bulk fuel from diesel belly tanks)	Accidental	LD14 lies on the outer edge of the outer zone (Zone 2) of a Groundwater source.	Infiltration through land surface following direct spill as above	As above with emission to water.	Low	Medium – Site clean-up and possible remediation required	Medium – low
Emission to groundwater (above ground Ad Blue tank)	Accidental	As above	Infiltration through ground following failure of tank or associated underground pipe work.	As above with emission to water.	Low	Low	Low – Medium
Odour	No known scenarios for significant emissions reaching offsite receptors						
Noise and vibration	Generator testing/ emergency operation	Local businesses / residential receptors	Airborne	The proposed testing regime is scheduled for daytime hours. Emergency running likelihood is anticipated to be very low and	low	Low – nearest residences are approximately 175m to the north west. The nearest businesses are	Low

Hazard	Operational scenario	Receptor	Pathway	Risk management techniques	Probability of exposure	Consequence	Overall risk
				unlikely to be of extended duration (see emissions to air)		approximately 20m.	
Litter/ pests	Normal operation	Neighbouring industrial and commercial units	Windblown	Housekeeping will be given a high priority as company policy. Waste generating activities will occur within the data centre building and will not be external. Waste generated by the data centre will not be putrescible	Low	Low	Low
Visible emissions (Black smoke on start-up)	Generators testing / emergency operation	Neighbouring industrial and commercial units	Airborne/ visual	Minimisation of planned testing Low likelihood of emergency running (see emissions to air)	Low	Low – short duration visible emission	Low
Surface water flooding from a weather event	All operational scenarios	Site operations restricted	Direct effects	Site's EMS considers climate change risk assessment and adaptation	Low – not in a fluvial flood plain	Low – operational impact	Low

APPENDIX A DIESEL FILLING PROCEDURES

APPENDIX B EMERGENCY RESPONSE PROCEDURE

APPENDIX C AIR QUALITY IMPACT ASSESSMENT REPORT

APPENDIX D ISO14001 AND 50001 CERTIFICATES

APPENDIX E SITE CONDITION REPORTS

APPENDIX F DRAINAGE DRAWINGS

APPENDIX G SCR STATEMENT

APPENDIX H AD BLUE SPECIFICATION

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