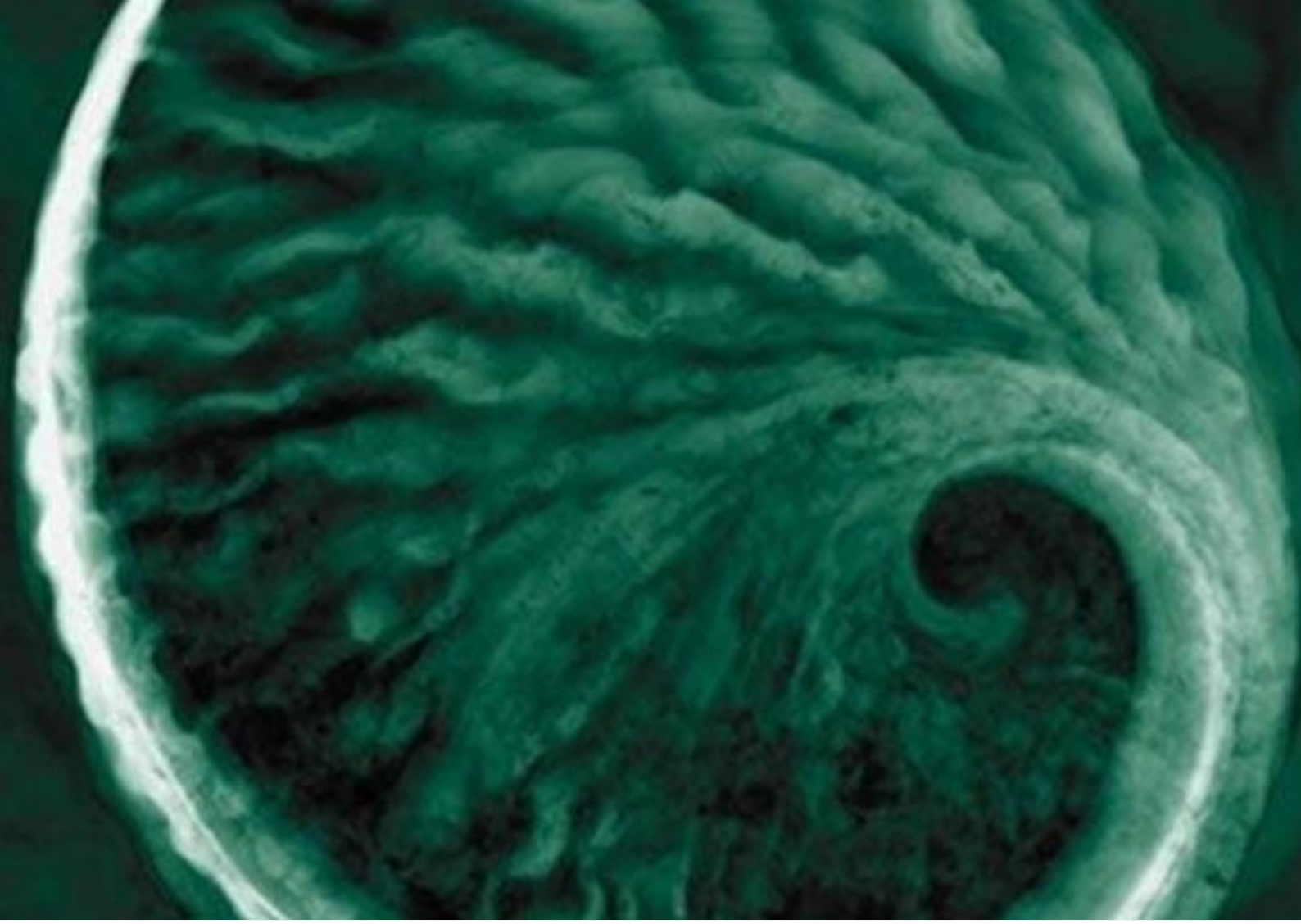

EQUINIX

Air Quality Impact Assessment

Equinix EPR/LP3303PR Variation and LD13x Partial Transfer with Variation

14 October 2020

Project No.: 0420743

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Air Quality Impact Assessment

Equinix EPR/LP3303PR Variation and LD13x Partial Transfer with Variation

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Acronyms and Abbreviations

Name	Description
AQS	Air Quality Standard
Breached, breaching, breach	Used 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.
Campus	Equinix data centres to remain permitted under Slough Campus Environmental Permit (EPR/LP3303PR): LD4, LD5, LD6 and LD7.
CL	Critical Load
EA	Environment Agency
EP	Environmental Permit
Exceeded, exceedance, exceed	Used when a predicted concentration is above an air quality standard threshold. For example, a 1-hour mean NO2 predicted environmental contribution of 220 µg/m3 exceeds the 200 µg/m3 air quality standard.
Extended Campus	All Equinix data centres located at Slough Trading Estate, i.e. Campus + LD10/LD13x + LD11x
LD13x	Data centre currently known as LD10 in EPR/LP3303PR. LD13x is the site to be transferred into its own Permit and varied at the same time.
LNR	Local Nature Reserve
$MW_{thermal}$/MW_{th}	megawatt thermal
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM_{10}	Particulate Matter of diameter below or equal to 10 µm
$PM_{2.5}$	Particulate Matter of diameter below or equal to 2.5 µm
SAC	Special Area of Conservation
SO_2	Sulphur dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

EXECUTIVE SUMMARY

Context

Equinix (UK) Ltd (Equinix) operates several data centres at the Slough Trading Estate. These data centres are subject to Environmental Permit (EP) requirements, due to the use of diesel generators at the data centres for the provision of back-up power in the event of a grid outage. The installed thermal capacity of these generators exceeds 50$MW_{thermal}$ and therefore operation requires an EP under Schedule 1, Part 2 of The Environmental Permitting (England and Wales) Regulations 2016 (as amended).

The impact assessment set out in this report supports:

- The proposed substantial variation to the existing EP for the Slough Campus (EPR/LP3303PR). This variation is required due to the installation of additional generators to existing data centres.
- The transfer of the LD10 data centre (to be renamed LD13x) to its own Permit. And;
- The substantial variation of the transferred LD13x Permit, which also proposes the installation of additional generators and a diesel-fuelled fire pump.

The information provided follows Environment Agency guidelines for the requirements for dispersion modelling of emissions to air and guidelines for assessing the impacts of emissions from generators. The Environment Agency requires evidence that emissions from the installation are not expected to result in applicable air quality standards being exceeded, or that the probability of exceeding is unlikely. This evidence is provided in this document.

The generators, which are all powered by diesel engines, will be tested periodically during the year, as part of the Equinix standard engine testing regime.

Currently there are two EPs operated by Equinix on the Slough Trading Estate:

- The Slough Campus Permit (EPR/LP3303PR) covering five data centres:
  - LD4
  - LD5
  - LD6
  - LD7
  - LD10, which is to be named LD13x and is the subject of an application to the EA to be transferred to its own Permit
- A Permit application currently undergoing determination (EPR/CP3409BH) covering:
  - LD11x

This report builds upon the previous impact assessments and modelling for the Slough Campus, presented in *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR) and for the LD11x Environmental Permit application (EPR/CP3409BH) presented in *Appendix F – AQ Modelling Report FINAL* of that application.

Assessment Scenarios

The six data centres are close enough to one another to potentially impact on the same sensitive receptors. Therefore, the impact assessment considers both the individual impacts of the data centres data centres within each EP, and the total potential cumulative impacts.

This impact assessment includes all six of the data centres listed above. Impacts have been modelled for eight scenarios in total:

- LD4 alone;
- LD5 alone;
- LD6 alone;
- LD7 alone;
- LD11x alone;
- LD10/LD13x alone (for the new stand-alone EP);
- LD4, LD5, LD6 and LD7 in combination (for the revised Campus EP); and
- LD4, LD5, LD6, LD7, LD10/13x, LD11 (in-combination assessment for all data centres).

The assessment considers the three test scenarios undertaken at the data centres. These being:

- Quarterly Black Building test – 3 times per year;
- Annual Load Bank test – 1 time per year; and
- Bi-monthly Start Up test – 24 times per year.

Additional generators are being installed at some data centres. In addition various amendments have been made to the modelling to reflect refinements of design information and in the case of LD10/13x an improvement condition. The changes are as follows:

- LD4 – 3 additional generators, updated stack heights and updated stack velocities;
- LD5 – 8 additional generators, no changes to existing stacks;
- LD6 – 0 additional generators, no changes to existing stacks;
- LD7 – 12 additional generators, updated stack location, updated diameter, updated velocity;
- LD11x – 0 additional generators, no changes to existing stacks; and
- LD10/LD13x – 4 additional generators plus a diesel fired fire pump engine. In response to Improvement Condition #1 updates to stack height, stack diameters and velocities. Stack locations updated.

The modelling results are related to three EPs. Summary reports have been prepared on the basis of this report for the two EP Substantial variations, and that will support the future Permits arrangements on the Slough Trading Estate as follows:

- Permit EPR/LP3303PR (Campus Summary Report for LD4, LD5, LD6 and LD7);
- Permit Application currently undergoing determination EPR/CP3409BH for LD11x (no change); and
- Transferred Permit being applied for to cover LD10/13x (LD13x Summary Report).

Findings – Routine Testing

The assessment identified that there is the potential to exceed the hourly nitrogen dioxide (NO_2) standard. This arises in all eight model scenarios.

However, the calculated statistical probability of breaching the standard is less than 1% in all modelled cases. The Environment Agency states[1] that below 1% exceedances are highly unlikely, and therefore no further actions are required.

The assessment suggests that the testing regime of LD13x alone does not have the potential to breach the hourly nitrogen dioxide standard as exceedances are predicted to occur a maximum of

[1] As per Environment Agency guidance, Specified generators: dispersion modelling assessment, exceedances are highly unlikely if probability is less than 1%, unlikely if less than 5% and over 5% the potential is likely and the risk must be reduced.

three times a year, it is to say less than the 18 times a year allowed by the standard. The maximum assessed probability of the testing regime breaching the hourly NO_2 standard is 1.7 x 10^{-17}% for the Campus alone and 1.0 x 10^{-12}% for the Campus in combination with LD13x and LD11x, i.e. very low. The Environment Agency guidance[2] states that where the probability of exceedance is greater than 5%, further proposals of emissions reduction are required. In both cases, exceedances of the hourly NO_2 standard are considered "highly unlikely" as the probabilities are far less than 1%. Therefore, no further proposals to reduce the risk of exceedance are made.

The testing regime scenarios were not predicted to have the potential to impact adversely the annual mean NO_2 standard for the protection of human health, including at the Air Quality Management Areas in Slough Borough.

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

Findings – Emergency Operations

Emergency power generation scenarios were assessed with all generators on all six data centres running concurrently. In this case, 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.

Furthermore, the model predicts that emergency running has the potential to exceed the 24 hour NO_x standard at Haymill Valley LNR (only for the Campus alone and Extended Campus) and predicts the potential for significant impacts at Burnham Beaches SAC (for the Extended Campus running only). The predicted process contribution at the SAC is however only marginally over the threshold for insignificance (11% vs a threshold of 10 %).

Furthermore, in practice in the last nine years there has been only one occurrence where some of the data centres (LD6, LD7 and LD10) had to use the back-up generators, this was during a national power outage in mid-2019. As a result the potential for actual significant impacts at Burnham Beaches SAC is considered highly unlikely.

PM_{10} and SO_2

The assessment found that the particulate emissions from the engines should not have the potential to breach the air quality standard for PM_{10} or $PM_{2.5}$. Sulphur dioxide (SO_2) emissions were not assessed as the Site use ultra-low-sulphur diesel and impacts are anticipated to be insignificant.

[2] Environment Agency, 2019, Guidance Specified generators: dispersion modelling assessment, https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

1. INTRODUCTION

The following assessment has been prepared by Environmental Resources Management Limited (ERM) on behalf of Equinix (UK) Limited (Equinix), based on data on current and anticipated operations provided to ERM by Equinix.

Equinix is planning to extend its operations currently permitted on their Slough Campus sites: LD4, LD5, LD6, LD7 and LD10. This involves a substantial variation to the existing Campus Environmental Permit (EP) (EPR/LP3303PR). Furthermore, one of the data centres currently in the Campus Permit (LD10, to be renamed LD13x) is proposed to be transferred into its own Permit. This report provides supporting information for both the substantial variation to the Campus Permit and the transfer with substantial variation of LD13x.

The main potential operational impacts from the diesel engines used for the generators are emissions to air. As per the Environment Agency working draft guidance[3] the most important consideration is the potential to breach the short-term ambient air quality standard for hourly mean NO_2. This standard allows the threshold to be exceeded 18 times in a calendar year before a breach of the standard is recorded. This report therefore presents the assessment of potential impacts to air quality from the NO_x emissions generated by both the Campus data centre and LD13x's engines.

This report considers the potential impacts of the data centres within each EP, and also the potential in-combination effects given the proximity of the data centres to one another.

In order to be able to compare and use the results of the Campus and LD13x impact assessment, the methodology of this assessment is similar to that used in *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR) and in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH). The data presented in the previous reports is not copied here to avoid repetition. The *Campus' Air Dispersion Modelling Report* and the *LD11x AQ Modelling Report* should be read along with this report for context.

The impact assessment has been carried out using an air dispersion model to estimate the potential impact of the engines' emissions. The model is based on data provided by Equinix for the Campus data centres and LD13x as well as publically available environmental data.

Impacts are assessed for:

- human health – versus short-term and long-term NO_2 standards
- protected conservation areas – versus short-term and long-term NO_x Critical Levels and nitrogen deposition and acid deposition Critical Loads.

The assessment and report have been prepared following the relevant guidance and published documents:

- Environment Agency, 2016, Air emissions risk assessment for your environmental permit, https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit ;
- Environment Agency, 2019, Environmental permitting: air dispersion modelling reports, https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports ;
- Environment Agency, 2018, Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, given by a Senior Permitting Officer, and available at: https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf ;
- Environment Agency, 2019, Specified generators: dispersion modelling assessment, https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment ;

[3] Data Centre FAQ Headline Approach, DRAFT version 10.0 H.Tee 01/06/18 – Release to Industry

- Environment Agency AQMAU, 2016, Diesel generator short term NO_2 impact assessment; https://consult.defra.gov.uk/airquality/medium-combustion-plant-and-controls-on-generators/supporting_documents/Generator%20EA%20air%20dispersion%20modelling%20report.pdf ; and
- Environment Agency, 2018, Data Centre FAQ Headline Approach DRAFT version 10.0, provided by Tech UK.

In the context of this report, the assessment considers the following definition:

- Exceeded, exceedance, exceed: Used when a predicted concentration is above an air quality standard threshold. For example, a 1-hour mean NO_2 predicted environmental contribution of 220 µg/m^3 exceeds the 200 µg/m^3 air quality standard.
- Breached, breaching, breach: Used 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.
- Campus: Equinix data centres to remain permitted under Slough Campus Environmental Permit (EP, EPR/LP3303PR): LD4, LD5, LD6 and LD7.
- Extended Campus: all Equinix data centres located at Slough Trading Estate: Campus + LD10/LD13x + LD11x.

Particulate matter has been examined in the H1 screening model and was found to require modelling. A screening exercise has been undertaken for the short-term impact of PM_{10}[4]. Long-term PM_{10} and $PM_{2.5}$ have not been assessed as the engines only operate for a small number of hours per year, and therefore significant impacts are not expected to arise. This is consistent with the *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR).

For these data centres, sulphur dioxide (SO_2) is not expected to be a material issue since all fuel oil is specified as ultra-low sulphur. No screening or detailed assessment have been undertaken for SO_2. This is consistent with the *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR).

[4] PM_{10} is the particulate matter in the air that is less than or equal to 10 µm in diameter

2. STRUCTURE OF REPORT

This report details the air quality assessments undertaken for supporting the variation application for the Campus Permit and LD13x after its partial transfer. Where information has been presented previously in *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR) or *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH), a cross reference to the relevant report section is provided and information is not duplicated here. Where revised information is presented, this is set out.

The report details:

- Background and Context;
- Legal Framework;
- Air Quality Background Concentrations ;
- Methodology;
- Impact Assessment; and
- Conclusions.

This report will inform into two separate summary reports designed to support the individual Substantial Variations applications of:

- Permit EPR/LP3303PR (Campus Summary Report for LD4, LD5, LD6 and LD7); and
- Permit related to LD10/LD13x after transfer into its own Permit (LD13x Summary Report).

3. BACKGROUND AND CONTEXT

3.1 Context of Assessment

The impact assessment set out in this report supports variations to the Campus Permit and LD13x after its partial transfer. These are required due to the installation of additional generators and a diesel fire pump.

The assessment refers to two existing EPs:

- Permit EPR/LP3303PR covering five data centres:
  - LD4;
  - LD5;
  - LD6;
  - LD7; and
  - LD10, which is to be named LD13x and is the subject of an application to the EA to be transferred to its own Permit
- Permit Application currently undergoing determination (EPR/CP3409BH) covers:
  - LD11x

In addition, the opportunity is taken to update the dispersion modelling with a number of smaller refinements to the existing stacks. These amendments include:

- Refinement of stack locations;
- Refinement of the stack diameter and exit velocity`; and
- Capturing changes to the stack height.

3.2 Assessment Scenarios

The six data centres are close enough to one another to potentially impact on the same sensitive receptors. Therefore, the impact assessment considers both the individual impacts of the data centres within each EP, and the total cumulative impacts.

This impact assessment includes all six of the data centres listed above. Impacts have been modelled for eight scenarios in total:

- LD4 alone
- LD5 alone
- LD6 alone
- LD7 alone
- LD11x alone
- LD10/LD13x alone (for the new stand-alone EP)
- LD4, LD5, LD6 and LD7 in combination (for the revised Campus EP)
- LD4, LD5, LD6, LD7, LD10/13x, LD11 (in-combination assessment for all data centres)

The assessment considers the three test scenarios undertaken at the data centres. These being:

- Quarterly Black Building test – 3 times per year
- Annual Load Bank test – 1 time per year
- Bi-monthly Start Up test – 24 times per year

Additional generators are being installed at some data centres. In addition various amendments have been made to the modelling to reflect refinements of design information and, in the case of LD10/13x, in response to an improvement condition. The changes are as follows:

- LD4 – 3 additional generators, updated stack heights and updated stack velocities
- LD5 – 8 additional generators, no changes to existing stacks
- LD6 – 0 additional generators, no changes to existing stacks
- LD7 – 12 additional generators, updated stack location, updated diameter, updated velocity
- LD11x – 0 additional generators, no changes to existing stacks
- LD10/LD13x – 4 additional generators plus a diesel fired fire pump engine. In response to Improvement Condition #1 updates to stack height, stack diameters and velocities. Stack locations are also updated

3.3 Site Location and Overview

3.3.1 Overview

The Campus and LD11x independent data centres are all located on Slough Trading Estate. The land surrounding the site is generally used for industrial or commercial purposes. A map showing the land use within 2 km of the data centres was presented in *Figure 2.2* of *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR). The terrain in the area is essentially flat lying with no steep slopes in the vicinity of the data centres.

3.3.2 Generators

Each new generator set comprises a generator and alternator in a combined set.

The new generators, like the ones already in place, are for backup generation purposes only, i.e. for electrical generation in the event of a failure of the national grid electrical supply. The data centres each have two separate substation feeds in order that power supply has built in redundancy. The data centres are protected from short-term brown-outs or black-outs by uninterruptable power supplies (UPS). These buffer small fluctuations in electrical supply. If the UPS detects power failure or extended reduced power, the generators within the data centres affected will start automatically to begin generating sufficient electricity to match the load required by the data centre. The UPS can supply power for a minimum of six minutes but ordinarily the generators would start well before this time elapses.

No periods of off-grid operation were recorded in the data centres on the Slough Trading Estate in 2017, 2018 and 2019, this is the norm due to the dual substation connection. Some of the Slough Campus generators did run in mid-2019, (LD6, LD7 and LD10) during a nationwide power outage. Additionally, one supply to LD4 ceased for four days in early 2017 as a result of an off-site substation transformer failure. The back-up mains supply meant there was no mains outage or generator operation. All generator starts have been for maintenance and testing purposes, which is an integral part of Equinix's service commitment to clients.

3.3.3 Engines Operation

Each of the six data centres has diesel backup generators installed to provide emergency power in the event of a grid supply failure. There are currently 81 backup generators on the Extended Campus, and one fire pump engine. The current proposal is to extend this to 108 generators and 2 fire pump engines.

The engines are not used to routinely provide power. However, the engines are tested regularly to ensure that they are capable of reliably fulfilling the backup supply requirements. Each data centre is tested separately, using three types of tests. All the different tests and a potential emergency power

scenario have been included in the impact assessment. The modelled scenarios for the assessment are presented in *Table 3.1.*

Table 3.1: Modelled Engine Operations

Regime	Expected Frequency	Representative Duration	Scheduling	Number of engines	Load
Testing Regime – All three tests					
Start-up test	Bi-monthly [a]	5-min	Weekdays	LD4: All engines simultaneously LD5: Half of the engines at a time [b] LD6: Three engines at a time [b] LD7: Three engines at a time [b] LD10/LD13x: All engines	No electrical load. Modelled as 30% load on engine
Black building test	Quarterly [c]	1 hour	Weekends	All engines of each LD. Not to coincide with tests at any other LD [b]	60% engine load
Load bank test	Annually	1 hour	Weekends	One engine after the other. Not to coincide with tests at any other LD [b]	100% engine load
Emergency power					
Emergency power	Unpredictable	1 hour	Any time	All	100% engine load [d]

[a] or the avoidance of doubt, bi-monthly refers here to twice a month, or 24 times a year.
[b] tests occur in sequential hours, not in the same hour
[c] The quarterly test is undertaken three times a year at each LD site. The fourth test is replaced by the annual load bank test
[d] It has been assumed that all engines would be running at 100% load in case of emergency. This is a worst-case scenario and in reality, it is expected that only a part of the engines would be running, with others in standby in case of failure

4. LEGAL FRAMEWORK

4.1 Applicable Air Quality Standards

See *Section 3.1 of Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR).

4.2 Significance of Impact

See *Section 3.2 of Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR).

4.3 Likelihood of Exceedances

See *Section 3.3 of Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH).

5. AIR QUALITY BACKGROUND CONCENTRATIONS

See *Section 4 of Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH).

6. METHODOLOGY

6.1 Model Parameters and Inputs

The key elements of the methodology used for carrying out the air dispersion modelling are set out in *Table 6.1*. For further details, see *Section 3.1* of *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR).

Table 6.1: Air Dispersion Model Methodology and Parameters

Parameter	Approach	Notes
Dispersion model	Lakes AERMOD View 9.6.5	
Number of sources	110 over six data centres	108 generators and two fire pump engines. See details in *Section 6.2*
Model domain	20km x 20km	Radius from Campus of 10km to cover protected conservation areas. Map in *Appendix A* of *Annex C – Air Dispersion Modelling Report* of the Campus Environmental Permit application (EPR/LP3303PR).
Receptor grid resolution	25m up to 2km from centre; 200m between 2km and 10km from centre	Stack heights range from ~3.5m to 23m, so 25m was considered adequate up to 2km from the Campus.
Discrete sensitive receptors	37	Detailed information in *Section 5.3* in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH).
Buildings	23 buildings, on Campus or Trading Estate	All buildings that are greater than one third of the stack height, within five stack heights of the stack, are included. Buildings dimensions and location presented in *Appendix A*.
Terrain	Not included	There is no sustained gradients of >1:10 in the vicinity of the Campus, and therefore terrain was not included
Surface Characteristics	Albedo: 0.222 Bowen Ratio: 1.45 Surface Roughness: 1.00	As provided with met data
Meteorological data	London Heathrow, 2012-2016 inclusive	Hour-sequential data. Wind roses are presented in *Appendix A*.
NO_x to NO_2 conversion ratio	Short-term concentrations: <500m from source 15% >500m from source 35% Long-term concentrations: 70%	The Environment Agency[a] states that a short-term conversion ratio of 15% is reasonable within 500m of a source. For distances of >500m ratios are taken from other Environment Agency guidance[b].

Parameter	Approach	Notes
Statistical method	Cumulative hypergeometric distribution for each discrete sensitive receptor.	The statistical method was used following the Environment Agency guidance[c].

[a] *Environment Agency AQMAU, 2016, Diesel generator short term NO_2 impact assessment, https://consult.defra.gov.uk/airquality/medium-combustion-plant-and-controls-on-generators/supporting_documents/Generator%20EA%20air%20dispersion%20modelling%20report.pdf*
[b] *Environment Agency, 2007, Review of methods for NO to NO_2 conversion in plumes at short ranges, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290985/scho0907bnhi-e-e.pdf*
[c] *Environment Agency, 2018, Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf ;*

6.2 Emission Parameters

The emission parameters for each modelled source are presented in *Table 6.2* and *Table 6.3*. New generators or fire pumps are indicated in *italics*. Maps showing the stack locations is presented in Figure 6.1 to Figure 6.5 (LD11x is not included, as there are no updates to this LD).

Table 6.2: Modelled Emissions Parameters LD4 – LD6

Data centre	LD4			LD5				LD6
Engine Make/Model	SDMO X2200C	CAT 3516B	*CAT 3516B*	SDMO X2500C	CAT 3516B	Clarke JU4H-UF42, fire pump	*SDMO X2500C*	Cummins KTA50_GS8
Emission Points [a]	LD4_01 to LD4_08	LD4_09 LD4_10	*LD4_11 to LD4_13*	LD5_01 to LD5_06	LD5_07 to LD5_14	LD5_15	*LD5_16 to LD5_23*	LD6_01 to LD6_24
Number of engines	8	2	*3*	6	8	1	*8*	24
Stack Orientation	Vertical with rain caps[d]	Vertical with rain caps[d]	*Vertical with rain caps[d]*	Vertical	Vertical	Vertical	*Vertical*	Horizontal
Stack Height (m)	8.5 (updated information)	8.5 (updated information)	*8.5*	9.8	9.8	9.8	*9.37*	22.8
Flue Diameter (m)	0.495[d]	0.495[d]	*0.495[d]*	0.35	0.35	0.10	*0.35*	0.35
Emission Velocity (m/s)	38.5 [d]	31.7[d]	*35.4[d]*	85.2	70.6	36.1	*85.2*	45.2
Actual Flow Rate (m^3/s)	7.4	6.1	*6.81*	8.2	6.8	0.3	*8.2*	4.3
Emission Temperature (K)	753	797	*805*	783	805	712	*783*	783
NO_x Concentration[b] (mg/m^3, 100% load)	1700	4384	*2020*	1700	3225.6	476	*1700*	3400
NO_x Emission Rate (g/s, 100% load)	6.29	6.18	*4.11*	6.29	4.69	0.13	*6.29*	3.62

Data centre	LD4			LD5				LD6
PM_{10} Concentration[c] (mg/m^3, 100% load)	50	20.3	*17.3*	50	22.3	17	*50*	130
PM_{10} Emission Rate (g/s, 100% load)	0.19	0.03	*0.04*	0.19	0.03	0.005	*0.19*	0.14
Sulphur Emission Rate[c] (g/s, 100% load)	0.0055	0.0021	*0.0021*	0.0055	0.0021	0.00005	*0.0055*	0.0016

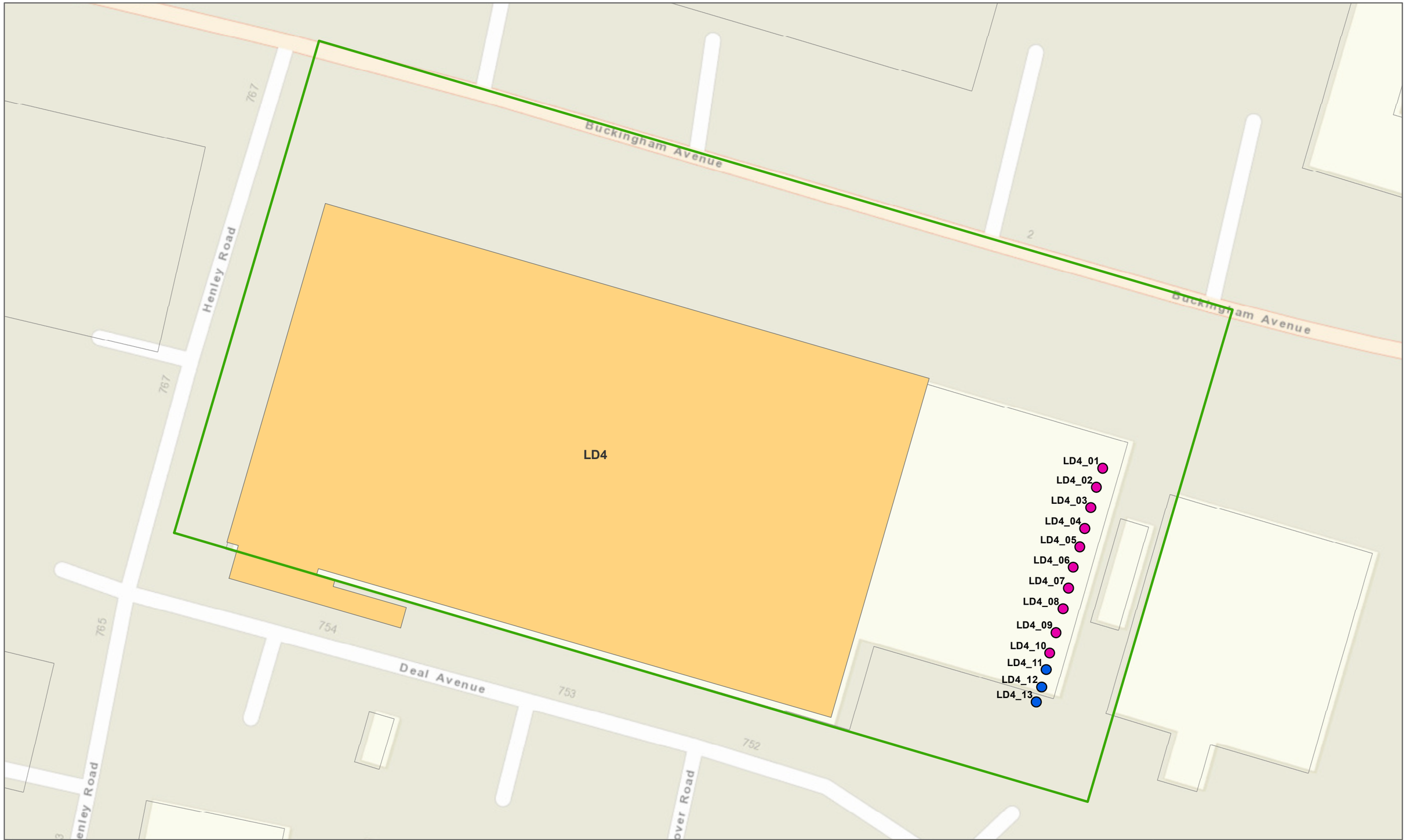
[a] *The location of each stack can be found in Appendix A.*
[b] *Concentrations were obtained from the engines' datasheets and are at standard conditions: 25°C, dry, 5% O_2 content*
[c] *SO_2 emission rates were estimated using the engine's fuel consumption, a sulphur content in the ultra low sulphur diesel of 10ppm (legal maximum) and assuming that all of the sulphur in the diesel is converted to SO_2*
[d] *to account for the raincap, these emission sources are modelled at half the exit velocity by doubling the stack cross sectional area*

Table 6.3: Modelled Emissions Parameters LD7 – LD11x

Data centre	LD7.1			*LD7.2*		LD10/LD13x						LD11x
Engine Make/Model	Cummins C2500-D5A	Cummins C3000-D5e	*Cummins C3500-D5e*	*Cummins C3000-D5e*	*Cummins C3000-D5e*	CAT C13	CAT 3516B-HD	Cummins C2500-D5A	*Cummins C3000-D5e*	*Cummins C2500-D5A 2g TAL*	*Clarke JU4H-UF54, fire pump*	Cummins C3500D5e
Emission Points [a]	LD7.1_01 to LD7.1_04	LD7.1_05 LD7.1_08	*LD7.1_09*	*LD7.2_01 to LD7.2_08*	*LD7.2_09*	LD10_01 and LD10_02	LD10_03 to LD10_05	LD10_06 to LD10_15	*LD10_16 to LD10_18*	*LD10_19*	*LD10_20*	LD11x-01 to LD11x_12
Number of engines	4	4	*1*	*8*	*1*	2	3	10	*3*	*1*	*1*	12
Stack Orientation	Vertical	Vertical	*Vertical*	*Vertical*	*Vertical*	Vertical	Vertical	Vertical	*Vertical*	*Vertical*	*Vertical*	Vertical
Stack Height (m)	22.9	22.9	*5.9*	*23*	*5.6*	12.8[b]	12.8[b]	12.0	*12.8*	*12.8*	*3.4*	16
Flue Diameter (m)	0.45 (updated information)	0.6 (updated information)	*0.6*	*0.6*	*0.46*	0.15 (updated information)	0.35 (updated information)	0.35	*0.6*	*0.35*	*0.35*	0.6
Emission Velocity (m/s)	39.7	25.5	*34.1*	*25.5*	*43.8*	59.2	78.6	65.7	*25.5*	*65.7*	*5.1*	34.1
Actual Flow Rate (m^3/s)	6.3	7.2	*9.6*	*7.2*	*7.2*	1.0	7.6	6.3	*7.2*	*6.3*	*0.5*	9.6
Emission Temperature (K)	758	754 (updated information)	*697*	*754*	*754*	802	813	758	*754*	*758*	*880*	697
NO_X Concentration [c] (mg/m^3, 100% load)	3498	2091	*2292*	*2091*	*2091*	2730.6	3059	3498	*2091*	*2000*	*476[e]*	2292
NO_X Emission Rate (g/s, 100% load)	5.39	4.04	*5.41*	*4.04*	*4.04*	0.70	4.95	5.39	*4.04*	*3.08*	*0.288*	5.41

Data centre	LD7.1			*LD7.2*		LD10/LD13x						LD11x
PM_{10} Concentration [c] (mg/m^3, 100% load)	13.57	23	*29*	*23*	*23*	11.25	12.6	13.57	*23*	*23*	*17[e]*	29
PM_{10} Emission Rate (g/s, 100% load)	0.02	0.04	*0.079*	*0.04*	*0.04*	0.003	0.02	0.02	*0.04*	*0.04*	*0.0085*	0.079
Sulphur Emission Rate[d] (g/s, 100% load)	0.0023	0.0029	*0.0033*	*0.0029*	*0.0029*	0.0004	0.0024	0.0023	*0.0029*	*0.0029*	*0.00019*	0.0033

[a] The location of each stack can be found in Appendix A.
[b] The stacks for points LD10_01 to LD10_05 have been increased in height to reflect the work undertaken for the Campus Permit Improvement Condition 1
[c] Concentrations were obtained from the engines' datasheets and are at standard conditions: 25°C, dry, 5% O_2 content
[d] SO_2 emission rates were estimated using the engine's fuel consumption, a sulphur content in the ultra low sulphur diesel of 10ppm (legal maximum) and assuming that all of the sulphur in the diesel is converted to SO_2
[e] assumed equal to LD5_15



Existing Emission Points to Air
Proposed New Emission Points to Air
LD4 Site Installation Boundary
Data Centre

0 10 20
Metres

N

Figure 6.1
Emission Points - LD4
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A01
SIZE: A3	DRAWN: RH
PROJECT: 0420743	CHECKED: HF
DATE:29/09/2020	APPROVED: HF

Site layout data provided by Equinix

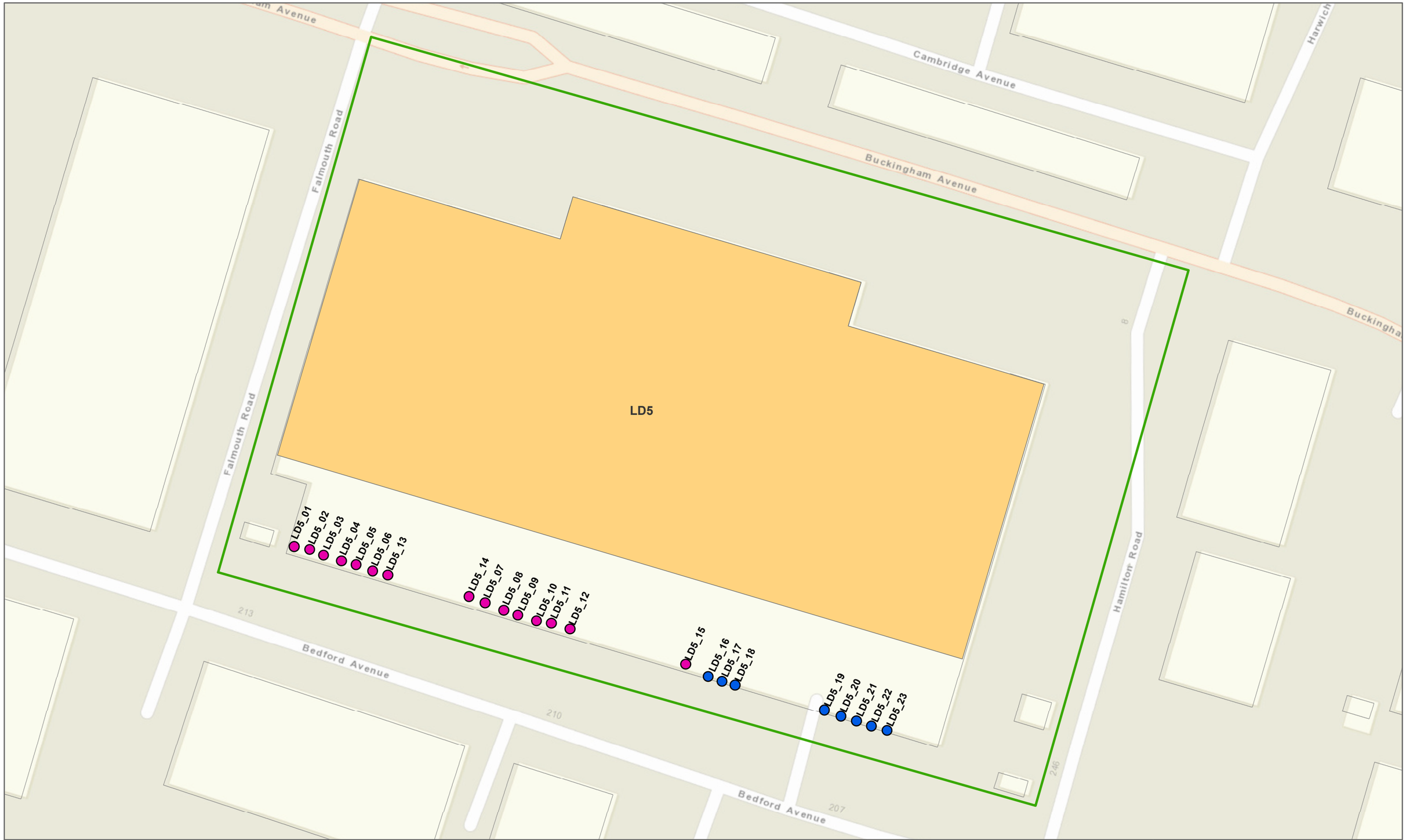
ERM

EQUINIX

PROJECTION: British National Grid

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Path: \\UKLONSV04\Data\Oxford\Projects\0420743 Equinix Slough Permit.GB\Slough campus variation\GIS\MAPS\LD4\Figure5.1_EmissionPointsToAir_LD4_A01.mxd



- Existing Emission Points to Air
- Proposed New Emission Points to Air
- LD5 Site Installation Boundary
- Data Centre

0 10 20
Metres

N

Figure 6.2
Emission Points - LD5
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A01
SIZE: A3	DRAWN: RH
PROJECT: 0420743	CHECKED: HF
DATE: 29/09/2020	APPROVED: HF

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EQUINIX

PROJECTION: British National Grid

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Path: \\UKLONSV04\Data\Oxford\Projects\0420743 Equinix Slough Permit.GB\Slough campus variation\GIS\MAPS\LD5\Figure5.2_EmissionPointsToAir_LD5_A01.mxd

Existing Emission Points to Air
LD6 Site Installation Boundary
LD7 Site Installation Boundary
Data Centre

0 10 20
Metres

N

Figure 6.3
Emission Points - LD6
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A01
SIZE: A3	DRAWN: RH
PROJECT: 0420743	CHECKED: HF
DATE: 06/10/2020	APPROVED: HF

Site layout data provided by Equinix

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EQUINIX

PROJECTION: British National Grid

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

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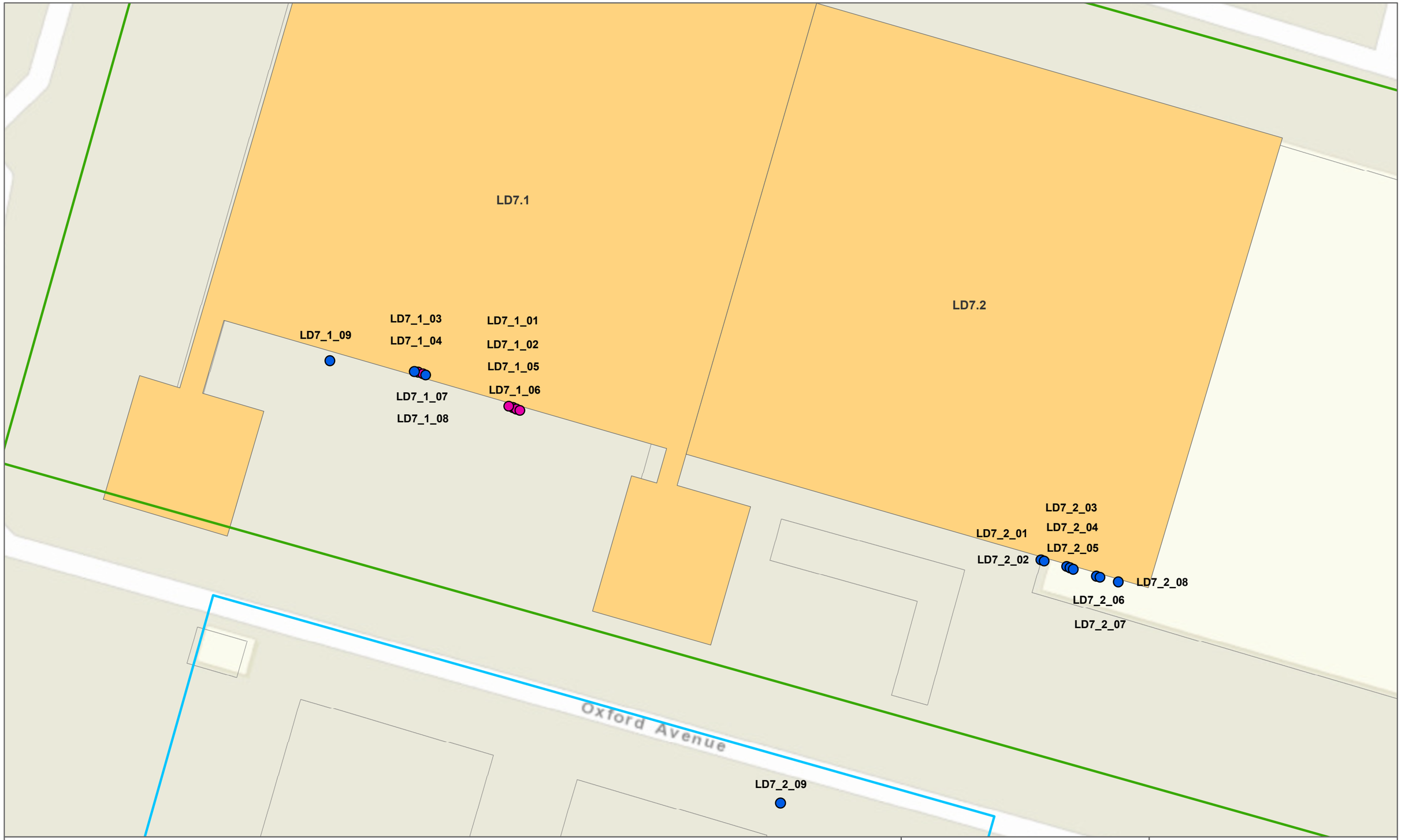

- Existing Emission Points to Air
- Proposed New Emission Points to Air
- LD6 Site Installation Boundary
- LD7 Site Installation Boundary
- Data Centre

PROJECTION: British National Grid

0 10 20
Metres

N

Figure 6.4
Emission Points - LD7
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A02
SIZE: A3	DRAWN: RH
PROJECT: 0420743	CHECKED: HF
DATE: 07/10/2020	APPROVED: HF

Site layout data provided by Equinix

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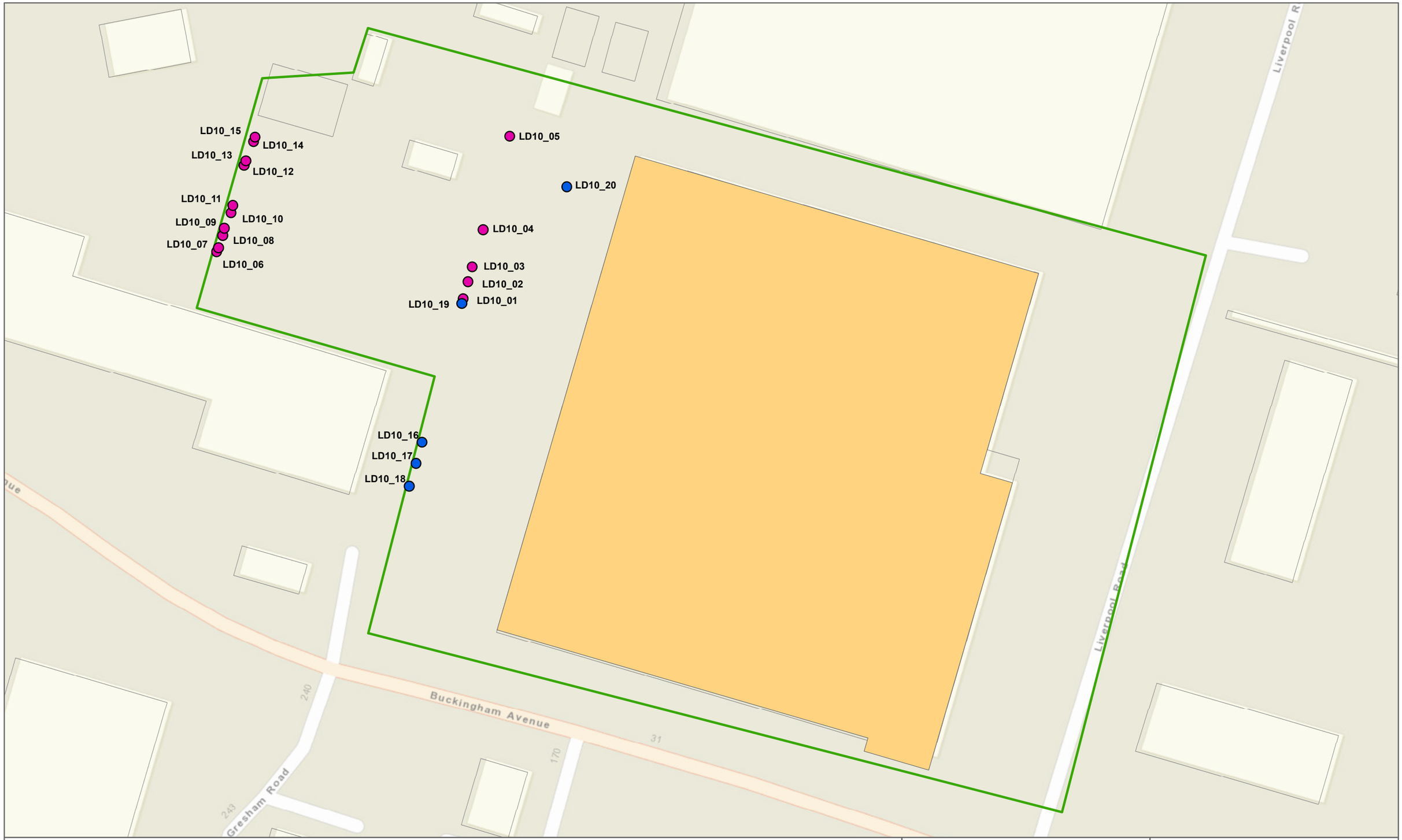


Existing Emission Points to Air

Proposed New Emission Points to Air

LD13x Site Installation Boundary

Data Centre

0 10 20
Metres

N

Figure 6.5
Emission Points - LD13x
Slough Trading Estate, 765 Henley Road
Slough SL1 4JW

SCALE: See Scale Bar	VERSION: A01
SIZE: A3	DRAWN: RH
PROJECT: 0420743	CHECKED: HF
DATE: 29/09/2020	APPROVED: HF

Site layout data provided by Equinix

ERM

EQUINIX

PROJECTION: British National Grid

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Path: \\UKLONSV04\Data\Oxford\Projects\0420743 Equinix Slough Permit.GB\LD13x Partial Transfer\GIS\MAPS\Figure5.1_EmissionPointsToAir_A01.mxd

6.3 Receptors Parameters

See *Section 5.3* in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH).

6.4 Sensitivity Analysis

See *Section 5.4* in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH).

7. IMPACT ASSESSMENT

7.1 Introduction

The assessment considers the potential impact of the following routine operations:

- Start-up test;
- Black building test; and
- Annual load bank test.

In addition the potential impacts of emergency power generation are assessed, noting the likely rarity of these events. A screening assessment was undertaken for PM_{10} in *Section 7.2*. A detailed assessment was undertaken in *Section 7.3* for NO_2 and NO_x, for human health and habitats respectively.

7.2 PM_{10} Screening

The H1 tool screened-in short-term PM_{10} emissions from the new engines for detailed dispersion modelling.

A screening exercise has been undertaken on the basis that the extended Campus, Campus or LD13x on its own, is running all the engines at the same time at 100% load for eight continuous hour in a day. This is in practice not how the testing regime is scheduled as each data centre is tested separately, and only individual engines are run at 100% load. This is also an unlikely case for an emergency scenario as not all engines would be run for the whole 8-hours, and in the last nine years there only been one occurrence where some of the data centres (LD6, LD7 and LD10) had to use the back-up generators, this was during a national power outage in mid-2019. The results of the modelling for this worst-case scenario are presented in *Table 7.1.* A short-term background concentration for PM_{10} of 32.6 µg/m^3 was used, based on the long-term background presented in *Table 4.2 of Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)*.

Table 7.1: Modelled 24-hour Mean Concentrations for PM_{10} Screening based on 8-hour of Operations, all Engines, 100% Load

Data Centre	Particulates (PM_{10}) Concentration (µg/m^3), Maximum at any of the Specified Receptors					
	24-hour maximum (100th %ile)			24-hour 36th highest hour (90.4th %ile)		
	PC	PEC	PEC as % of AQS	PC	PEC	PEC as % of AQS
Extended Campus	30.3	62.9	126%	12.5	45.1	90%
Campus	30.2	62.8	126%	11.9	44.5	89%
LD13x	5.3	37.9	76%	3.1	35.7	71%

[a] *All Campus' engines running at 100% load for 8 hours*

The modelling results presented in *Table 7.1* show that the AQS is not expected to be exceeded even in this worst case. On this basis, the current testing regime is not expected to result in the AQS being exceeded. No further detailed assessment of PM_{10} for each test undertaken or emergency power operations has therefore been performed.

A contour plot of the 36th highest 24-hour mean is presented in *Appendix B*.

7.3 Detailed Assessment of NO_2 and NO_x

7.3.1 Testing Regime

7.3.1.1 Summary

The impact assessment considers the potential for the 1 hour NO_2 air quality standard of 200µg/m^3 to be exceeded at receptors, due to engine emissions. This requires consideration of the baseline. In this case the short term baseline, based on the long-term background presented in *Section 4 of Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)*, is 52µg/m^3, meaning that the Process Contribution (PC) at a receptor must be greater than 148µg/m^3 NO_2 in order for the Predicted Environmental Concentrations (PEC) to exceed the 1 hour NO_2 standard.

The testing regime described in Section 3.3.3 has been modelled to identify whether testing could potentially result in a PEC >200µg/m^3, with the following results:

- Bi-monthly test results predict a PEC <200µg/m^3 at all receptors, and therefore need not be considered further.
- Quarterly test results predict a PEC >200µg/m^3 at some receptors, and therefore requires further analysis.
- Annual Load Bank test predict a PEC >200µg/m^3 at some receptors, and therefore requires further analysis.

The predicted PCs and PECs for each of the three tests are set out below.

7.3.1.2 Bi-monthly Start-up Test

As described in Section 3.3.3, a start-up test is undertaken as follows:

- Undertaken every two weeks during weekdays;
- Running a group of generators at each data centre for approximately 5 minutes;
- No electrical load corresponding to load and NO_x emissions 30% of maximum.
- Each data centre is tested for a maximum of 24 hours per year

Each data centre is tested separately, with no other data centre being tested at the same time, as follows:

- LD4: All engines tested in one single group;
- LD5: Half of the engines tested in one group, then the other half;
- LD6: Eight groups of three engines each are run one after the other;
- LD7: Three engines at a time (6x3, i.e. 3x3 at LD7.1 and 3x3 at LD7.2);
- LD11x: Two engines at a time;
- LD10/LD13x: All engines tested in one single group.

The resulting predicted maximum concentrations at any of the 37 specified receptors (listed *Section 5.3* in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH)) are presented in *Table 7.2*.

Table 7.2: Predicted Hourly Concentrations for Start-up Test

Data Centre	Nitrogen Dioxide (NO_2) Concentration (µg/m^3), Maximum at any of the Specified Receptors					
	1-hour maximum (100th %ile)			1-hour 19th highest hour (99.79th %ile)		
	PC	PEC	PEC as % of AQS	PC	PEC	PEC as % of AQS
LD4	48.6	101	50%	36.9	89	44%
LD5	63.9	116	58%	42.8	95	47%
LD6	30.7	83	41%	23.6	76	38%
LD7	24.3	76	38%	20.2	72	36%
LD10/LD13x	36.6	89	44%	31.3	83	42%
LD11x	21.1	73	37%	11.0	63	32%

The results presented predict that there is no predicted exceedance of the AQS as a result of the start-up test at any data centre. Contour plots for the 1-hour maximum have also been created and are presented in *Appendix B*.

7.3.1.3 Black Building Test, Quarterly

As described in *Section 3.3.3*, a black building test is undertaken as follows:

- Undertaken three times a year during the weekend.
- Running all the generators at each data centre for approximately 1 hour, at 60% load. Each data centre is tested separately, with no other data centre being tested at the same time.
- Electrical load corresponding to load and NOx emissions 60% of maximum.
- Each data centre is tested for a maximum of 15 hours per year.

The resulting maximum predicted concentrations at any of the 37 specified receptors (listed Section 5.3 in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH)) are presented in *Table 7.3*.

Table 7.3: Predicted Hourly Concentrations for Black Building Test

Data Centre	Nitrogen Dioxide (NO_2) Concentration (µg/m^3), Maximum at any of the Specified Receptors					
	1-hour maximum (100th %ile)			1-hour 19th highest hour (99.79th %ile)		
	PC	PEC	PEC as % of AQS	PC	PEC	PEC as % of AQS
LD4	1165	1217	609%	885	937	469%
LD5	1534	1586	793%	1027	1079	540%
LD6	738	790	395%	566	618	309%
LD7	583	635	318%	484	536	268%
LD10/LD13x	878	930	465%	751	803	402%
LD11x	507	559	279%	264	316	158%

The results presented in *Table 7.3* predict that the black building test has the potential to exceed the NO_2 hourly standard for all data centres.

Contour plots for the 1-hour maximum have also been created and are presented in *Appendix B*.

7.3.1.4 Annual Load-Bank Test

As described in Section 3.3.3, a load-bank test is undertaken as follows:

- Once per year during the weekend.
- Running one generator at a time sequentially at each data centre for 1 hour. Each data centre is tested separately, with no other data centre being tested at the same time.
- Electrical load corresponding to load and NO_x emissions 100% of maximum.
- The fire pumps at LD5 and LD13x are not tested during the load-bank test.

The resulting maximum predicted concentrations at any of the 37 specified receptors (listed Section 5.3 in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/CP3409BH)) are presented in *Table 7.4*.

Table 7.4: Predicted Hourly Concentrations for Load-Bank Test

Data Centre	Nitrogen Dioxide (NO_2) Concentration (µg/m^3), Maximum at any of the Specified Receptors					
	1-hour maximum (100th %ile)			1-hour 19th highest hour (99.79th %ile)		
	PC	PEC	PEC as % of AQS	PC	PEC	PEC as % of AQS
LD4	173	225	113%	142	194	97%
LD5	195	247	123%	155	207	103%
LD6	73.1	125	63%	57.3	109	55%
LD7	229	281	140%	156	208	104%
LD10/LD13x	147	199	99%	112	164	82%
LD11x	91.7	144	72%	49.5	102	51%

The results presented in *Table 7.4* predict that the load-bank test has the potential to exceed the NO_2 hourly standard when undertaken at LD4, LD5 and LD7. Contour plots for the 1-hour maximum have been created and are presented in *Appendix B*.

7.3.1.5 Summary of Testing Regime Effects on Hourly NO_2 Standard

The results presented in *Sections 7.3.1.2 to 7.3.1.4* predict that the black building test and load bank test have the potential to result in PECs >200µg/m^3 and therefore there is a risk of the 1 hour NO_2 air quality standard being exceeded.

Statistical tests were therefore undertaken to ascertain the risk of the NO_2 1 hour standards being breached as a result of these tests. The statistical analysis was undertaken, following Environment Agency guidance[5]. This statistical analysis is to identify the likelihood of tests coinciding with unfavourable meteorological conditions, and therefore leading to the AQS being breached.

The following formula, extracted from the guidance document, was used (Section 5.3 in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application EPR/CP3409BH):

$$\sum_{i=0}^{N-4} \frac{\binom{K}{i}\binom{M-K}{N-i}}{\binom{M}{N}}$$

The parameters are defined as follows:

- N: Number of operational hours (hours during which a test may cause an exceedance at a specific receptor);

[5] Environment Agency, 2018, Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf

- M: Operating envelope, 8760 hours; and
- K: Number of non-exceedance hours (hours over a year during which no exceedances are predicted);

As the operating hours are not fully random, the calculated probability was multiplied by 2.5, as recommended in the guidance document.

The following is noted:

- The model was run with for the black building test and load bank tests for three scenarios:
  - Extended campus (LD4, LD5, LD6, LD7, LD10/13x and LD11x)
  - Campus (LD4, LD5, LD6, LD7)
  - LD13x alone
- N is determined as follows:
  - N is calculated for each discreet receptor
  - Only those test hours that result in a PC of >148µg/m^3 count towards N at each receptor. *For example if the quarterly tests at LD4 and LD5 result in a PC >148µg/m^3 at a receptor, then N = 2 x 3 = 6 (tests at 2 data centres, 3 times per year). As the quarterly tests at LD6, LD7, LD10/13x and LD11x are not predicted to result in a PC >148µg/m^3, then these do not count towards N.*
- K is taken from the model and is derived for each sensitive receptor

This method means that a statistical probability is calculated for each sensitive receptor on the basis of those tests that results in a potential exceedance (ie PC>148µg/m^3). The results of the statistical tests are set out in *Table 7.5*, based upon the highest N at any sensitive receptor.

Table 7.5: Summary of Statistical Test Results

Data Centre	Statistical Test Result	
	Maximum N at any receptor	**Statistical Probability of Breach**
Extended Campus	30	<<1% (maximum calculated is 1.00 x 10^{-12}% at a receptor with N=22 and K= 7692)
Campus	24	<<1% (maximum calculated is 1.71 x 10^{-17}% at a receptor with N=22 and K= 8162)
LD13x	3	N/A (less than 19 potential hours of exceedance, therefore 1 hour NO_2 standard cannot be breached)

The assessed probability of the testing regime breaching the hourly NO_2 standard is less than 1% at any of the discrete receptors and therefore highly unlikely[6] to result in the 1 hour NO_2 standard being breached. Therefore, no further proposals to reduce the risk of exceedance are made.

7.3.1.6 Impact of Testing Regime on the NO_2 Annual Mean Standard

The impact on the annual mean NO_2 standard of all data centres undertaking the three tests described in *Section 3.3.3* have been evaluated based upon the anticipated total cumulative impacts of all tests undertaken as described above.

The resulting expected annual mean concentrations at any of the 37 specified receptors are presented in *Table 7.6* for:

[6] As per Environment Agency guidance, Specified generators: dispersion modelling assessment, exceedances are highly unlikely if probability is less than 1%, unlikely if less than 5% and over 5% the potential is likely and the risk must be reduced.

- The extended Campus;
- The Campus on its own (LD4, LD5, LD6 and LD7); and
- LD13x on its own.

Table 7.6: Modelled Annual Mean Concentrations for the Testing Regime

Data Centre	Nitrogen Dioxide (NO_2) Concentration (µg/m^3), Maximum at any of the Specified Receptors			
	Annual Mean			
	PC	PC as % of AQS	PEC	PEC as % of AQS
Extended Campus	0.38	0.96%	26.4	66%
Campus	0.33	0.82%	26.3	66%
LD13x	0.17	0.42%	26.2	65%

The results presented in *Table 7.6* predict that the impacts of the testing regime of the extended Campus, Campus or LD13x on its own are insignificant.

7.3.1.7 Assessment of Impacts on Protected Conservation Areas

The potential impact of NO_x emissions from the extended Campus testing regime on the surrounding protected conservation areas has been assessed based upon the anticipated total cumulative impacts of the all tests undertaken as described above.

The results for annual mean NO_x are presented in *Table 7.7* for:

- The extended Campus;
- The Campus on its own (LD4, LD5, LD6 and LD7); and
- LD13x on its own.

The results presented in *Table 7.7* predict that the anticipated impacts of the testing regime on annual mean NO_x concentrations of the extended Campus, Campus itself, or LD13x on its own, are all insignificant.

Table 7.7: NO_x Annual Mean Concentrations (µg/m^3)

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Extended Campus						
Haymill Valley (LNR)	0.089	<1%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	0.022	<1%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	0.009	<1%	23.8	23.8	79%	Insignificant
Windsor Forest & Great Park (SAC)	0.003	<1%	23.3	23.3	78%	Insignificant
South West London Waterbodies (SPA & Ramsar)	0.004	<1%	54.2	54.2	181%	Insignificant
Chilterns Beechwoods (SAC)	0.001	<1%	23.0	23.0	77%	Insignificant
Campus						
Haymill Valley (LNR)	0.064	<1%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	0.017	<1%	N/A	N/A	N/A	Insignificant

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Burnham Beeches (SAC)	0.007	<1%	23.8	23.8	79%	Insignificant
Windsor Forest & Great Park (SAC)	0.002	<1%	23.3	23.3	78%	Insignificant
South West London Waterbodies (SPA & Ramsar)	0.003	<1%	54.2	54.2	181%	Insignificant
Chilterns Beechwoods (SAC)	0.001	<1%	23.0	23.0	77%	Insignificant
LD13x						
Haymill Valley (LNR)	0.005	<1%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	0.002	<1%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	0.001	<1%	23.8	23.8	79%	Insignificant
Windsor Forest & Great Park (SAC)	0.001	<1%	23.3	23.3	78%	Insignificant
South West London Waterbodies (SPA & Ramsar)	0.001	<1%	54.2	54.2	181%	Insignificant
Chilterns Beechwoods (SAC)	0.001	<1%	23.0	23.0	77%	Insignificant

[a] *The Environment Agency guidance on Air emissions risk assessment for your environmental permit states that there is no need to calculate PEC for local nature sites.*

For the 24-hour mean NO_x concentrations, the black building test has the highest potential to create significant NO_x emissions as all the engines of each data centre are running. The results in *Table 7.8* present the highest PC from any of the data centres being tested for one, all engines at 60% load for:

- The extended Campus;
- The Campus on its own (LD4, LD5, LD6 and LD7); and
- LD13x on its own.

The results presented in *Table 7.8* show that the anticipated impacts of the testing regime on 24-hour mean NO_x concentrations of the extended Campus, Campus itself, or LD13x on its own, are all insignificant.

Table 7.8: NO_x 24-hour Mean Concentrations (µg/m³)

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Extended Campus						
Haymill Valley (LNR)	25.2	34%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	5.5	7%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	2.0	3%	47.6	49.6	66%	Insignificant
Windsor Forest & Great Park (SAC)	1.4	2%	46.7	48.1	64%	Insignificant
South West London Waterbodies (SPA & Ramsar)	1.2	2%	108.4	109.6	146%	Insignificant
Chilterns Beechwoods (SAC)	0.6	1%	46.0	46.6	62%	Insignificant
Campus						
Haymill Valley (LNR)	25.2	34%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	5.5	7%	N/A	N/A	N/A	Insignificant

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Burnham Beeches (SAC)	2.0	3%	47.6	49.6	66%	Insignificant
Windsor Forest & Great Park (SAC)	1.4	2%	46.7	48.1	64%	Insignificant
South West London Waterbodies (SPA & Ramsar)	1.2	2%	108.4	109.6	146%	Insignificant
Chilterns Beechwoods (SAC)	0.6	1%	46.0	46.6	62%	Insignificant
LD13x						
Haymill Valley (LNR)	4.3	6%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	2.3	3%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	1.0	1%	47.6	48.6	65%	Insignificant
Windsor Forest & Great Park (SAC)	1.0	1%	46.7	47.6	64%	Insignificant
South West London Waterbodies (SPA & Ramsar)	0.8	1%	108.4	109.2	146%	Insignificant
Chilterns Beechwoods (SAC)	0.4	1%	46.0	46.4	62%	Insignificant

[a] *The Environment Agency guidance on Air emissions risk assessment for your environmental permit states that there is no need to calculate PEC for local nature sites and short-term targets, such as 24-hour mean.*

The nitrogen deposition and acid deposition were calculated using AQTAG06 guidance[7], based on the annual mean NO_x concentrations presented in *Table 7.7*. The results are presented in *Table 7.9* and *Table 7.10* for:

- The extended Campus;
- The Campus on its own (LD4, LD5, LD6 and LD7); and
- LD13x on its own.

All the potential impacts from the testing regime of the extended Campus, Campus or LD13x on protected conservation areas are assessed as insignificant. As the habitats in the South West London Waterbodies SPA and Ramsar site do not have a critical load, they have not been assessed.

[7] Habitats Directive, 2014, AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, http://bailey.persona-pi.com/Public-Inquiries/A465-English/8%20Air%20Quality/8.2.2%20-%20AQTAG06_Technical%20Guidance%20Assessment%20emissions%20to%20air%20Mar2014.pdf

Table 7.9: Nutrient Nitrogen Deposition (kgN/ha/yr)

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Extended Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	10	0.0026	<1%	27.3	27.3	273%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]	10	0.0009	<1%	28.1	28.1	281%	Insignificant
	Violet click beetle	10	0.0009	<1%	28.1	28.1	281%	Insignificant
	Old acidophilous oak woods […]	10	0.0009	<1%	28.1	28.1	281%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler	No CL	0.0005	N/A	11.2	11.2	N/A	Insignificant
	Gadwall	No CL	0.0005	N/A	11.2	11.2	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests	10	0.0003	<1%	33.5	33.5	335%	Insignificant
	Stag beetle	10	0.0003	<1%	33.5	33.5	335%	Insignificant
	Semi-natural dry grasslands and scrubland […]	15	0.0001	<1%	19.9	19.9	133%	Insignificant
Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	10	0.0019	<1%	27.3	27.3	273%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]	10	0.0006	<1%	28.1	28.1	281%	Insignificant
	Violet click beetle	10	0.0006	<1%	28.1	28.1	281%	Insignificant
	Old acidophilous oak woods […]	10	0.0006	<1%	28.1	28.1	281%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler	No CL	0.0004	N/A	11.2	11.2	N/A	Insignificant
	Gadwall	No CL	0.0004	N/A	11.2	11.2	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests	10	0.0002	<1%	33.5	33.5	335%	Insignificant
	Stag beetle	10	0.0002	<1%	33.5	33.5	335%	Insignificant
	Semi-natural dry grasslands and scrubland […]	15	0.0001	<1%	19.9	19.9	133%	Insignificant
LD13x								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	10	0.0004	<1%	27.3	27.3	273%	Insignificant

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]	10	0.0002	<1%	28.1	28.1	281%	Insignificant
	Violet click beetle	10	0.0002	<1%	28.1	28.1	281%	Insignificant
	Old acidophilous oak woods […]	10	0.0002	<1%	28.1	28.1	281%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler	No CL	0.0001	N/A	11.2	11.2	N/A	Insignificant
	Gadwall	No CL	0.0001	N/A	11.2	11.2	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests	10	<0.0001	<1%	33.5	33.5	335%	Insignificant
	Stag beetle	10	<0.0001	<1%	33.5	33.5	335%	Insignificant
	Semi-natural dry grasslands and scrubland […]	15	<0.0001	<1%	19.9	19.9	133%	Insignificant

Table 7.10: Acid Deposition (keq/ha/yr)

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Extended Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	cfr. Table 3.3 in Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)	$1.8x10^{-4}$	<1%	S:0.26 N:1.95	2.21	86%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]		$6.4x10^{-5}$	<1%	S:0.23 N:2.1	2.24	156%	Insignificant
	Violet click beetle		$6.4x10^{-5}$	<1%		2.24	156%	Insignificant
	Old acidophilous oak woods […]		$6.4x10^{-5}$	<1%		2.24	156%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler		$3.6x10^{-5}$	N/A	S:0.25 N:0.8	1.05	N/A	Insignificant
	Gadwall		$3.6x10^{-5}$	N/A		1.05	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests		$2.0x10^{-5}$	<1%	S:0.27 N:2.39	2.66	162%	Insignificant
	Stag beetle		$2.0x10^{-5}$	<1%		2.66	162%	Insignificant
	Semi-natural dry grasslands and scrubland […]		$1.0x10^{-5}$	<1%	S:0.22 N:1.42	1.64	34%	Insignificant
Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	cfr. Table 3.3 in Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)	$1.4x10^{-4}$	<1%	S:0.26 N:1.95	2.21	86%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]		$4.6x10^{-5}$	<1%	S:0.23 N:2.1	2.24	156%	Insignificant
	Violet click beetle		$4.6x10^{-5}$	<1%		2.24	156%	Insignificant
	Old acidophilous oak woods […]		$4.6x10^{-5}$	<1%		2.24	156%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler		$2.6x10^{-5}$	N/A	S:0.25 N:0.8	1.05	N/A	Insignificant
	Gadwall		$2.6x10^{-5}$	N/A		1.05	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests		$1.5x10^{-5}$	<1%	S:0.27 N:2.39	2.66	162%	Insignificant
	Stag beetle		$1.5x10^{-5}$	<1%		2.66	162%	Insignificant
	Semi-natural dry grasslands and scrubland […]		$7.3x10^{-6}$	<1%	S:0.22 N:1.42	1.64	34%	Insignificant
LD13x								

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	cfr. Table 3.3 in Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)	$2.6x10^{-5}$	<1%	S:0.26 N:1.95	2.21	86%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]		$1.2x10^{-5}$	<1%	S:0.23 N:2.1	2.24	156%	Insignificant
	Violet click beetle		$1.2x10^{-5}$	<1%		2.24	156%	Insignificant
	Old acidophilous oak woods […]		$1.2x10^{-5}$	<1%		2.24	156%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler		$6.9x10^{-6}$	N/A	S:0.25 N:0.8	1.05	N/A	Insignificant
	Gadwall		$6.9x10^{-6}$	N/A		1.05	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests		$3.5x10^{-6}$	<1%	S:0.27 N:2.39	2.66	162%	Insignificant
	Stag beetle		$3.5x10^{-6}$	<1%		2.66	162%	Insignificant
	Semi-natural dry grasslands and scrubland […]		$1.7x10^{-6}$	<1%	S:0.22 N:1.42	1.64	34%	Insignificant

7.3.2 Emergency Operation

7.3.2.1 Introduction

As described in *Table 3.1*, an emergency power scenario, in which all of the extended Campus' engines would run together at 100% load for an hour has been modelled. This is a worst-case approach as in reality:

- It is more likely that only one data centre and not the entire (extended) Campus would need power.
- Not all the engines would be running the whole time.
- It should also be noted that there has been only one occurrence where some of the data centres (LD6, LD7 and LD10) had to use the back-up generators, this was during a national power outage in mid-2019.

7.3.2.2 Impacts of Emergency Operation on Human Health

The resulting maximum concentrations at any of the 37 specified receptors (listed Section 5.3 in *Appendix F – AQ Modelling Report FINAL* of the LD11x Environmental Permit application (EPR/LP3303PR)) are presented in *Table 7.11* for:

- The extended Campus;
- The Campus on its own (LD4, LD5, LD6 and LD7); and
- LD13x on its own.

Table 7.11: Modelled NO_2 Concentrations for Emergency Operation

Data Centre	Nitrogen Dioxide (NO_2) Concentration (µg/m^3), Maximum at any of the Specified Receptors								
	1-hour maximum (100th %ile)			1-hour 19th highest hour (99.79th %ile)			Annual mean		
	PC	PEC	PEC as % of AQS	PC	PEC	PEC as % of AQS	PC	PEC	PEC as % of AQS
Extended Campus	4676	4728	2364%	3132	3184	1592%	0.09	26.1	65%
Campus	3586	3638	1819%	2830	2882	1441%	0.07	26.1	65%
LD13x	1463	1515	758%	1252	1304	652%	0.04	26.0	65%

The results presented in *Table 7.11* show that in case of all the extended Campus, Campus or LD13x needing emergency power, the 200µg/m^3 threshold would be expected to be exceeded. Whether the AQS would be exceeded would depend on whether the engines operated in excess of 18 hours at 100% load, noting that 18 exceedances are allowed in any one year.

A contour plot for the predicted 1-hour maximum and annual mean have also been created and are presented in *Appendix B*.

7.3.2.3 Impacts of Emergency Operation on Protected Conservation Areas

The potential impact of NO_x emissions from the extended Campus emergency power operation assuming 1 hour of operations on the surrounding protected conservation areas has been assessed. The resulting NO_x ambient concentrations, nutrient nitrogen deposition and acid deposition have been modelled and are presented in *Table 7.12* to *Table 7.15*. They were assessed against the standards and critical loads presented in *Section 3.1 of Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)*. The criteria outlined in *Section 3.2 of*

Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR) were used to determine the significance of the impact.

The results for the annual mean NO_x concentrations are presented in *Table 7.12* for:

- The extended Campus;
- The Campus on its own (LD4, LD5, LD6 and LD7); and
- LD13x on its own.

Table 7.12: NO_x Annual Mean Concentrations (µg/m³)

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Extended Campus						
Haymill Valley (LNR)	0.026	0%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	0.007	0%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	0.003	0%	23.8	23.8	79%	Insignificant
Windsor Forest & Great Park (SAC)	0.001	0%	23.3	23.3	78%	Insignificant
South West London Waterbodies (SPA & Ramsar)	0.001	0%	54.2	54.2	181%	Insignificant
Chilterns Beechwoods (SAC)	0.0003	0%	23.0	23.0	77%	Insignificant
Campus						
Haymill Valley (LNR)	0.019	0%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	0.005	0%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	0.002	0%	23.8	23.8	79%	Insignificant
Windsor Forest & Great Park (SAC)	0.001	0%	23.3	23.3	78%	Insignificant
South West London Waterbodies (SPA & Ramsar)	0.001	0%	54.2	54.2	181%	Insignificant
Chilterns Beechwoods (SAC)	0.0002	0%	23.0	23.0	77%	Insignificant
LD13x						
Haymill Valley (LNR)	0.002	0%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	0.001	0%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	0.0004	0%	23.8	23.8	79%	Insignificant
Windsor Forest & Great Park (SAC)	0.0002	0%	23.3	23.3	78%	Insignificant
South West London Waterbodies (SPA & Ramsar)	0.0002	0%	54.2	54.2	181%	Insignificant
Chilterns Beechwoods (SAC)	0.0001	0%	23.0	23.0	77%	Insignificant

[a] *The Environment Agency guidance on Air emissions risk assessment for your environmental permit states that there is no need to calculate PEC for local nature sites.*

For the 24-hour mean concentrations, the results in *Table 7.13* assume all the engines running for one hour during the same 24-hour period of continuous emergency power generation.

Table 7.13: NO_x 24-hour Mean Concentrations (µg/m³)

Site	PC	PC as % of AQS	Background	PEC	PEC as % of AQS	Significance
Extended Campus						
Haymill Valley (LNR)	87.8	117%	N/A [a]	N/A	N/A	Potentially Significant
Cocksherd Wood (LNR)	20.3	27%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	8.6	11%	N/A	N/A	N/A	Potentially Significant
Windsor Forest & Great Park (SAC)	6.8	9%	N/A	N/A	N/A	Insignificant
South West London Waterbodies (SPA & Ramsar)	6.9	9%	N/A	N/A	N/A	Insignificant
Chilterns Beechwoods (SAC)	3.5	5%	N/A	N/A	N/A	Insignificant
Campus						
Haymill Valley (LNR)	82.0	109%	N/A [a]	N/A	N/A	Potentially Significant
Cocksherd Wood (LNR)	18.1	24%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	6.7	9%	N/A	N/A	N/A	Insignificant
Windsor Forest & Great Park (SAC)	5.1	7%	N/A	N/A	N/A	Insignificant
South West London Waterbodies (SPA & Ramsar)	5.3	7%	N/A	N/A	N/A	Insignificant
Chilterns Beechwoods (SAC)	2.5	3%	N/A	N/A	N/A	Insignificant
LD13x						
Haymill Valley (LNR)	7.2	10%	N/A [a]	N/A	N/A	Insignificant
Cocksherd Wood (LNR)	3.9	5%	N/A	N/A	N/A	Insignificant
Burnham Beeches (SAC)	1.7	2%	N/A	N/A	N/A	Insignificant
Windsor Forest & Great Park (SAC)	1.6	2%	N/A	N/A	N/A	Insignificant
South West London Waterbodies (SPA & Ramsar)	1.3	2%	N/A	N/A	N/A	Insignificant
Chilterns Beechwoods (SAC)	0.7	1%	N/A	N/A	N/A	Insignificant

[a] *The Environment Agency guidance on Air emissions risk assessment for your environmental permit states that there is no need to calculate PEC for local nature sites and short-term targets, such as 24-hour mean.*

The results presented in *Table 7.13* predict that in case of the Campus alone or the Extended Campus needing emergency power, the 75µg/m³ standard can potentially be breached at Haymill Valley LNR and there is a potential for significant impacts to occur at Burnham Beaches SAC (only for Extended Campus). The predicted process contribution at the SAC is however only marginally over the threshold for insignificance (11% vs a threshold of 10 %). Furthermore, as explained in *Section 7.3.2.1*, this type of emergency is very unlikely (a full Campus emergency event hasn't occurred in nine years). As a result the potential for actual significant impacts at Burnham Beaches SAC is considered highly unlikely.

In the case of LD13x only needing emergency power, the impacts on 24-hour mean concentrations are predicted to be insignificant.

The nitrogen deposition and acid deposition were calculating using AQTAG06 guidance, based on the annual mean NO_x concentrations presented in *Table 7.12*. The results are presented in *Table 7.14* and *Table 7.15* for:

- The extended Campus;
- The Campus on its own (LD4, LD5, LD6 and LD7); and
- LD13x on its own.

All the impacts from the testing regime of the extended Campus, Campus or LD13x on protected conservation areas are expected to be insignificant. As the habitats in the South West London Waterbodies SPA and Ramsar site do not have a critical load, they have not been assessed.

Table 7.14: Nutrient Nitrogen Deposition (kgN/ha/yr)

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Extended Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	10	$7.6.10^{-4}$	0%	27.3	27.3	273%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]	10	$2.6.10^{-4}$	0%	28.1	28.1	281%	Insignificant
	Violet click beetle	10	$2.6.10^{-4}$	0%	28.1	28.1	281%	Insignificant
	Old acidophilous oak woods […]	10	$2.6.10^{-4}$	0%	28.1	28.1	281%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler	No CL	$1.5.10^{-4}$	N/A	11.2	11.2	N/A	Insignificant
	Gadwall	No CL	$1.5.10^{-4}$	N/A	11.2	11.2	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests	10	$8.4.10^{-5}$	0%	33.5	33.5	335%	Insignificant
	Stag beetle	10	$8.4.10^{-5}$	0%	33.5	33.5	335%	Insignificant
	Semi-natural dry grasslands and scrubland […]	15	$4.2.10^{-5}$	0%	19.9	19.9	133%	Insignificant
Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	10	$5.6.10^{-4}$	0%	27.3	27.3	273%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]	10	$1.9.10^{-4}$	0%	28.1	28.1	281%	Insignificant
	Violet click beetle	10	$1.9.10^{-4}$	0%	28.1	28.1	281%	Insignificant
	Old acidophilous oak woods […]	10	$1.9.10^{-4}$	0%	28.1	28.1	281%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler	No CL	$1.1.10^{-4}$	N/A	11.2	11.2	N/A	Insignificant
	Gadwall	No CL	$1.1.10^{-4}$	N/A	11.2	11.2	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests	10	$6.0.10^{-5}$	0%	33.5	33.5	335%	Insignificant
	Stag beetle	10	$6.0.10^{-5}$	0%	33.5	33.5	335%	Insignificant
	Semi-natural dry grasslands and scrubland […]	15	$3.0.10^{-5}$	0%	19.9	19.9	133%	Insignificant
LD13x								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	10	$1.1.10^{-4}$	0%	27.3	27.3	273%	Insignificant

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]	10	$4.9.10^{-5}$	0%	28.1	28.1	281%	Insignificant
	Violet click beetle	10	$4.9.10^{-5}$	0%	28.1	28.1	281%	Insignificant
	Old acidophilous oak woods […]	10	$4.9.10^{-5}$	0%	28.1	28.1	281%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler	No CL	$2.8.10^{-5}$	N/A	11.2	11.2	N/A	Insignificant
	Gadwall	No CL	$2.8.10^{-5}$	N/A	11.2	11.2	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests	10	$1.4.10^{-5}$	0%	33.5	33.5	335%	Insignificant
	Stag beetle	10	$1.4.10^{-5}$	0%	33.5	33.5	335%	Insignificant
	Semi-natural dry grasslands and scrubland […]	15	$7.2.10^{-6}$	0%	19.9	19.9	133%	Insignificant

Table 7.15: Acid Deposition (keq/ha/yr)

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Extended Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	cfr. Table 3.3 in Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)	$5.4.10^{-5}$	0%	S:0.26 N:1.95	2.21	86%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]		$1.9.10^{-5}$	0%	S:0.23 N:2.1	2.24	156%	Insignificant
	Violet click beetle		$1.9.10^{-5}$	0%		2.24	156%	Insignificant
	Old acidophilous oak woods […]		$1.9.10^{-5}$	0%		2.24	156%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler		$1.1.10^{-5}$	N/A	S:0.25 N:0.8	1.05	N/A	Insignificant
	Gadwall		$1.1.10^{-5}$	N/A		1.05	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests		$6.0.10^{-6}$	0%	S:0.27 N:2.39	2.66	162%	Insignificant
	Stag beetle		$6.0.10^{-6}$	0%		2.66	162%	Insignificant
	Semi-natural dry grasslands and scrubland […]		$3.0.10^{-6}$	0%	S:0.22 N:1.42	1.64	34%	Insignificant

Site	Habitat	Minimum Critical Load	PC	PC as % of CL	Background	PEC	PEC as % of CL	Significance
Campus								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	cfr. Table 3.3 in Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)	$4.0.10^{-5}$	0%	S:0.26 N:1.95	2.21	86%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]		$1.4.10^{-5}$	0%	S:0.23 N:2.1	2.24	156%	Insignificant
	Violet click beetle		$1.4.10^{-5}$	0%		2.24	156%	Insignificant
	Old acidophilous oak woods […]		$1.4.10^{-5}$	0%		2.24	156%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler		$7.6.10^{-6}$	N/A	S:0.25 N:0.8	1.05	N/A	Insignificant
	Gadwall		$7.6.10^{-6}$	N/A		1.05	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests		$4.3.10^{-6}$	0%	S:0.27 N:2.39	2.66	162%	Insignificant
	Stag beetle		$4.3.10^{-6}$	0%		2.66	162%	Insignificant
	Semi-natural dry grasslands and scrubland […]		$2.1.10^{-6}$	0%	S:0.22 N:1.42	1.64	34%	Insignificant
LD13x								
Burnham Beeches (SAC)	Atlantic acidophilous beech forests […]	cfr. Table 3.3 in Annex C – Air Dispersion Modelling Report of the Campus Environmental Permit application (EPR/LP3303PR)	$7.6.10^{-6}$	0%	S:0.26 N:1.95	2.21	86%	Insignificant
Windsor Forest & Great Park (SAC)	Atlantic acidophilous beech forests […]		$3.5.10^{-6}$	0%	S:0.23 N:2.1	2.24	156%	Insignificant
	Violet click beetle		$3.5.10^{-6}$	0%		2.24	156%	Insignificant
	Old acidophilous oak woods […]		$3.5.10^{-6}$	0%		2.24	156%	Insignificant
South West London Waterbodies (SPA & Ramsar)	Northern shoveler		$2.0.10^{-6}$	N/A	S:0.25 N:0.8	1.05	N/A	Insignificant
	Gadwall		$2.0.10^{-6}$	N/A		1.05	N/A	Insignificant
Chilterns Beechwoods (SAC)	Asperulo-Fagetum beech forests		$1.0.10^{-6}$	0%	S:0.27 N:2.39	2.66	162%	Insignificant
	Stag beetle		$1.0.10^{-6}$	0%		2.66	162%	Insignificant
	Semi-natural dry grasslands and scrubland […]		$5.1.10^{-7}$	0%	S:0.22 N:1.42	1.64	34%	Insignificant

7.3.2.4 Summary

- In case of emergency power being required for an hour for extended Campus, Campus or LD13x on its own, the AQS for NO_2 of 200µg/m^3 is expected to be exceeded. Assuming that outages would happen for an hour or more, an emergency power event would have to happen 19 hours a year to result in a breach of the 18 exceedances allowed by the short-term standard. In the last nine years there has been only one occurrence where some of the data centres (LD6, LD7, LD9 and LD10) had to use the back-up generators, this was during a national power outage in mid-2019.
- In case of emergency power being required for an hour for extended Campus or Campus, the AQS for NO_x of 75 µg/m^3 is expected to be exceeded at Haymill Valley LNR. There is a potential for significant short-term impacts at Burnham Beaches SAC to occur for extended Campus emergency. The predicted process contribution is however only marginally over the threshold for insignificance (11% vs a threshold of 10 %). This type of emergency is however very unlikely (a full Campus emergency event hasn't occurred in nine years). As a result the potential for actual significant impacts at Burnham Beaches SAC is considered highly unlikely.
- No significant long-term impacts on human health (by comparison with the NO_2 annual mean standard) or protected conservation areas are predicted.
- The modelled scenario assumed that all the of the data centres would be running all of their engines at 100% load at the same time. In reality, in an emergency power event, some engines would not be turned on, or only for start-up as the data centres are designed with more generators than actually required, to cover a possible engine failure.
- Breaching the hourly NO_2 standard or the hourly NO_x standard because of emergency power operation is therefore considered unlikely.

8. CONCLUSION

8.1 Testing Regime – NO_x and NO_2

The testing regime of the generators at the Equinix data centres on Slough Trading Estate is not predicted to result in a significant adverse impact on air quality.

The dispersion modelling shows that there is the potential for the total number of hours when the NO_2 hourly standard is exceeded to be greater than the 18 allowed before a breach arises. However, statistical tests show that the chance of this happening is expected to be less than 1%, therefore constituting an insignificant risk. This is the case for the extended Campus and Campus alone (assessed probabilities of 1.7 x 10^{-17}% for the Campus alone and 1.0 x 10^{-12}% for the extended Campus). LD13x on its own does not have the potential to breach the hourly nitrogen dioxide standard as exceedances are predicted to occur a maximum of three times a year, it is to say less than the 18 times a year allowed by the standard.

The testing regime scenarios were not predicted to have the potential to impact adversely the annual mean NO_2 standard for the protection of human health, including at the Air Quality Management Areas in Slough Borough. There are no significant impacts predicted on any protected conservation areas from the testing regime

8.2 Emergency Operation - NO_x and NO_2

An emergency power generation scenario with all generators of the extended Campus, Campus itself, or LD13x on its own, running at the same time for an hour was also assessed. In this case, an exceedance of the hourly NO_2 standard is expected, as would be an exceedance of the 24 hour NO_x standard at Haymill Valley LNR (Campus alone and Extended Campus only). There is also a potential for a significant impact to occur for 24 hour NO_x at Burnham Beaches SAC (Extended Campus only). The predicted process contribution is however only marginally over the threshold for insignificance (11% vs a threshold of 10 %).

In the last nine years, there was only one occurrence where some of the data centres (LD6, LD7 and LD10) had to use the back-up generators. This was during a national power outage in mid-2019. This modelled scenario is therefore unlikely to arise. Furthermore, a total outage time exceeding 18 hours a year is even less likely. Consequently, the likelihood of an outage occurring for a sufficient amount of time to breach the NO_2 1 hour or NO_x 24 hour standard at habitats is extremely low. A plausible duration emergency power generation event is not expected to impact adversely the annual mean NO_2 standard or the other protected conservation areas in the vicinity of the Slough Trading Estate. As a result the potential for actual significant impacts at Burnham Beaches SAC is considered highly unlikely.

8.3 PM_{10} and SO_2

It was also found that the PM_{10} emissions from the engines are not expected to breach the air quality standard for PM_{10}. Sulphur dioxide emissions were not assessed as the data centres use ultra-low-sulphur diesel.

APPENDIX A MODEL PARAMETERS

A.1 Modelled Area

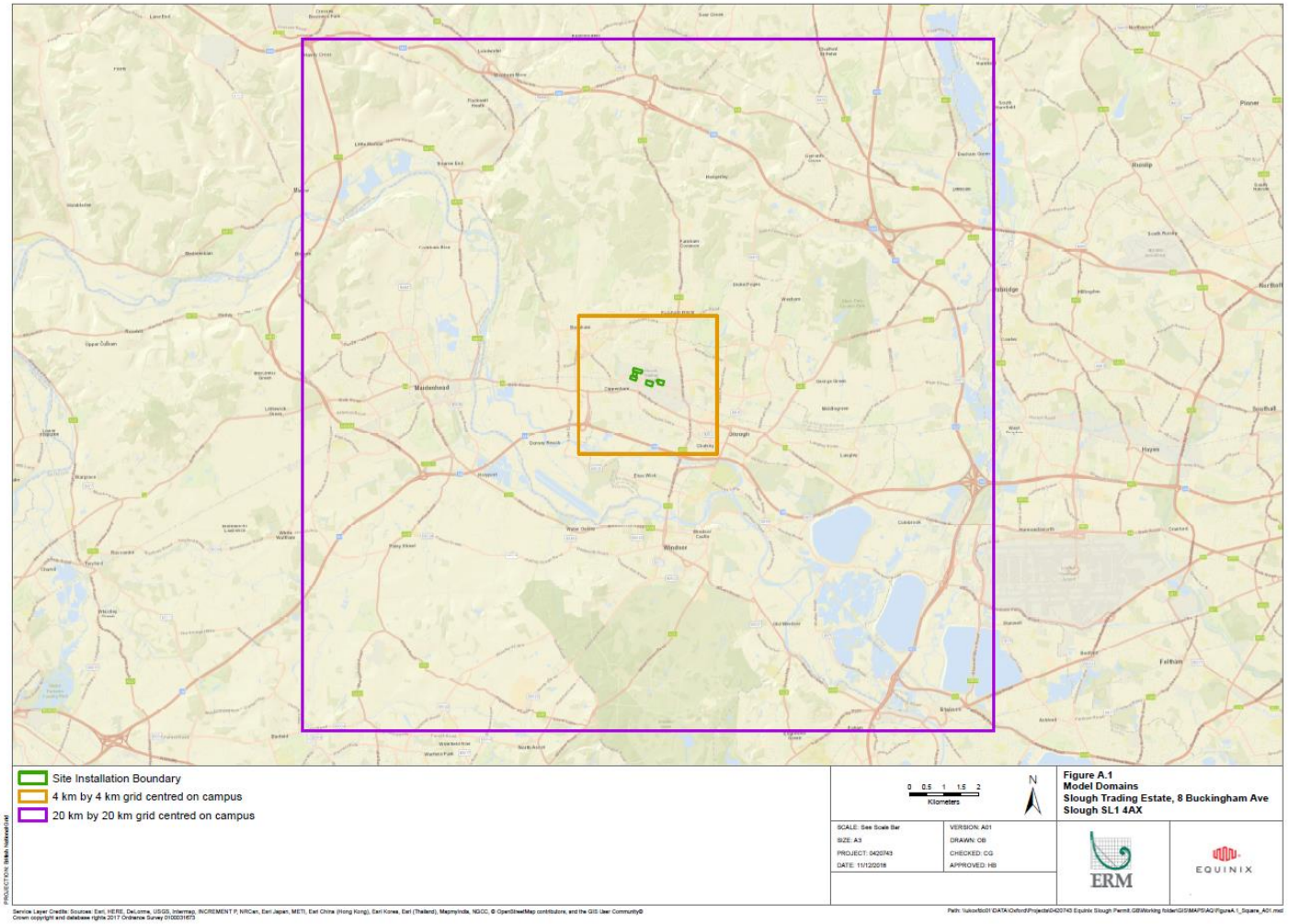


Figure A.1: Modelled Area Around the Campus

A.2 Modelled Buildings Data

The location of the modelled buildings is presented in Figure A.2, while their heights are listed in Table A.1.

Figure A.2: Location of Modelled Buildings

Table A.1: Height of Modelled Buildings

Building on Campus	Height (m)	Building on Slough Trading Estate	Height (m)
LD4.1	14.0	2	8.8
LD4.2	8.25	3	12.3
LD5.1	17.4	4	11.6
LD5.2	9.8	5	12.5
LD6.1	24.0	6	10.1
LD6.2	18.0	7	8.9
LD7.1	22.1	8	9.3
LD7.2	22.1	9	9.8
LD7.2a	22.9	10	8.0
LD13x.1	17.26	11	7.2
LD13x.2	12.8	12	7.6
LD13x.3	3.2	13	10.7
LD11x.1	16.0	14	20.0
LD11x.2	16.0	15	14.0
		16	11.0

A.3 London Heathrow 2012-2016 Wind Roses

The London Heathrow wind roses for years 2012 to 2016 are presented in *Figures A.3 to A.7*.

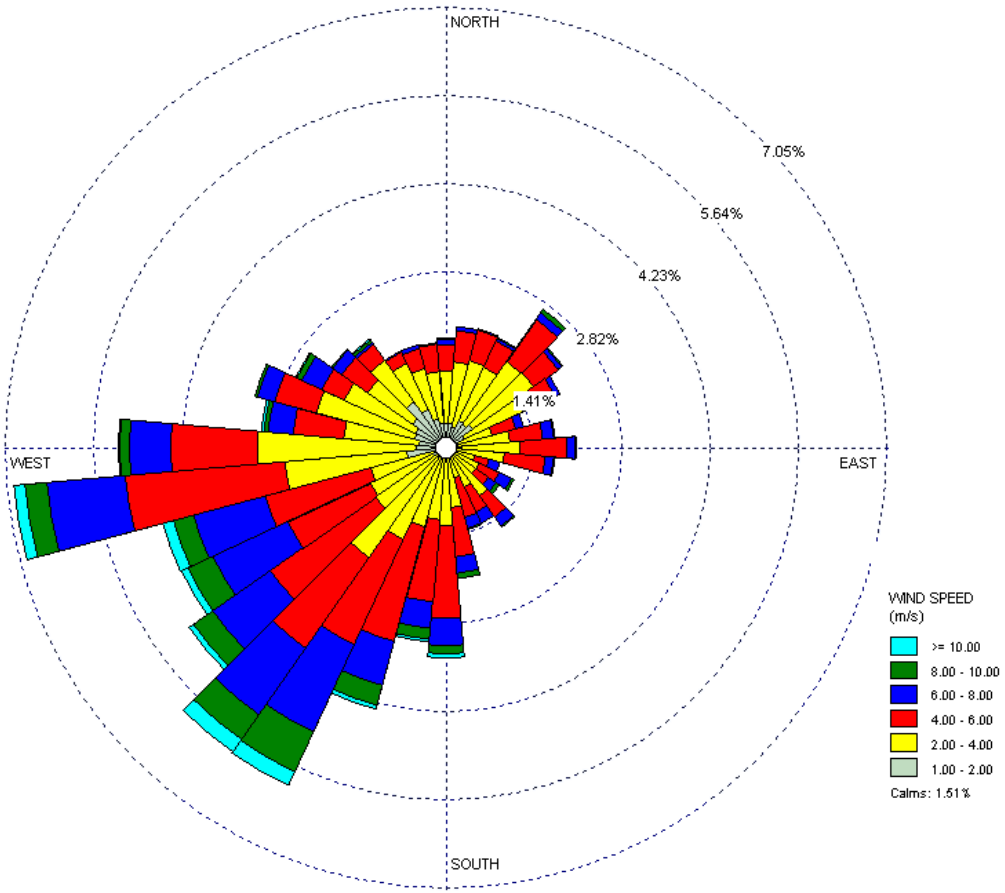


Figure A.3: London Heathrow Wind Rose - 2012

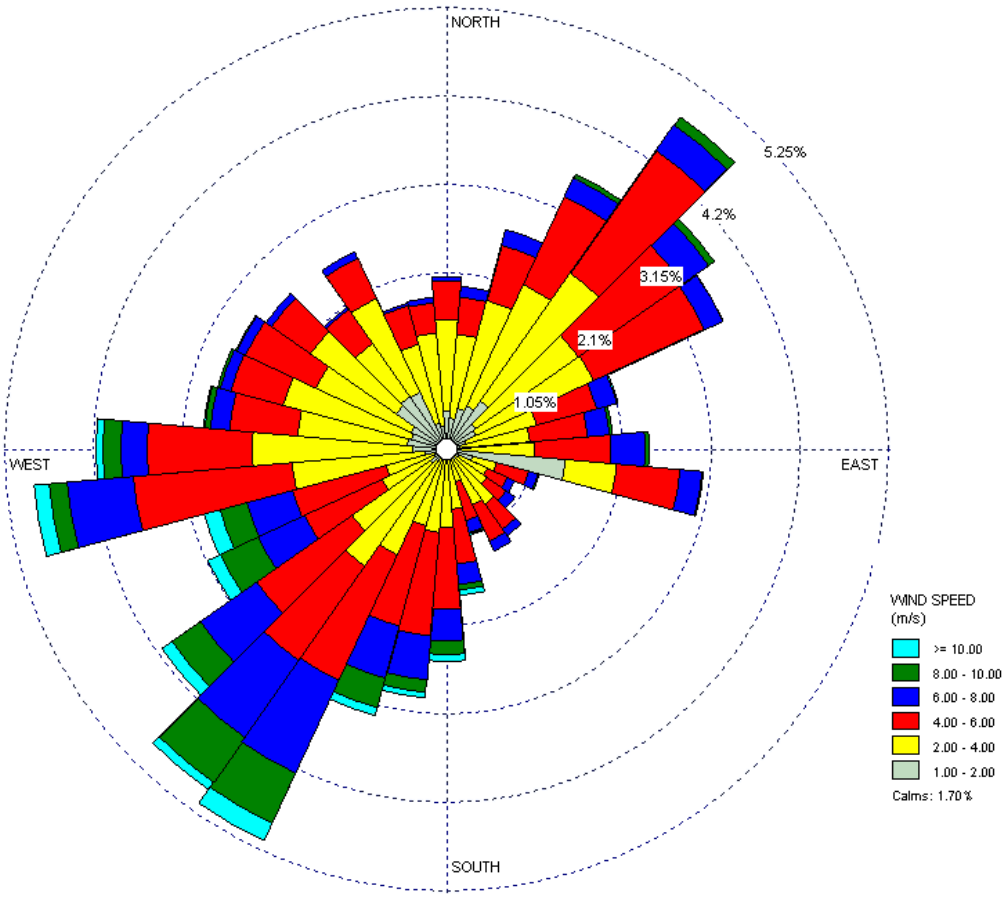


Figure A.4: London Heathrow Wind Rose - 2013

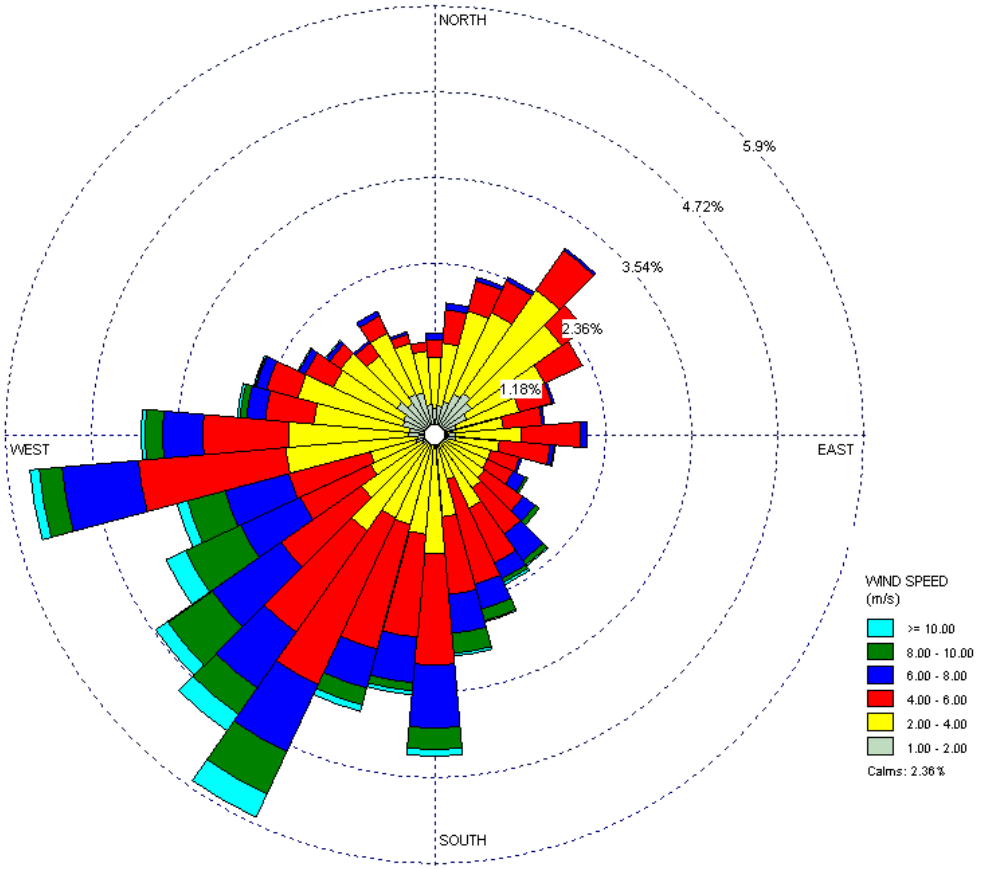


Figure A.5: London Heathrow Wind Rose – 2014

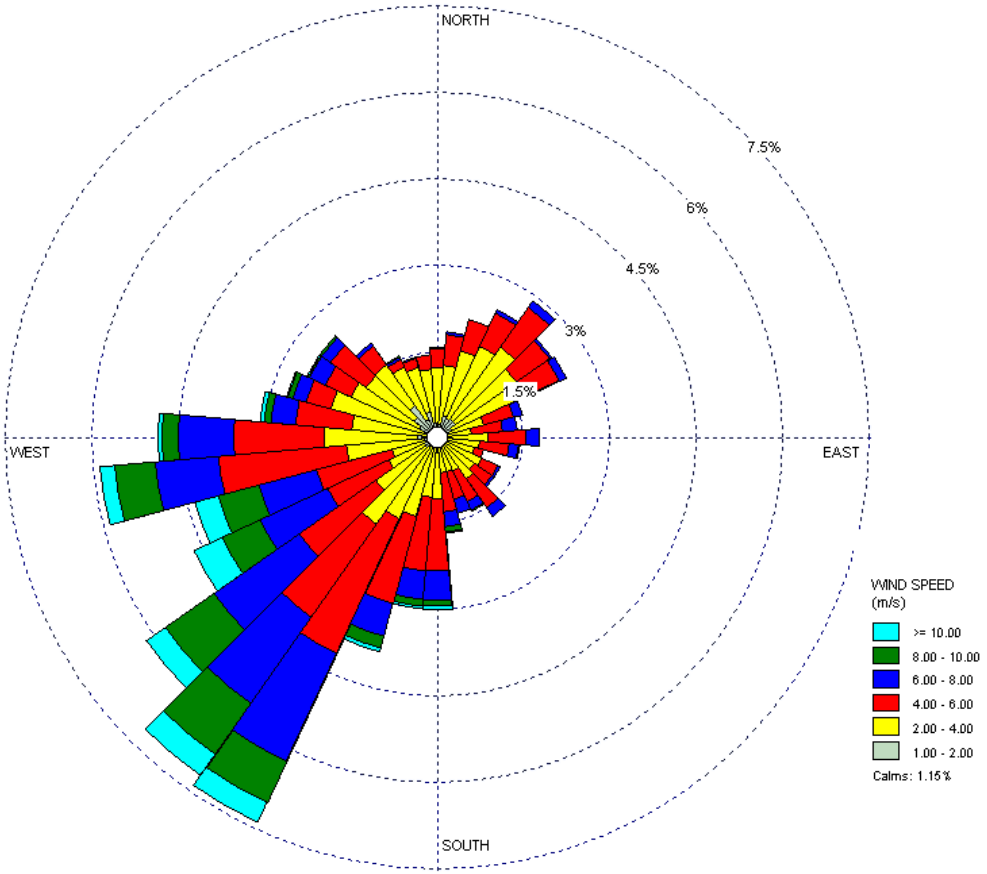


Figure A.6: London Heathrow Wind Rose - 2015

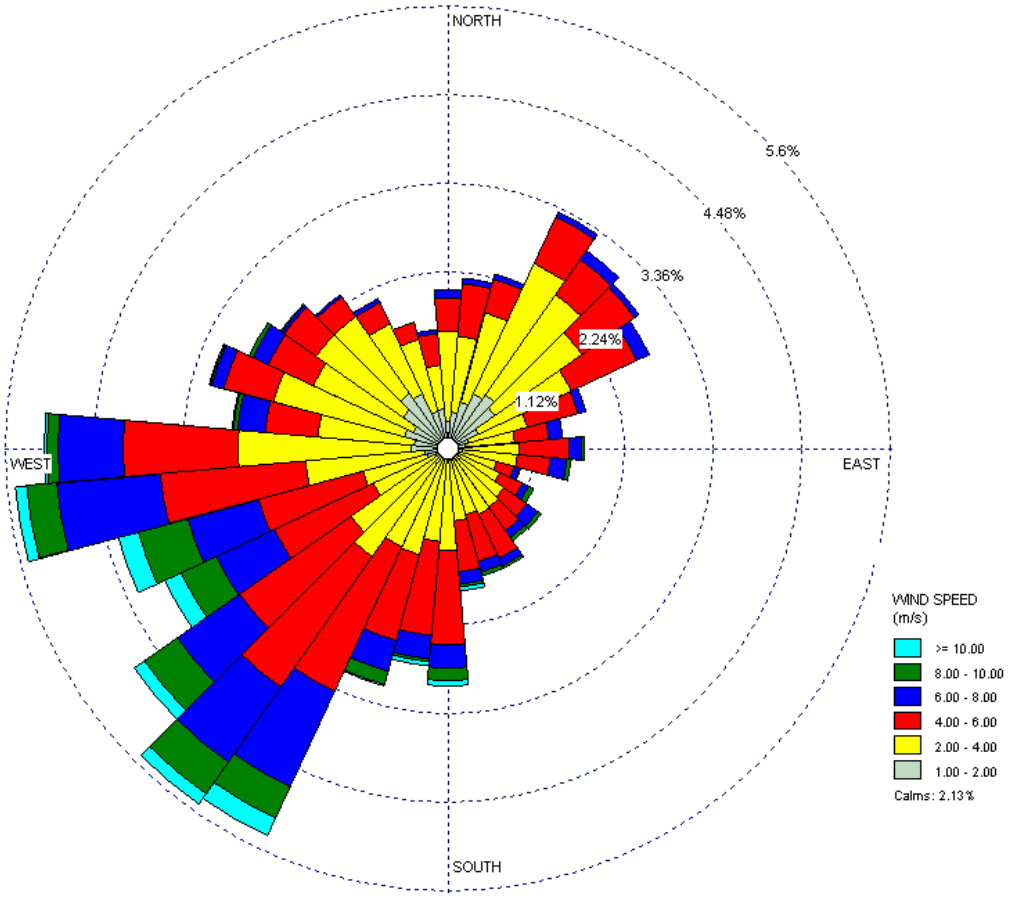


Figure A.7: London Heathrow Wind Rose – 2016

A.4 Emission Points Location

Table A.2 presents the coordinates used for each stack in the air dispersion model.

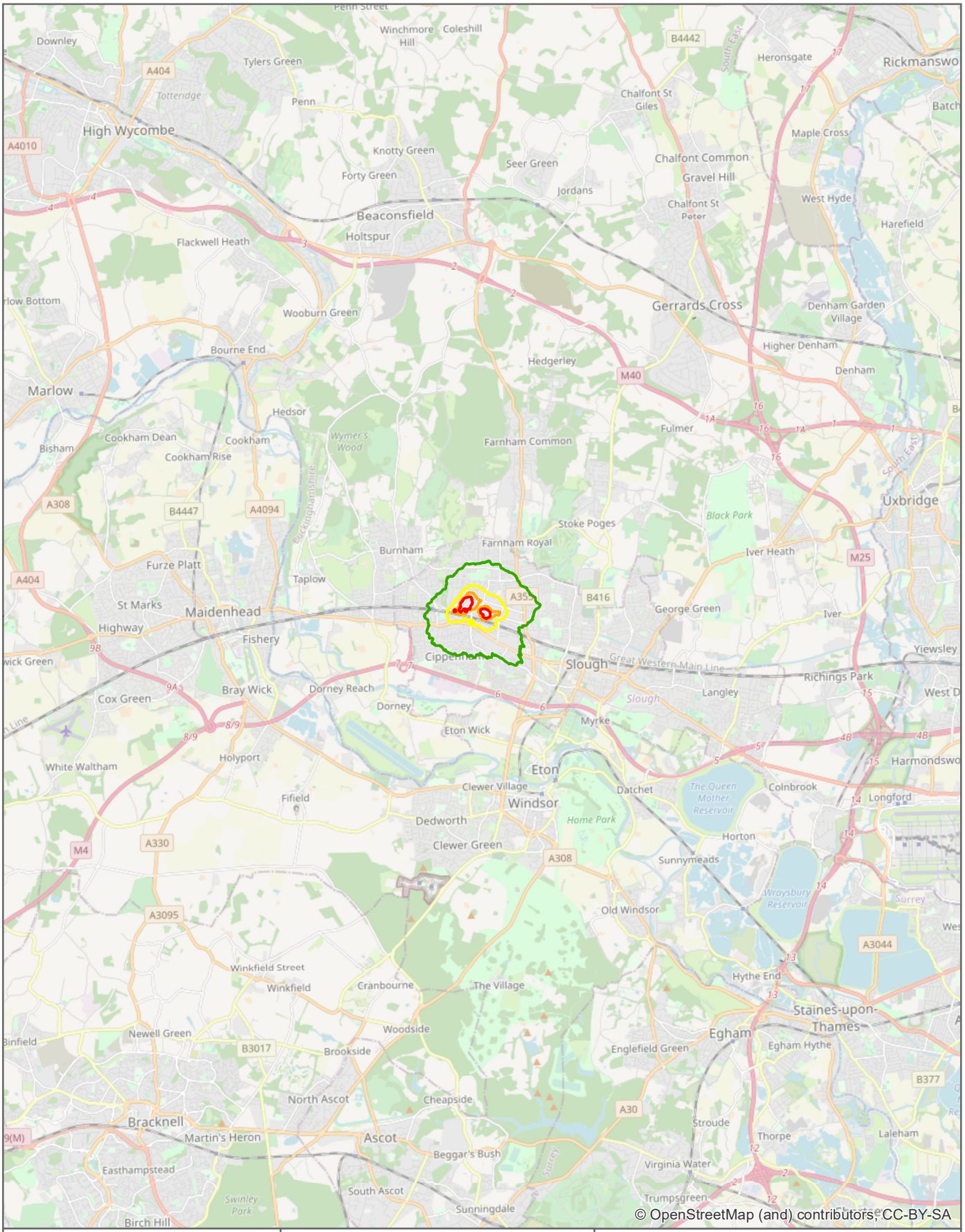
Table A.2: Coordinates of Modelled Stacks

Data Centre	Emission Point	X (National Grid)	Y (National Grid)
LD4	LD4_01	494817.70	181386.40
	LD4_02	494816.50	181382.90
	LD4_03	494815.50	181379.20
	LD4_04	494814.40	181375.40
	LD4_05	494813.50	181372.00
	LD4_06	494812.30	181368.30
	LD4_07	494811.40	181364.50
	LD4_08	494810.40	181360.70
	LD4_09	494809.15	181356.34
	LD4_10	494807.99	181352.60
	LD4_11	494807.32	181349.53
	LD4_12	494806.48	181346.37
	LD4_13	494805.53	181343.64
LD5	LD5_01	495114.46	181214.57
	LD5_02	495118.00	181213.90
	LD5_03	495121.10	181212.60
	LD5_04	495125.10	181211.30
	LD5_05	495128.40	181210.50
	LD5_06	495132.10	181209.10
	LD5_07	495157.40	181201.90
	LD5_08	495161.60	181200.20
	LD5_09	495164.80	181199.10
	LD5_10	495169.00	181197.80
	LD5_11	495172.30	181197.30
	LD5_12	495176.50	181196.00
	LD5_13	495135.50	181208.10
	LD5_14	495153.80	181203.30
	LD5_15	495202.50	181188.10
	LD5_16	495207.61	181185.29
	LD5_17	495210.68	181184.18
	LD5_18	495213.61	181183.38
	LD5_19	495233.75	181177.76
	LD5_20	495237.48	181176.44
	LD5_21	495240.91	181175.36

	LD5_22	495244.31	181174.20
	LD5_23	495247.79	181173.17
LD6	LD6_01	494800.12	181471.05
	LD6_02	494800.29	181471.52
	LD6_03	494800.46	181471.99
	LD6_04	494805.24	181487.94
	LD6_05	494805.39	181488.42
	LD6_06	494805.55	181488.89
	LD6_07	494817.44	181530.04
	LD6_08	494817.59	181530.52
	LD6_09	494817.74	181530.99
	LD6_10	494822.75	181547.34
	LD6_11	494822.89	181547.82
	LD6_12	494823.03	181548.30
	LD6_13	494761.83	181566.10
	LD6_14	494761.69	181565.62
	LD6_15	494761.55	181565.14
	LD6_16	494757.41	181549.10
	LD6_17	494757.29	181548.62
	LD6_18	494757.17	181548.13
	LD6_19	494744.43	181506.40
	LD6_20	494744.29	181505.92
	LD6_21	494744.16	181505.43
	LD6_22	494739.74	181489.49
	LD6_23	494739.59	181489.02
	LD6_24	494739.45	181488.54
LD7	LD7_1_01	494790.02	181607.46
	LD7_1_02	494790.45	181607.28
	LD7_1_03	494777.91	181611.94
	LD7_1_04	494778.50	181611.70
	LD7_1_05	494789.49	181607.63
	LD7_1_06	494790.89	181607.10
	LD7_1_07	494777.48	181612.05
	LD7_1_08	494778.94	181611.59
	LD7_1_09	494766.76	181613.42
	LD7_2_01	494857.02	181588.13
	LD7_2_02	494857.46	181587.96
	LD7_2_03	494860.29	181587.27

	LD7_2_04	494860.74	181587.10
	LD7_2_05	494861.14	181586.95
	LD7_2_06	494864.07	181586.07
	LD7_2_07	494864.52	181585.90
	LD7_2_08	494866.87	181585.33
	LD7_2_09	494823.97	181557.27
LD10/LD13x	LD10_01	495467.99	181296.68
	LD10_02	495469.02	181300.26
	LD10_03	495469.89	181303.39
	LD10_04	495472.19	181311.29
	LD10_05	495477.85	181331.04
	LD10_06	495415.89	181306.63
	LD10_07	495416.29	181307.43
	LD10_08	495417.16	181310.07
	LD10_09	495417.46	181311.57
	LD10_10	495418.93	181314.84
	LD10_11	495419.33	181316.44
	LD10_12	495421.69	181324.89
	LD10_13	495422.05	181325.82
	LD10_14	495423.70	181329.89
	LD10_15	495424.04	181330.82
	LD10_16	495459.29	181266.29
	LD10_17	495458.02	181261.89
	LD10_18	495456.59	181257.02
	LD10_19	495467.69	181295.67
	LD10_20	495489.92	181320.34
LD11x	LD11X_01	494501.71	181344.03
	LD11X_02	494499.66	181342.36
	LD11X_03	494497.11	181340.20
	LD11X_04	494495.06	181338.54
	LD11X_05	494492.52	181336.41
	LD11X_06	494490.47	181334.68
	LD11X_07	494487.87	181332.52
	LD11X_08	494485.87	181330.85
	LD11X_09	494483.28	181328.72
	LD11X_10	494481.26	181327.06
	LD11X_11	494478.68	181324.90
	LD11X_12	494476.66	181323.18

APPENDIX B CONTOUR PLOTS



µg/m³

- 35
- 40
- 45
- 50

0 1 2 3 4 5
Kilometers

N

PEC for PM_{10} 24-hour, 90.4th percentile (µg/m³) - screening Extended Campus

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PROJECT: 0420743	CHECKED: YV
DATE: 02/10/2020	APPROVED:

ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

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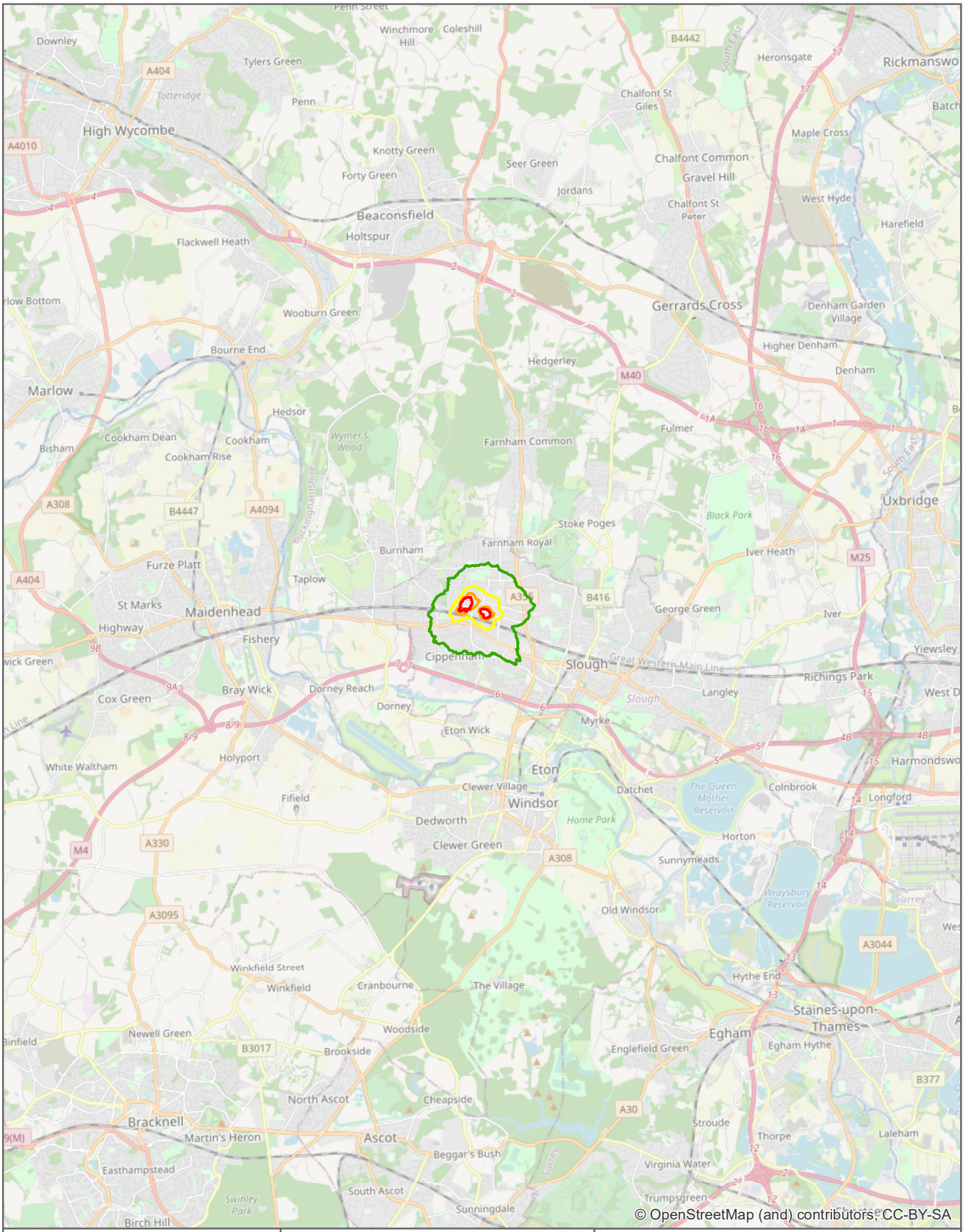

µg/m³

- 35
- 40
- 45
- 50

0 1 2 3 4 5
Kilometers

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PEC for PM_{10} 24-hour, 90.4th percentile (µg/m³) - screening Campus

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DATE: 02/10/2020	APPROVED:

ERM

Equinix

PROJECTION: British National Grid

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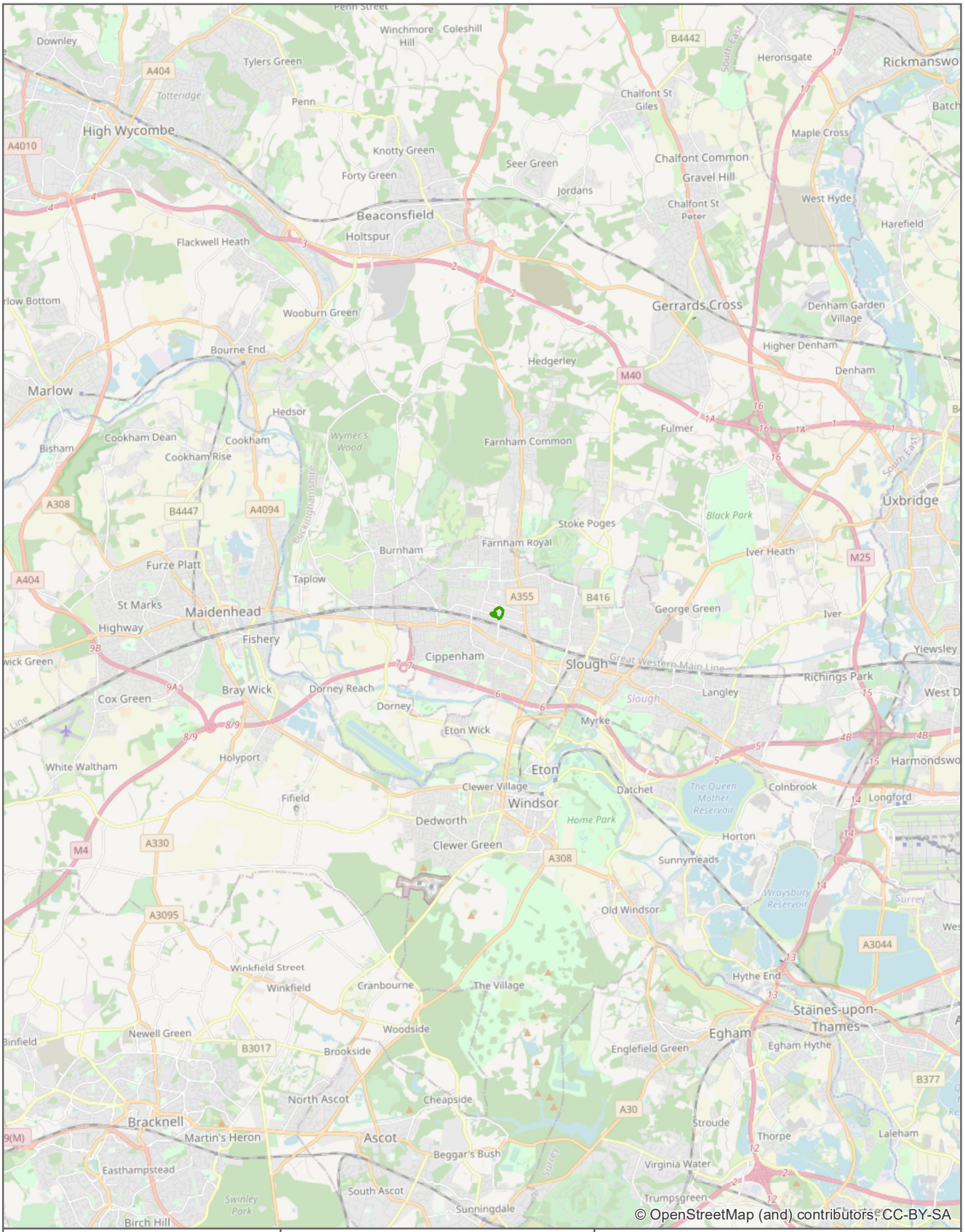

µg/m³

- 35
- 40
- 45
- 50

0 1 2 3 4 5
Kilometers

N

PEC for PM_{10} 24-hour, 90.4th percentile (µg/m³) - screening LD13x

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Equinix

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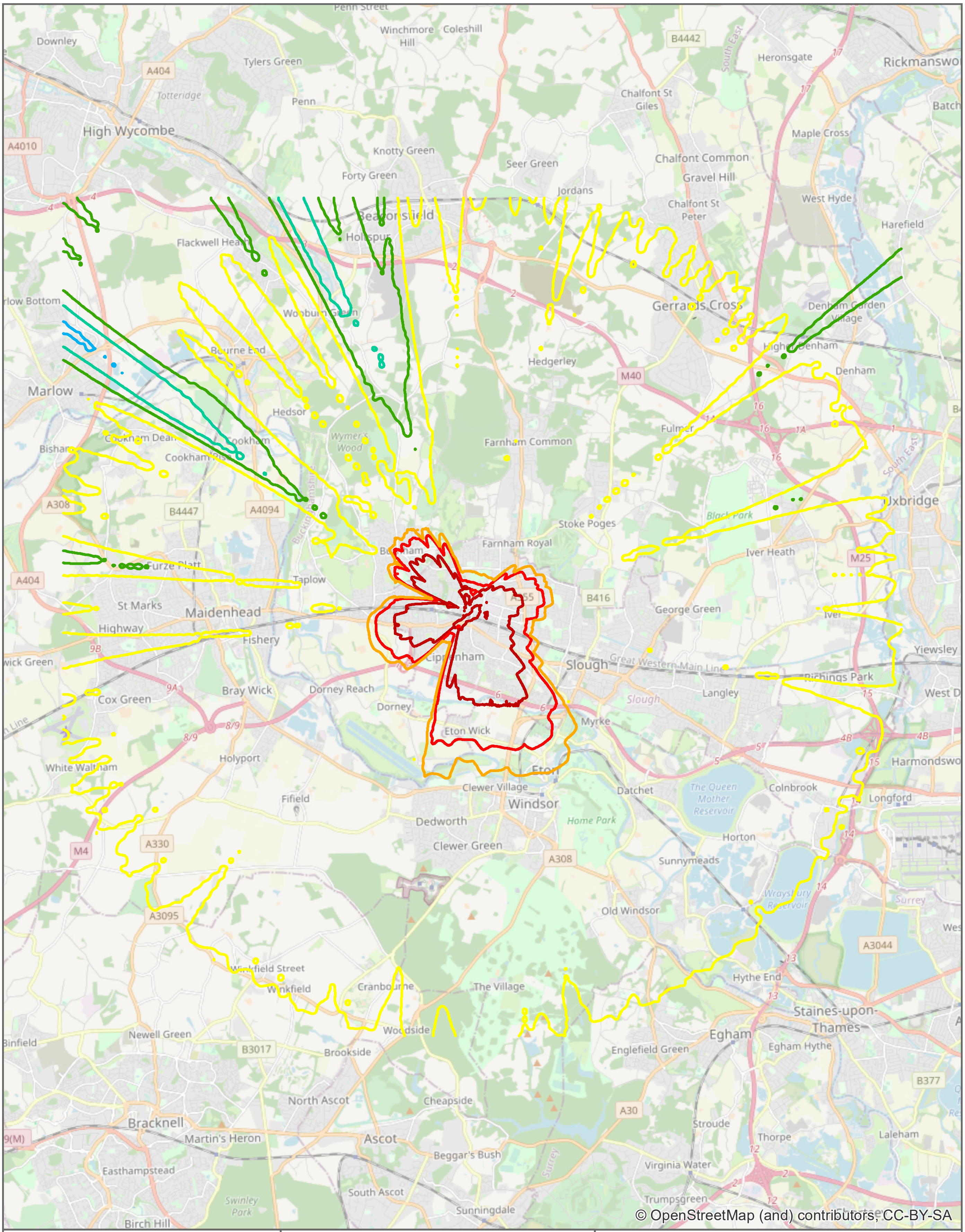
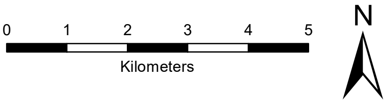


PROJECTION: British National Grid

µg/m³

▬	55	▬	100
▬	65	▬	150
▬	75	▬	200
▬	85	▬	400



PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Black Buiding test LD4

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ERM

Equinix

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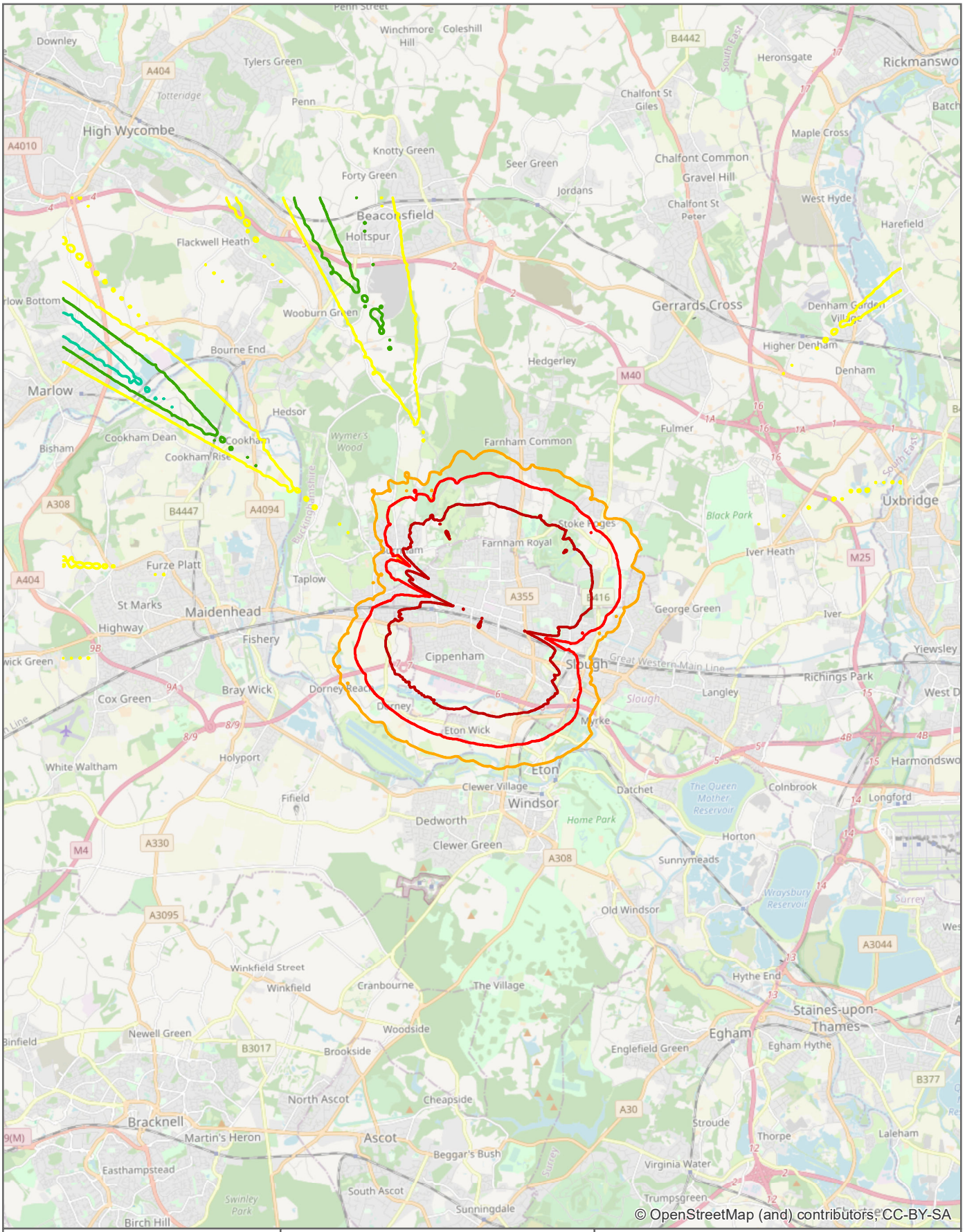

µg/m³	
55	100
65	150
75	200
85	400

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Black Buiding test LD5

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PROJECT: 0420743	CHECKED: YV
DATE: 04/10/2020	APPROVED:

ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

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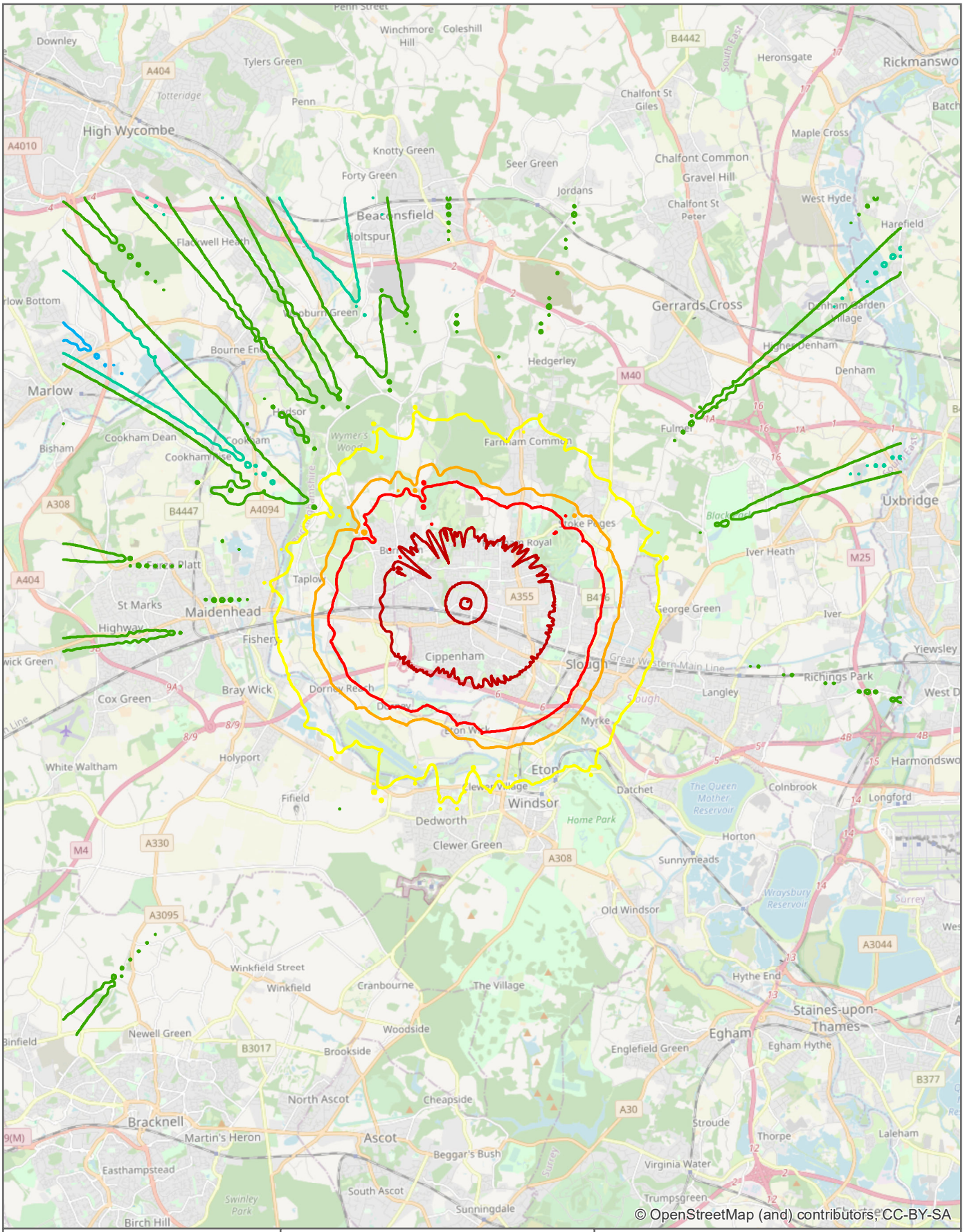

µg/m³	
55	100
65	150
75	200
85	400

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Black Buiding test LD6

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DATE: 04/10/2020	APPROVED:

ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

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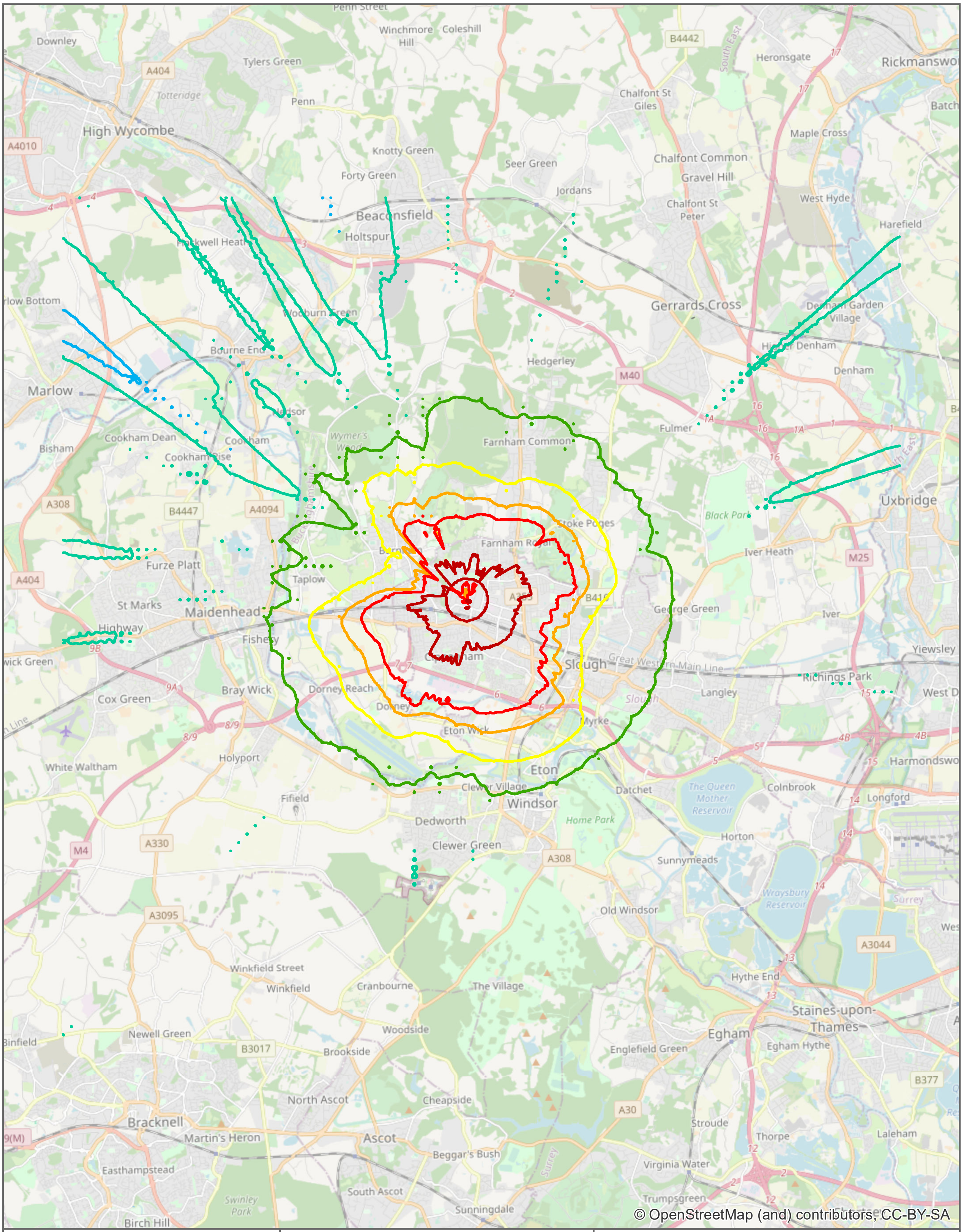
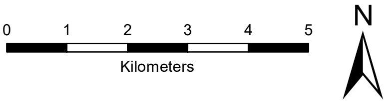


µg/m³	
55	100
65	150
75	200
85	400



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APPROVED:

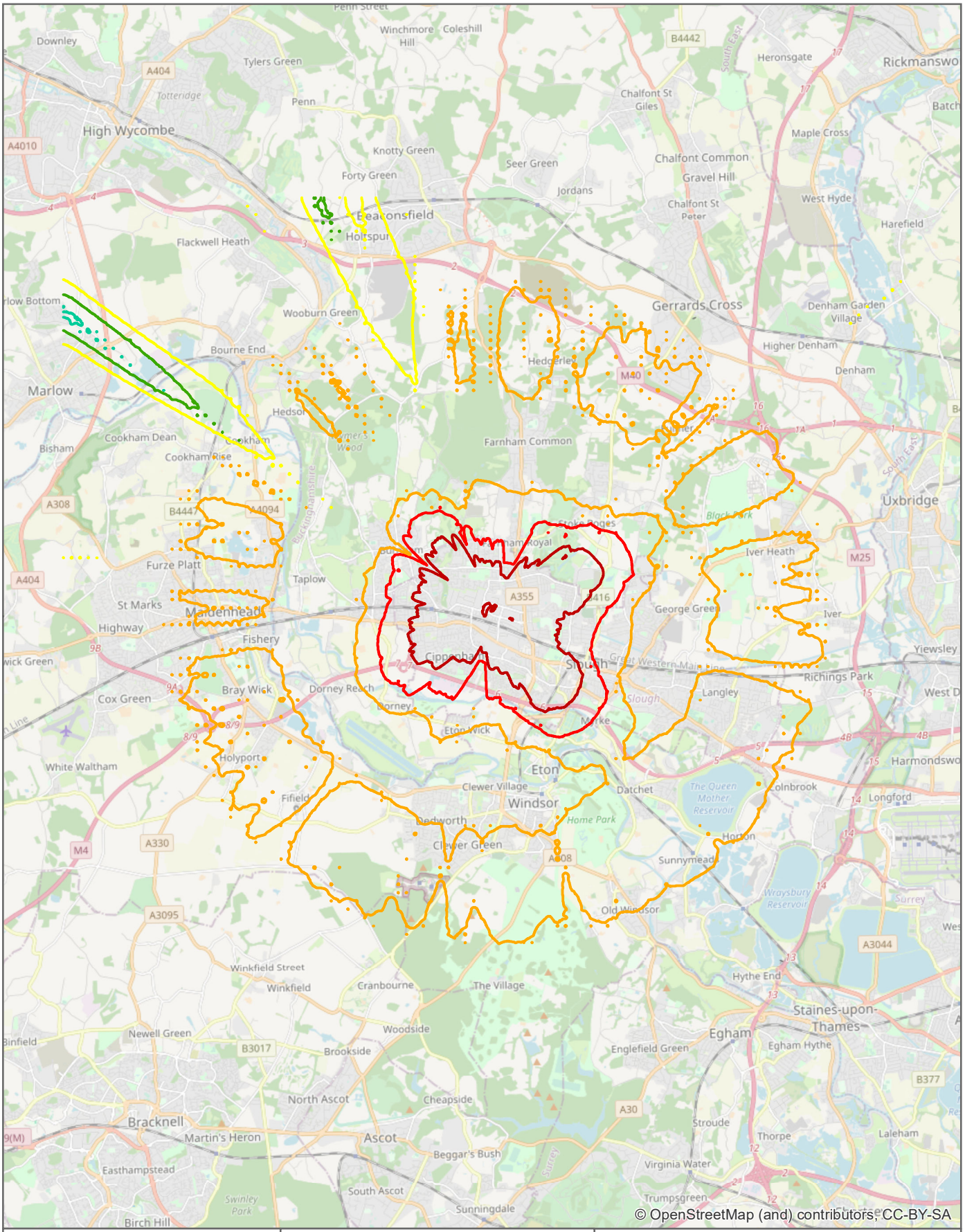
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_BBT_LD7_A01.mxd



µg/m³	
55	100
65	150
75	200
85	400

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Black Buiding test LD10/LD13x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 04/10/2020	APPROVED:

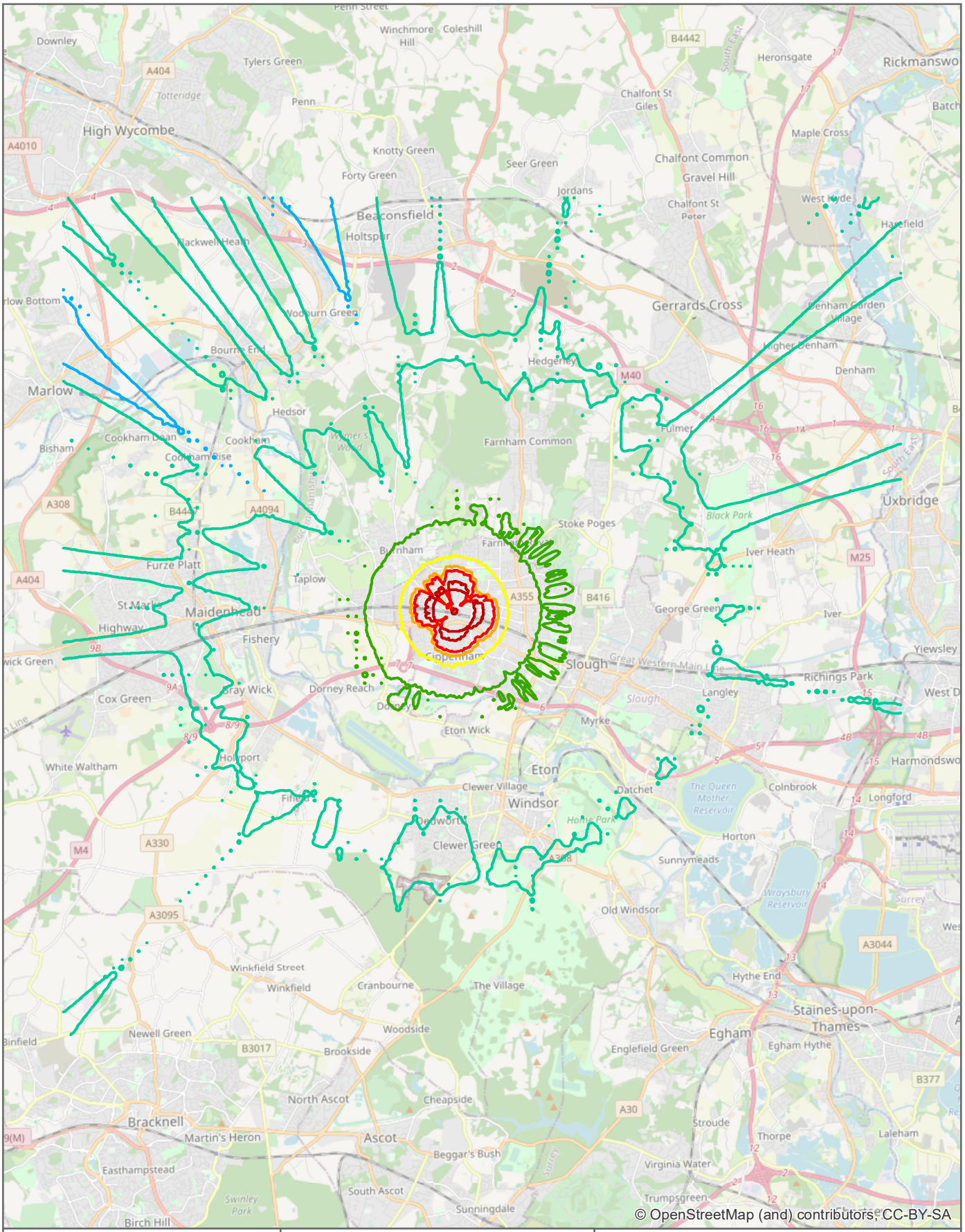
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_BBT_LD10_A01.mxd



µg/m³	
55	100
65	150
75	200
85	400

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Black Buiding test LD11x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 04/10/2020	APPROVED:

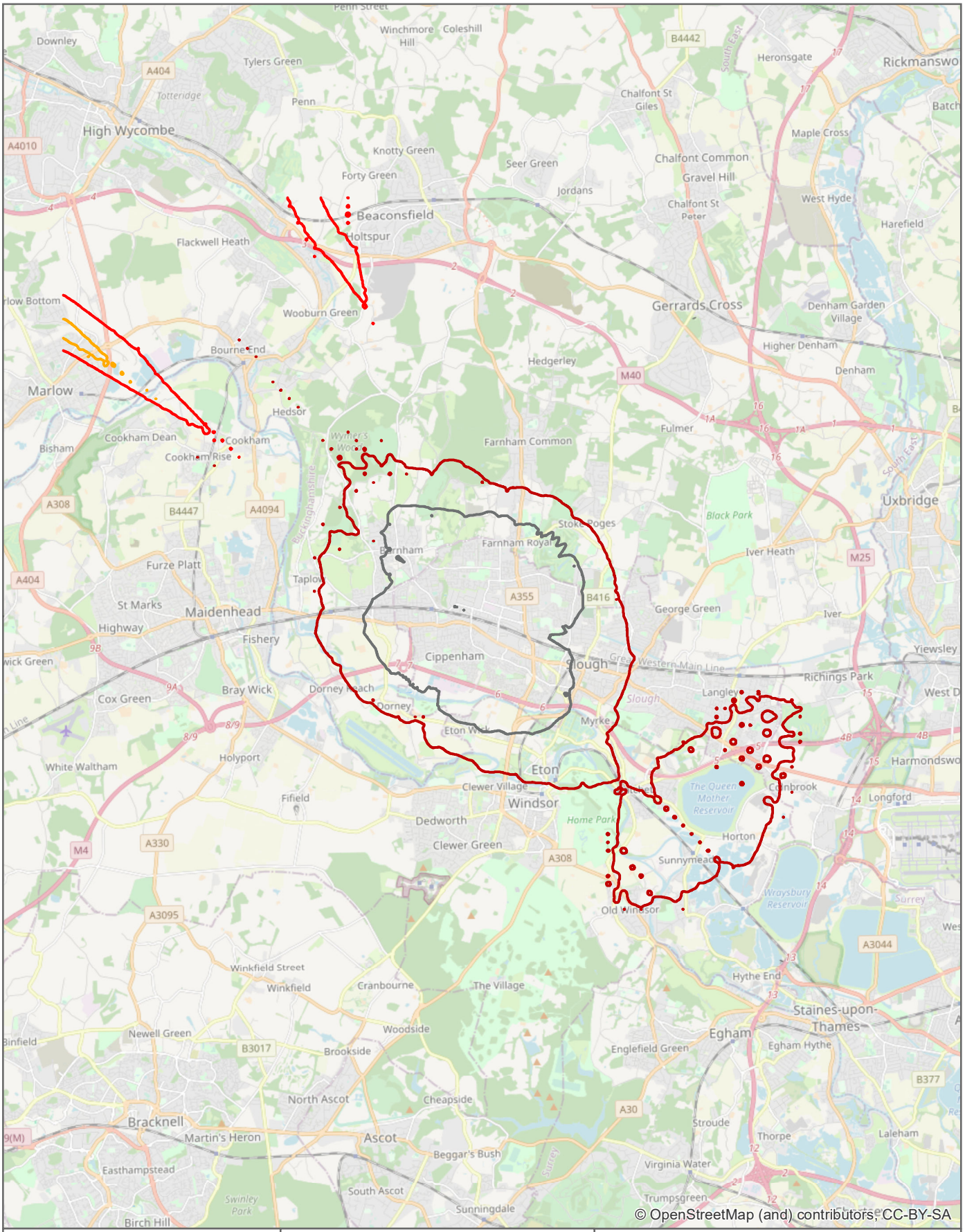
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_BBT_LD11_A01.mxd



µg/m³	
55	100
65	150
75	200
85	400
	800

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - emergency power for Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 04/10/2020	APPROVED:

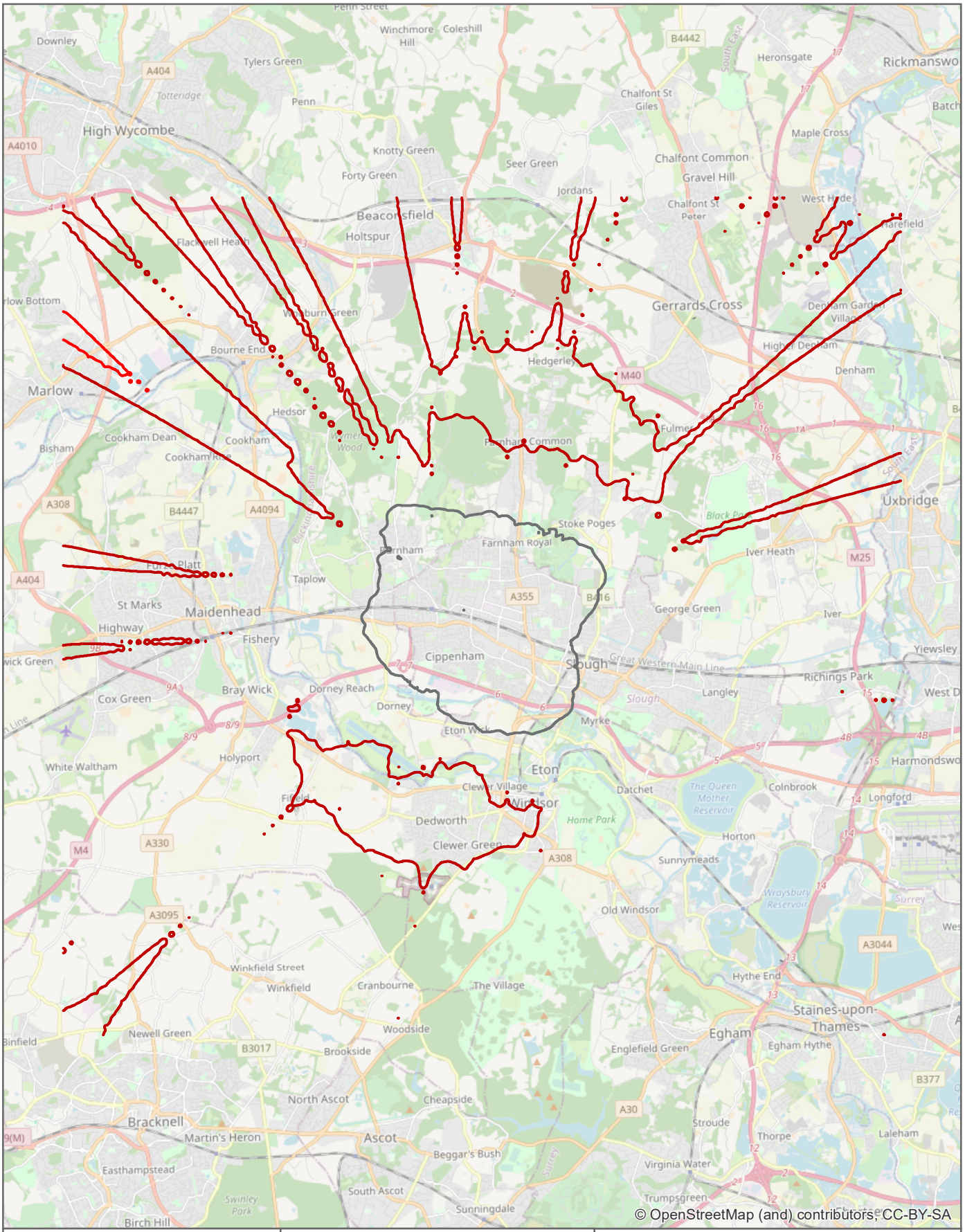
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_EP_Ca_A01.mxd



µg/m³	
55	100
65	150
75	200
85	400
	800

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - emergency power for Extended Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 04/10/2020	APPROVED:

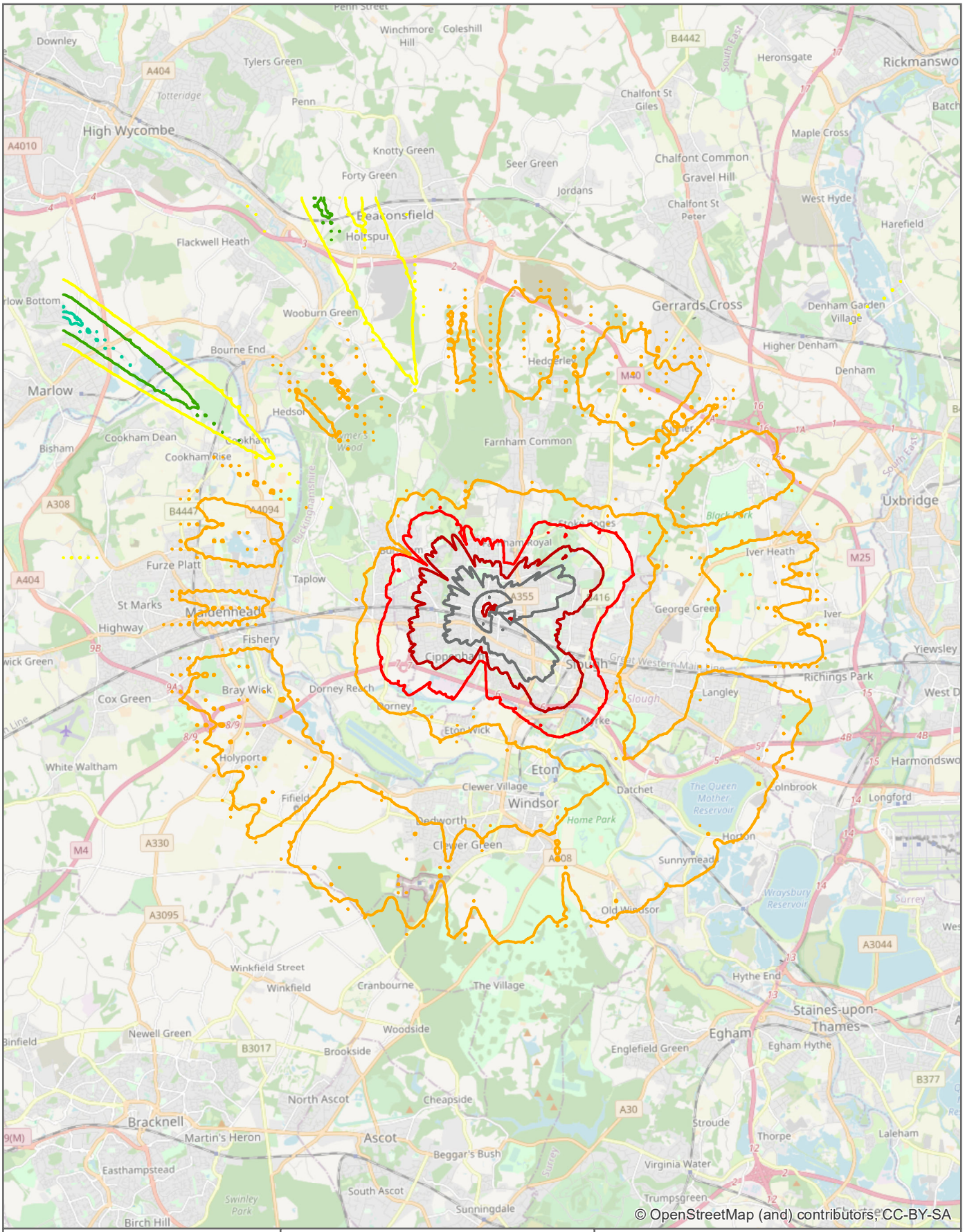
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_EP_ExCa_A01.mxd



µg/m³	
55	100
65	150
75	200
85	400
	800

0 1 2 3 4 5
Kilometers

N

PEC for NO₂ 1-hour maximum, 100th percentile (µg/m³) - emergency power for LD13x

SCALE: See Scale Bar
SIZE: A4
PROJECT: 0420743
DATE: 04/10/2020

VERSION: A
DRAWN: JTL
CHECKED: YV
APPROVED:

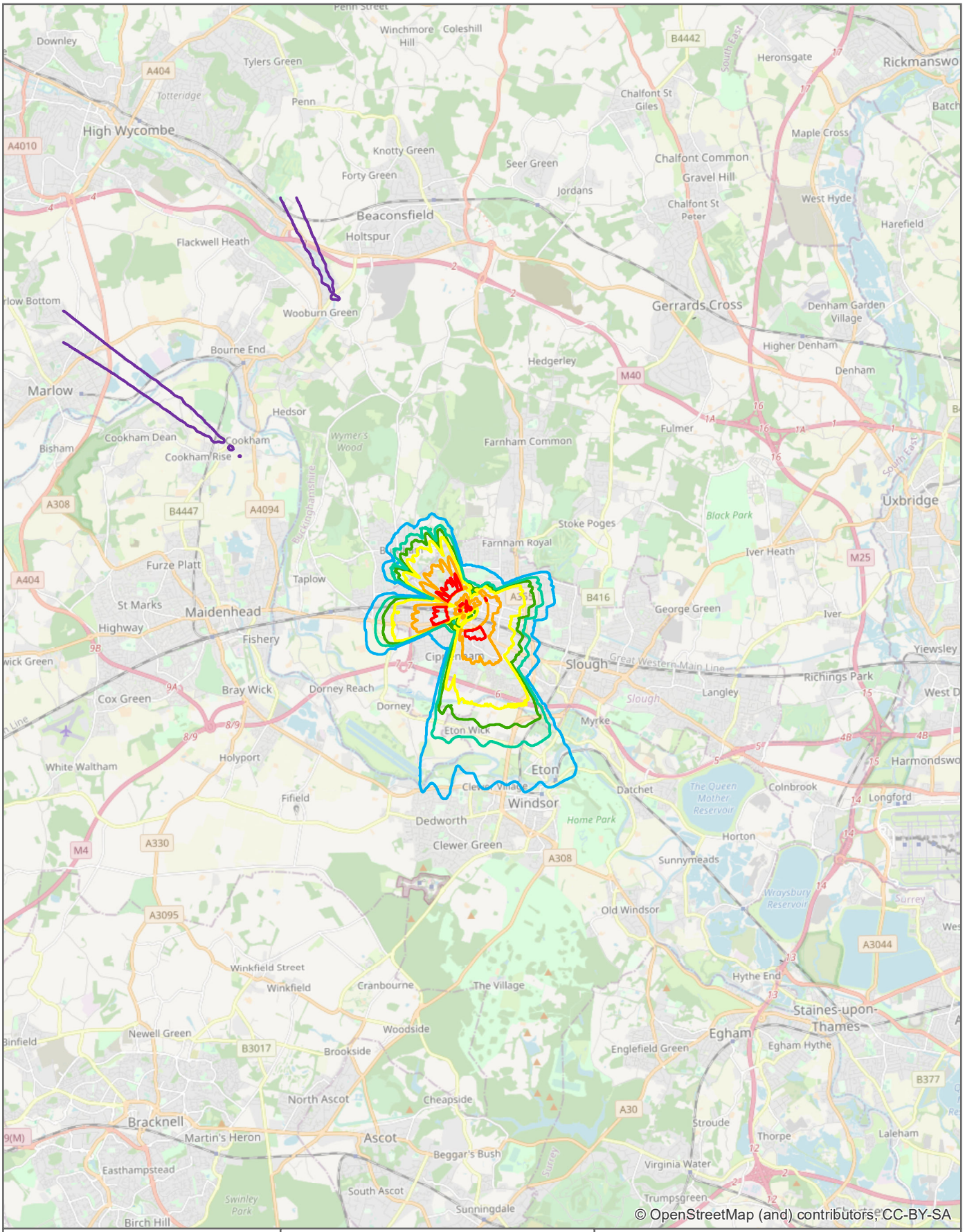
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_EP_LD13x_A01.mxd



µg/m³	
55	85
65	100
75	150
	200

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Load-bank test LD4

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

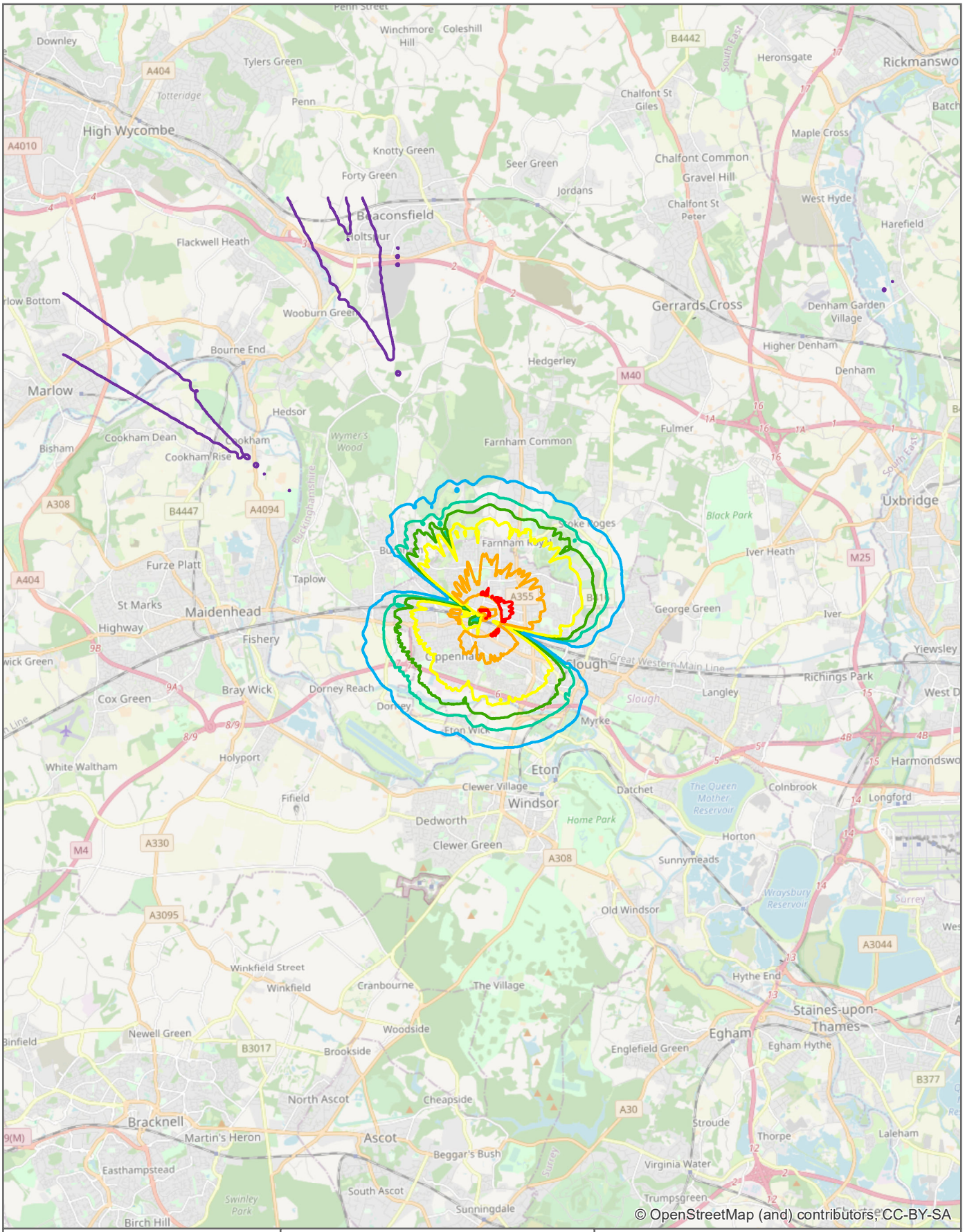
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_LBT_LD4_A01.mxd



µg/m³	
55	85
65	100
75	150
	200

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Load-bank test LD5

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

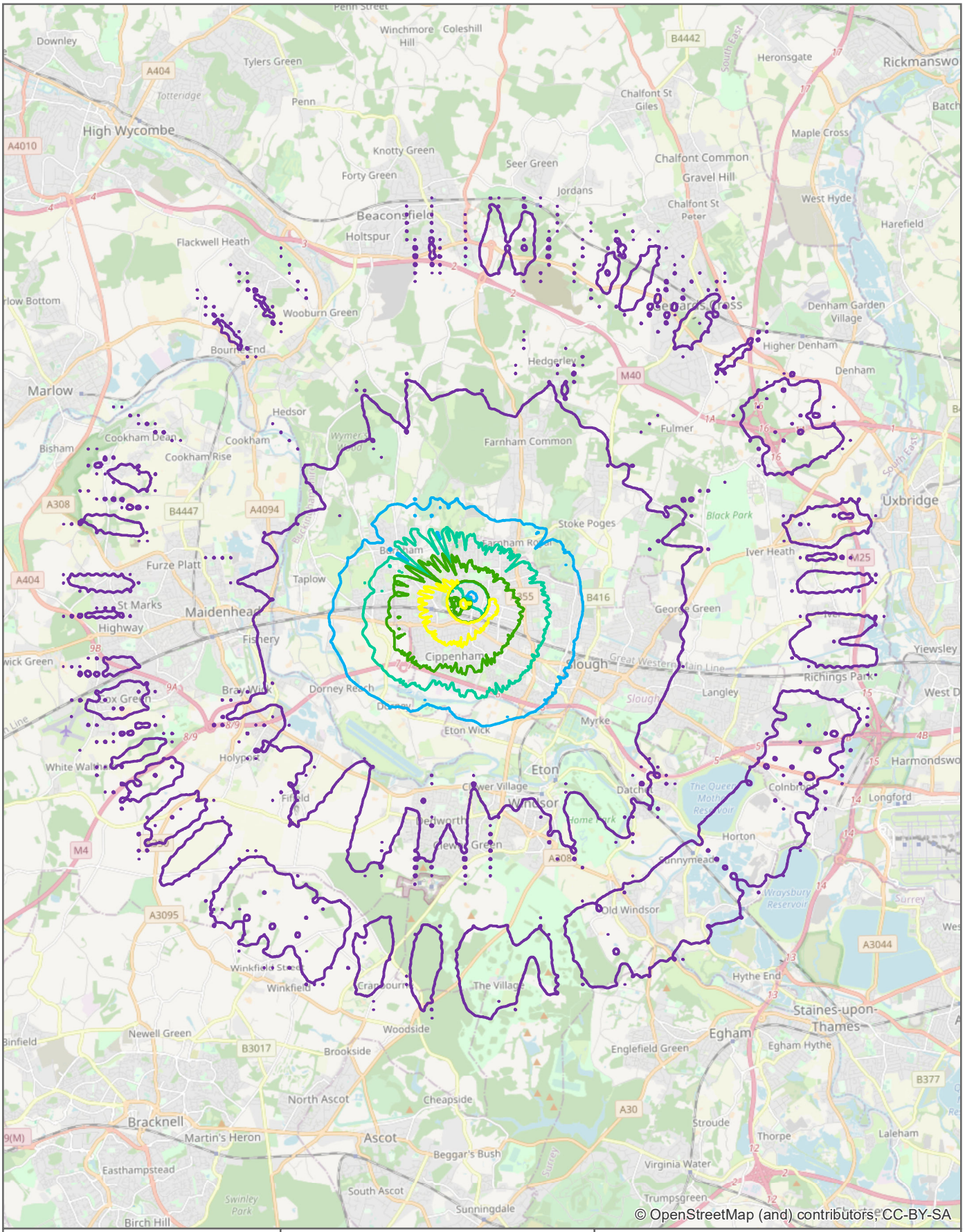
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_LBT_LD5_A01.mxd



µg/m³

55	85
65	100
75	150
	200

0 1 2 3 4 5

Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Load-bank test LD6

SCALE: See Scale Bar
SIZE: A4
PROJECTION: 0420743
DATE: 05/10/2020

VERSION: A
DRAWN: JTL
CHECKED: YV
APPROVED:

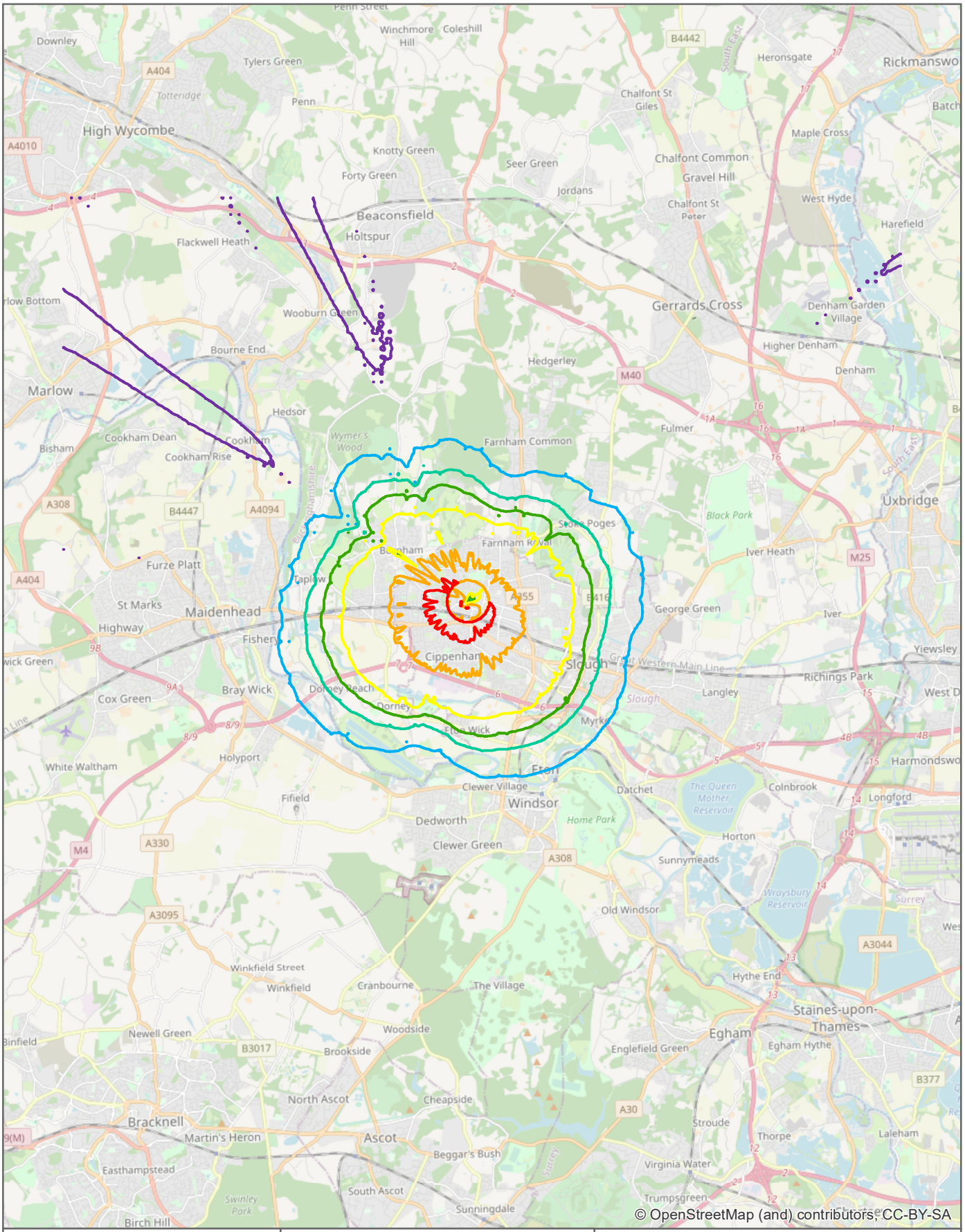
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_LBT_LD6_A01.mxd



µg/m³	
55	85
65	100
75	150
	200

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Load-bank test LD7

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

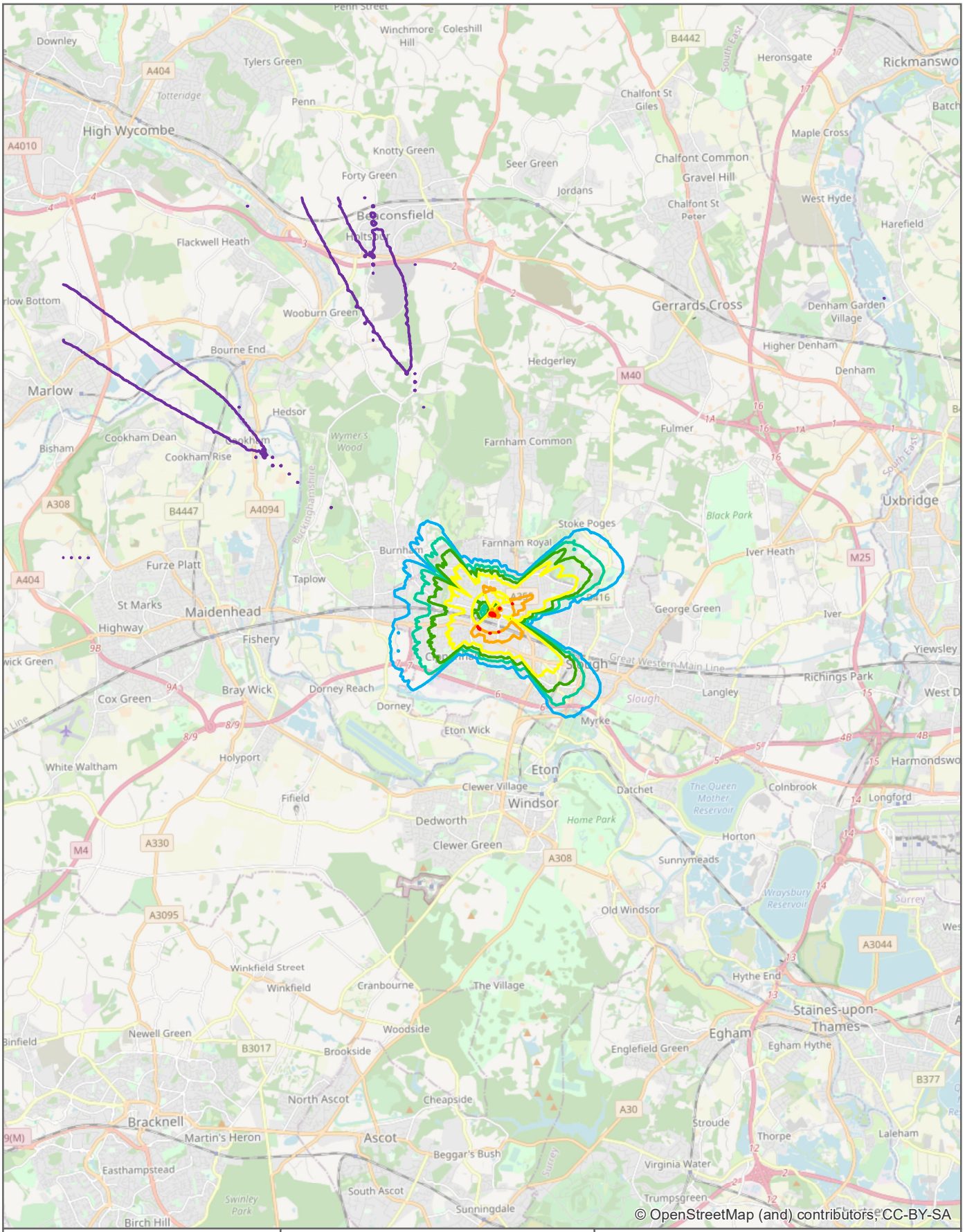
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_LBT_LD7_A01.mxd



µg/m³	
55	85
65	100
75	150
	200

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Load-bank test LD10/LD13x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

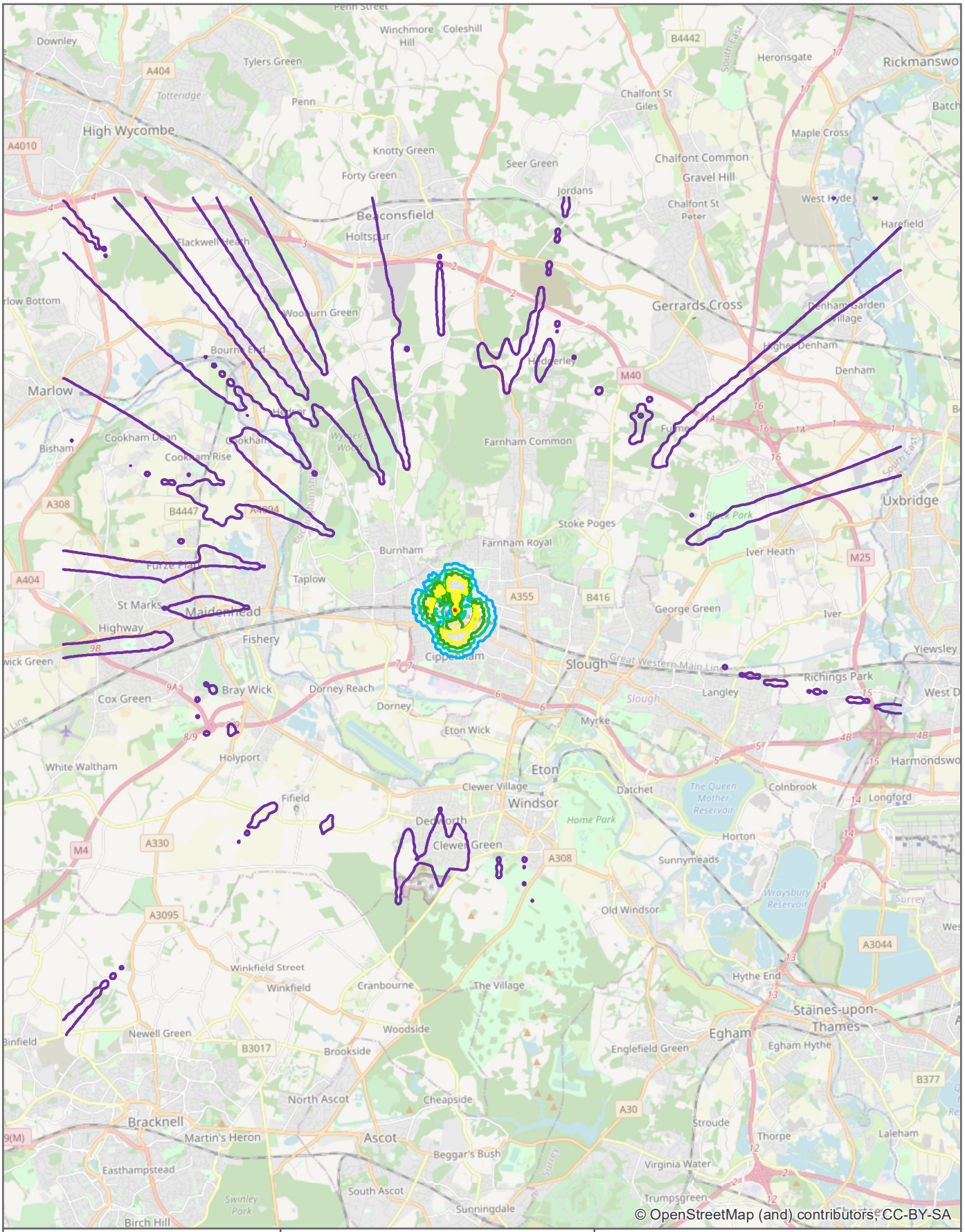
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_LBT_LD10_A01.mxd



µg/m³	
55	85
65	100
75	150
	200

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Load-bank test LD11

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

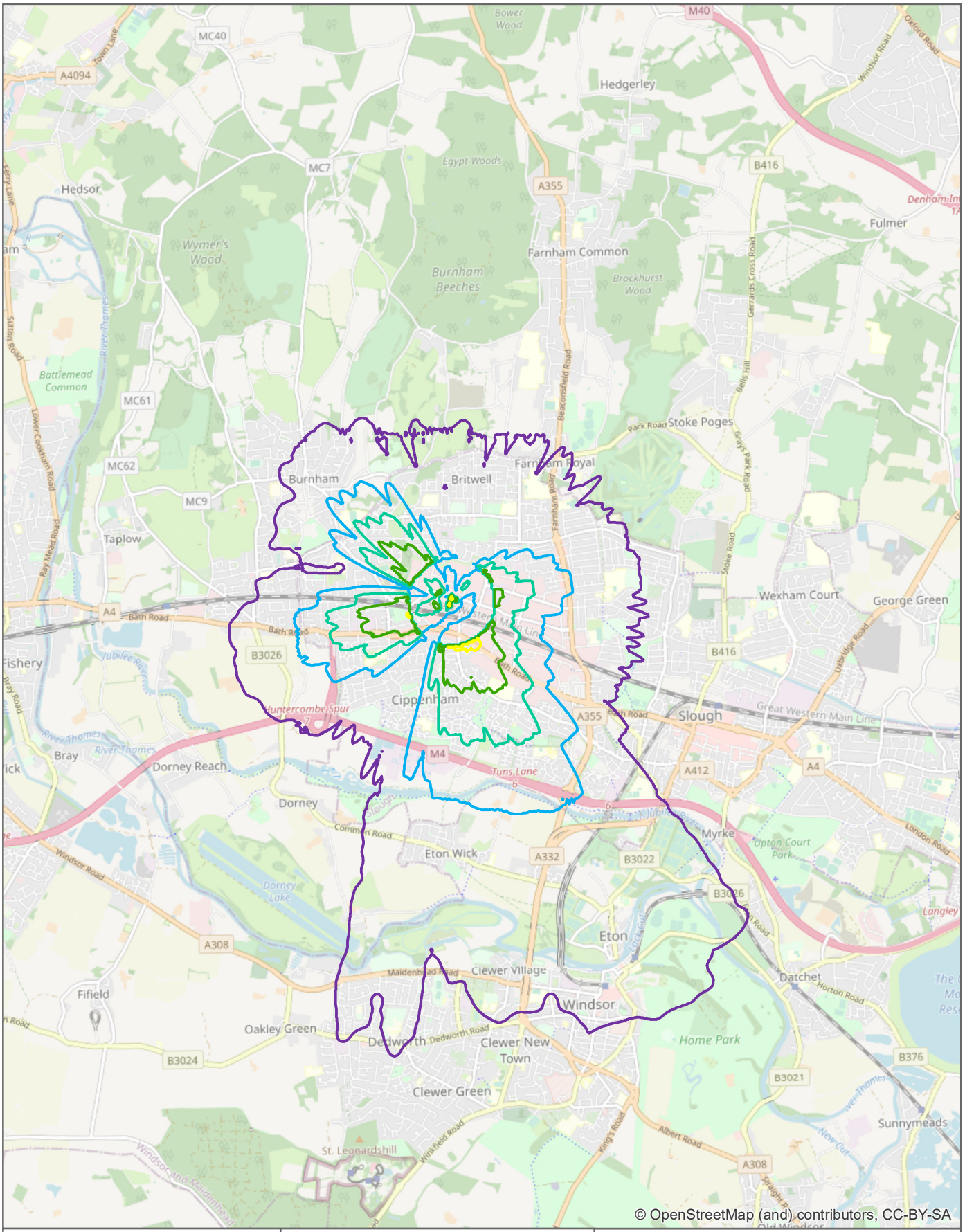
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_LBT_LD11_A01.mxd



µg/m³	
55	85
65	100
75	150
	200

0 0.5 1 1.5 2 2.5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Start-up test LD4

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

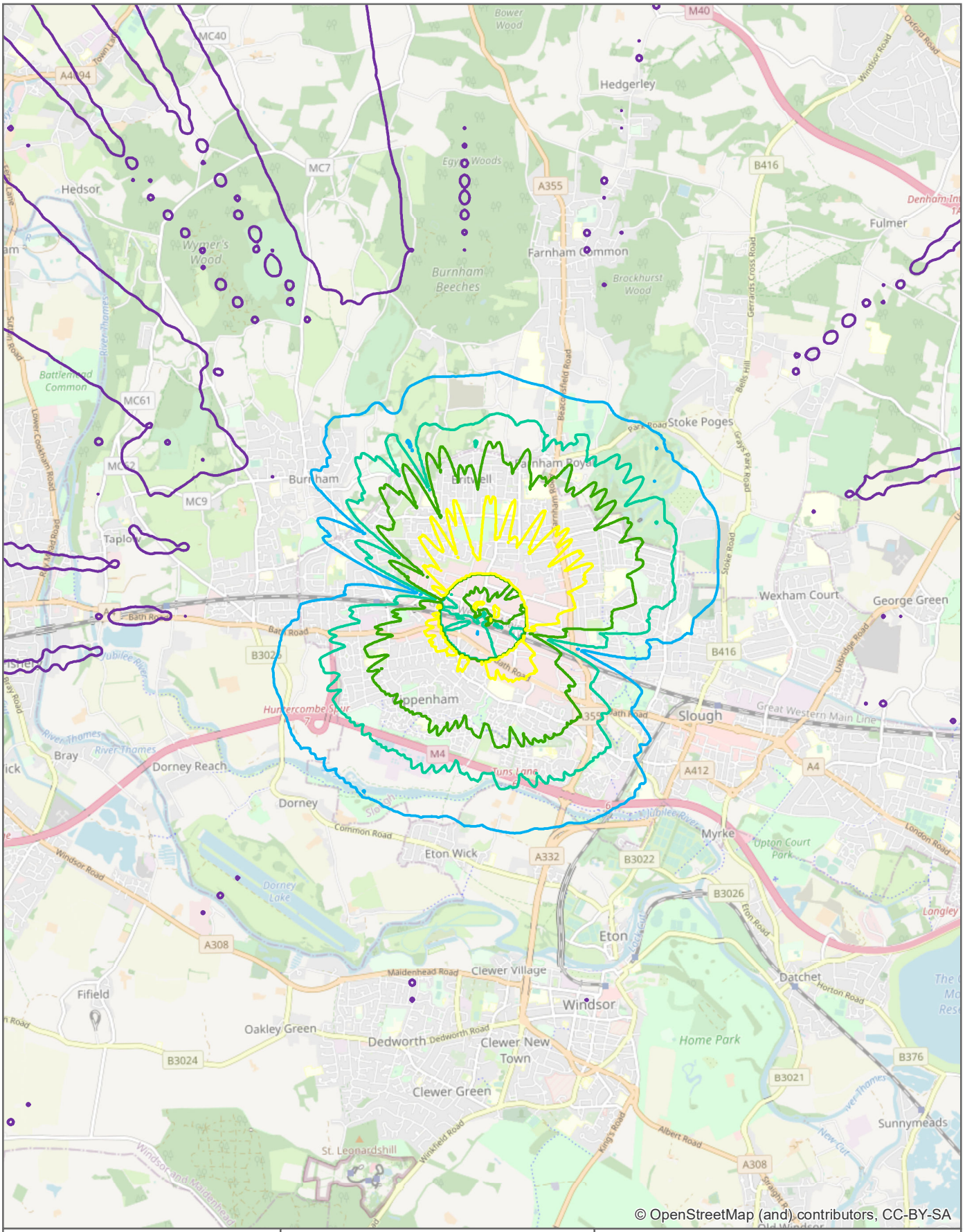
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_ST_LD4_A02.mxd



µg/m³	
55	85
65	100
75	150
	200

0 0.5 1 1.5 2 2.5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Start-up test LD5

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

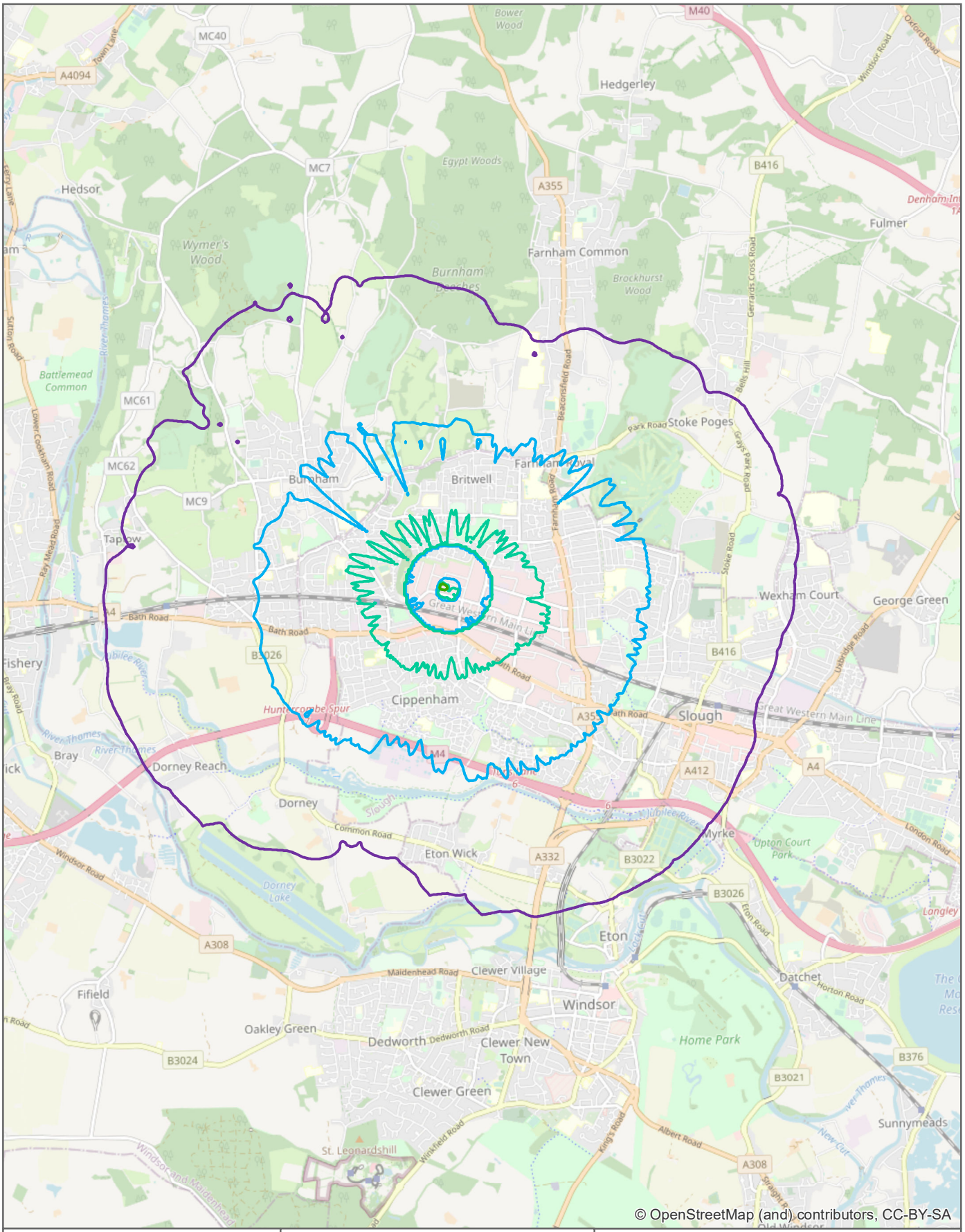
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_ST_LD5_A02.mxd



µg/m³	
55	85
65	100
75	150
	200

0 0.5 1 1.5 2 2.5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Start-up test LD6

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

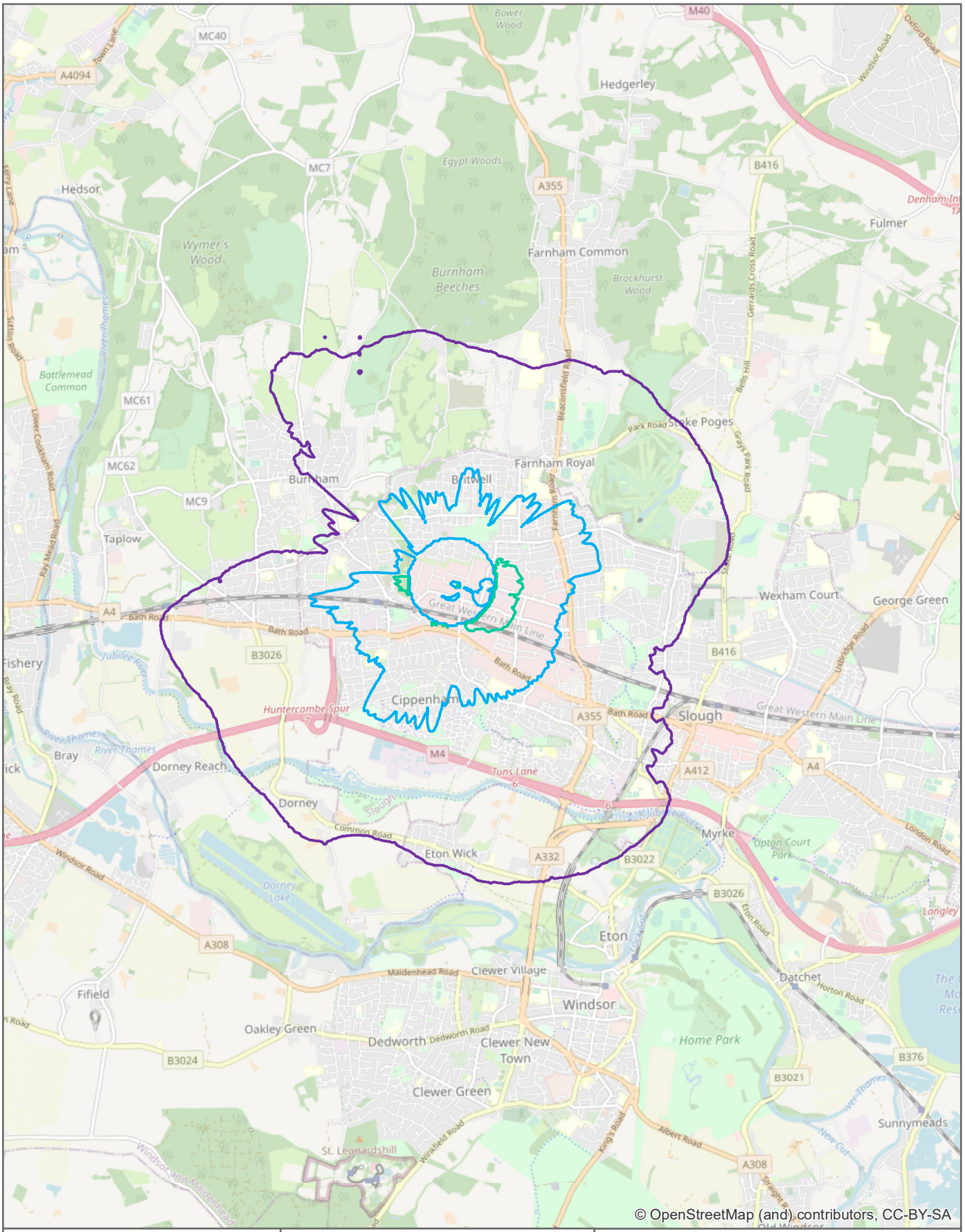
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_ST_LD6_A02.mxd



µg/m³	
55	85
65	100
75	150
	200

0 0.5 1 1.5 2 2.5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Start-up test LD7

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

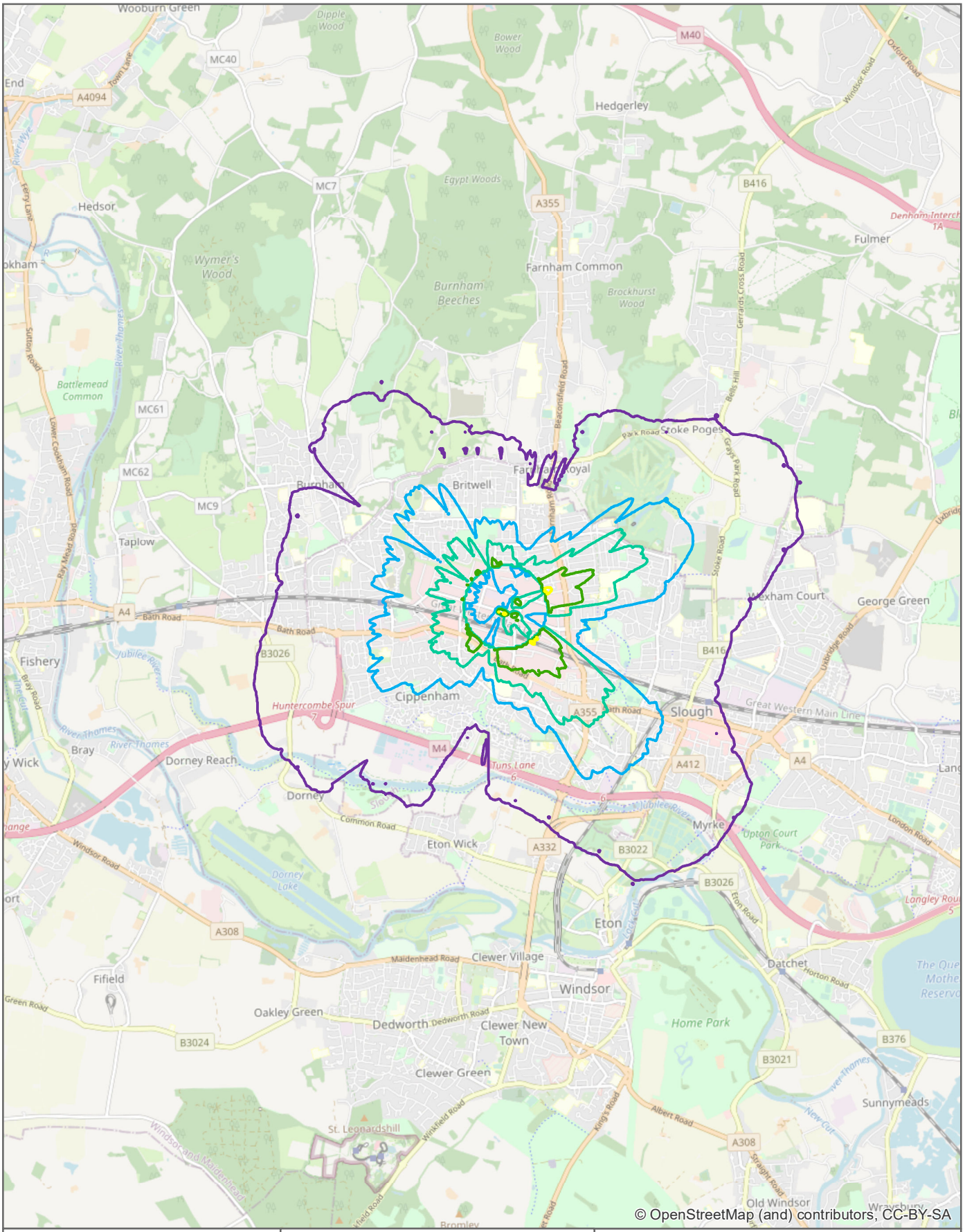
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_ST_LD7_A02.mxd



µg/m³	
55	85
65	100
75	150
	200

0 0.5 1 1.5 2 2.5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Start-up test LD10/LD13x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

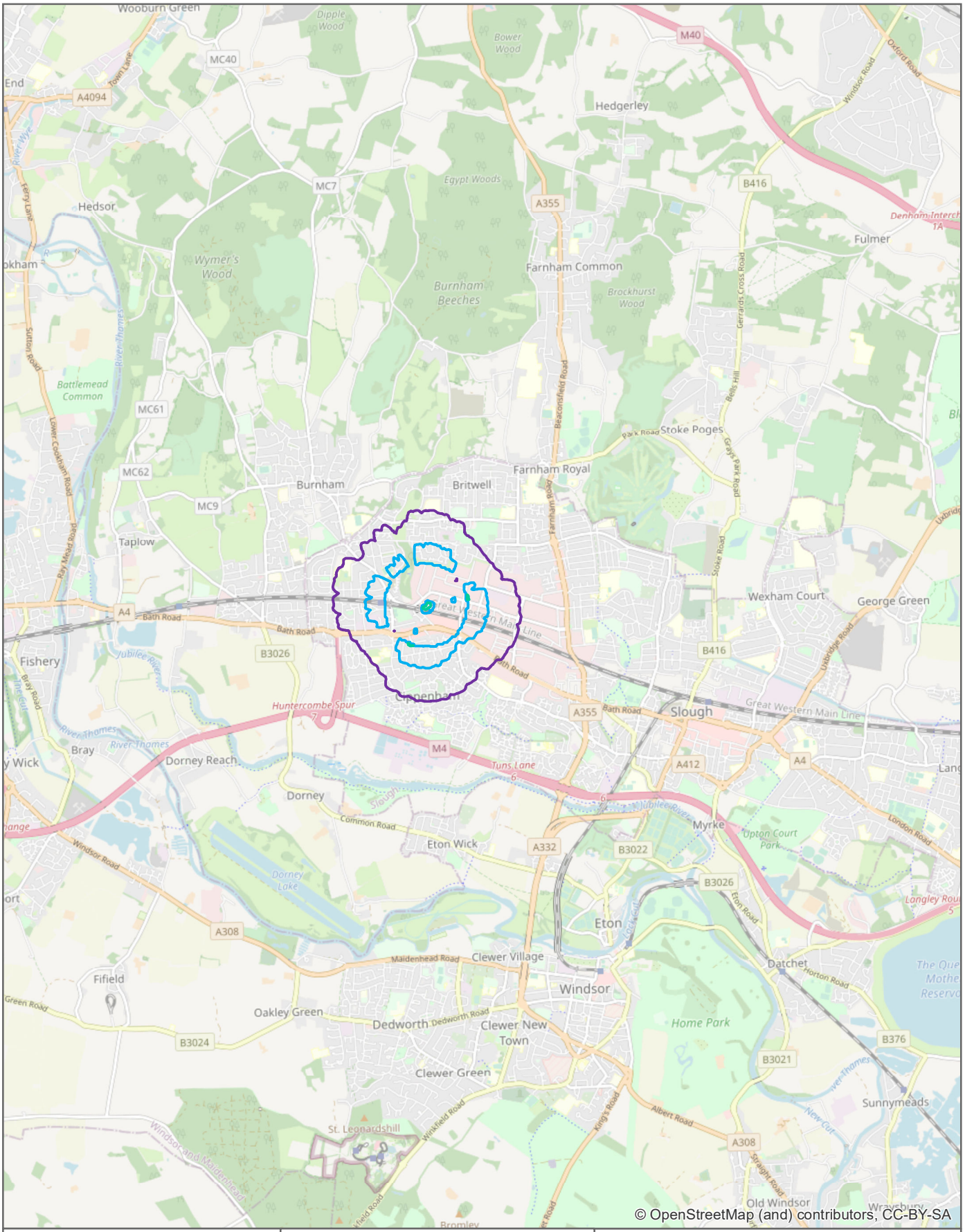
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_ST_LD10_A02.mxd



µg/m³	
55	85
65	100
75	150
	200

0 0.5 1 1.5 2 2.5
Kilometers

N

PEC for NO_2 1-hour maximum, 100th percentile (µg/m³) - Start-up test LD11x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

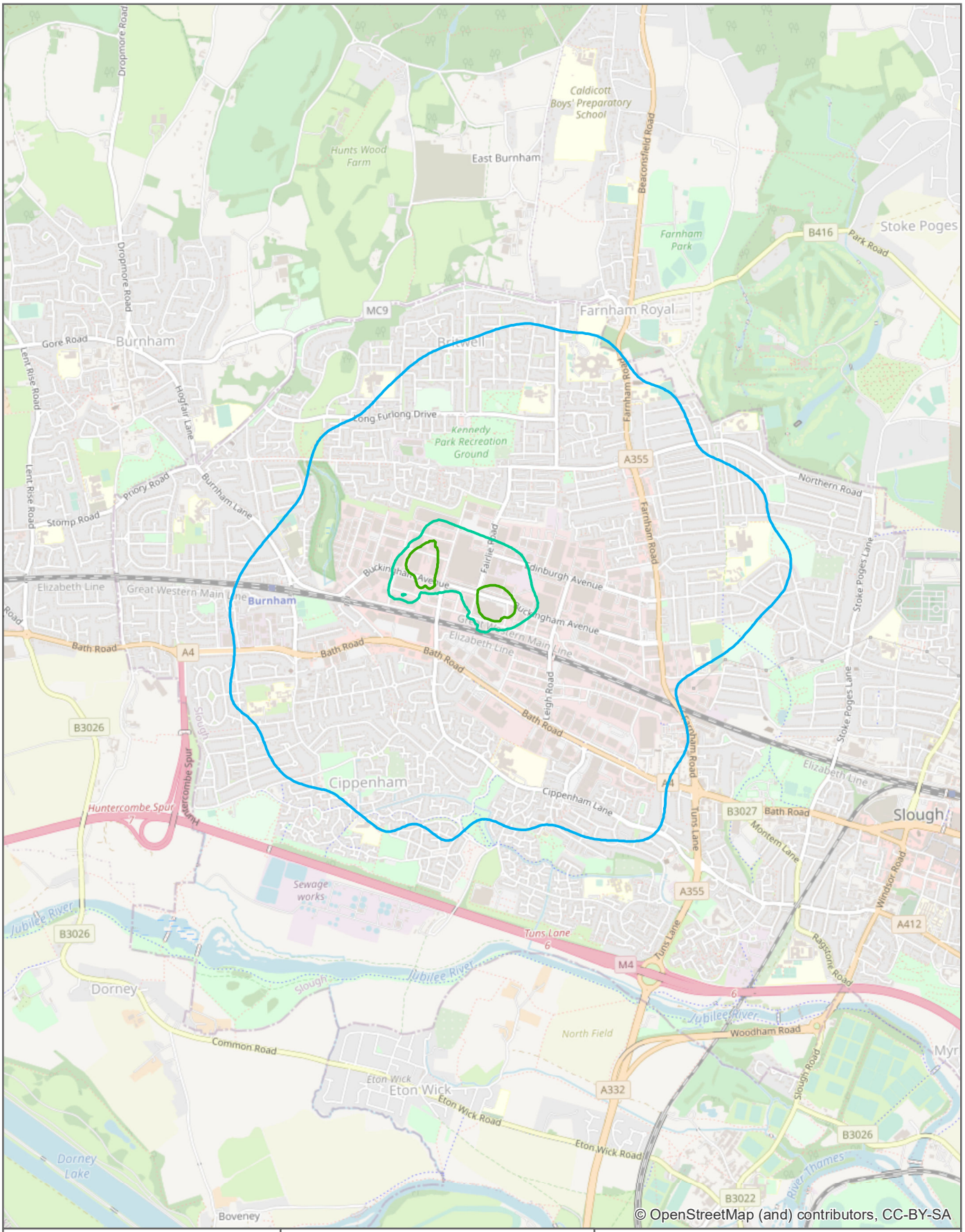
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_1hrMx_100PCT_ST_LD11_A02.mxd



µg/m³

- 26.005
- 26.05
- 26.1
- 30
- 40

0 250 500 750 1,000 1,250
Meters

N

PEC for NO_2 annual mean (µg/m³) - emergency power for Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

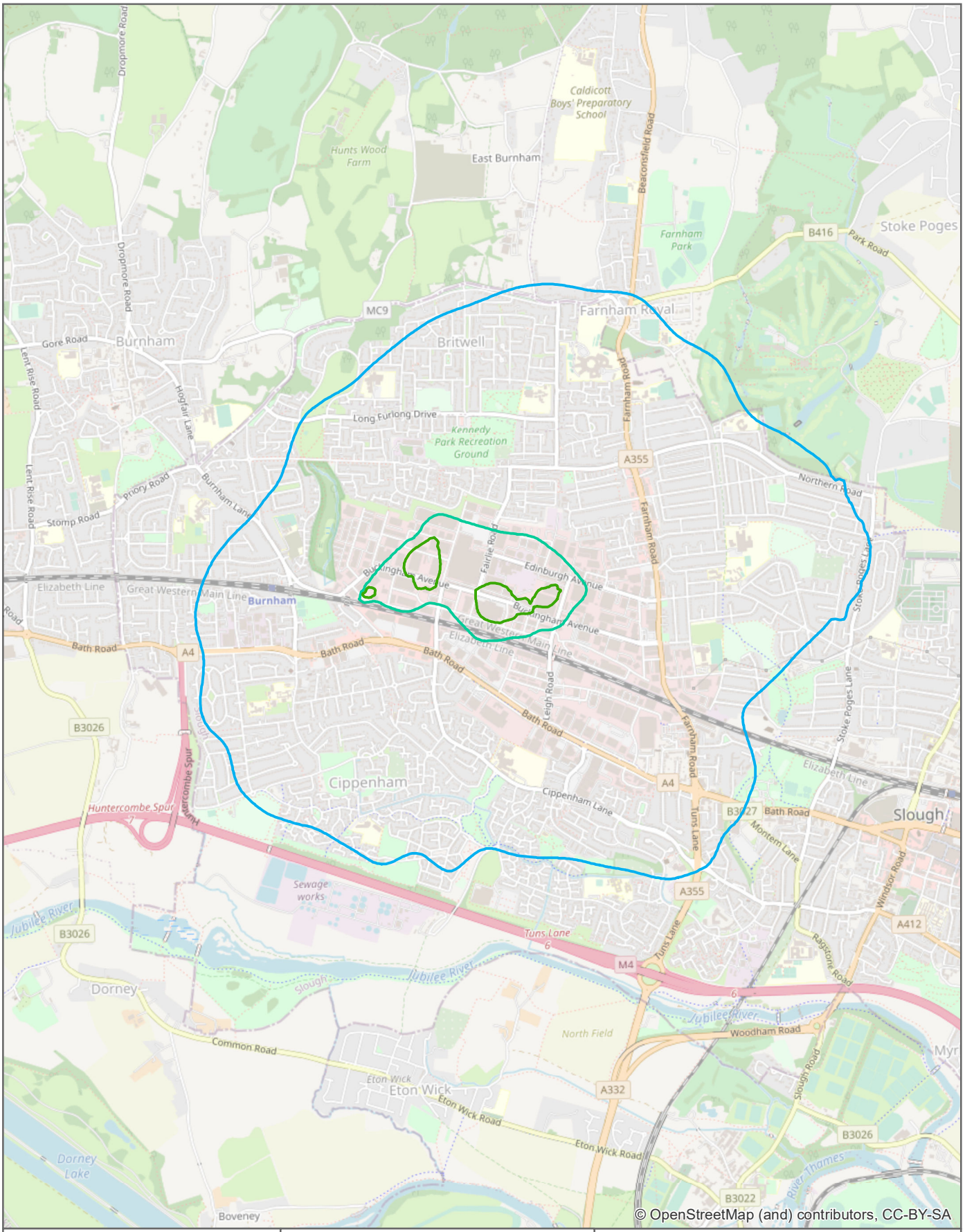
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_AnnMean_EP_Ca_A02.mxd



µg/m³

- 26.005
- 26.05
- 26.1
- 30
- 40

0 250 500 750 1,000 1,250
Meters

N

PEC for NO_2 annual mean (µg/m³) - emergency power for Extended Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

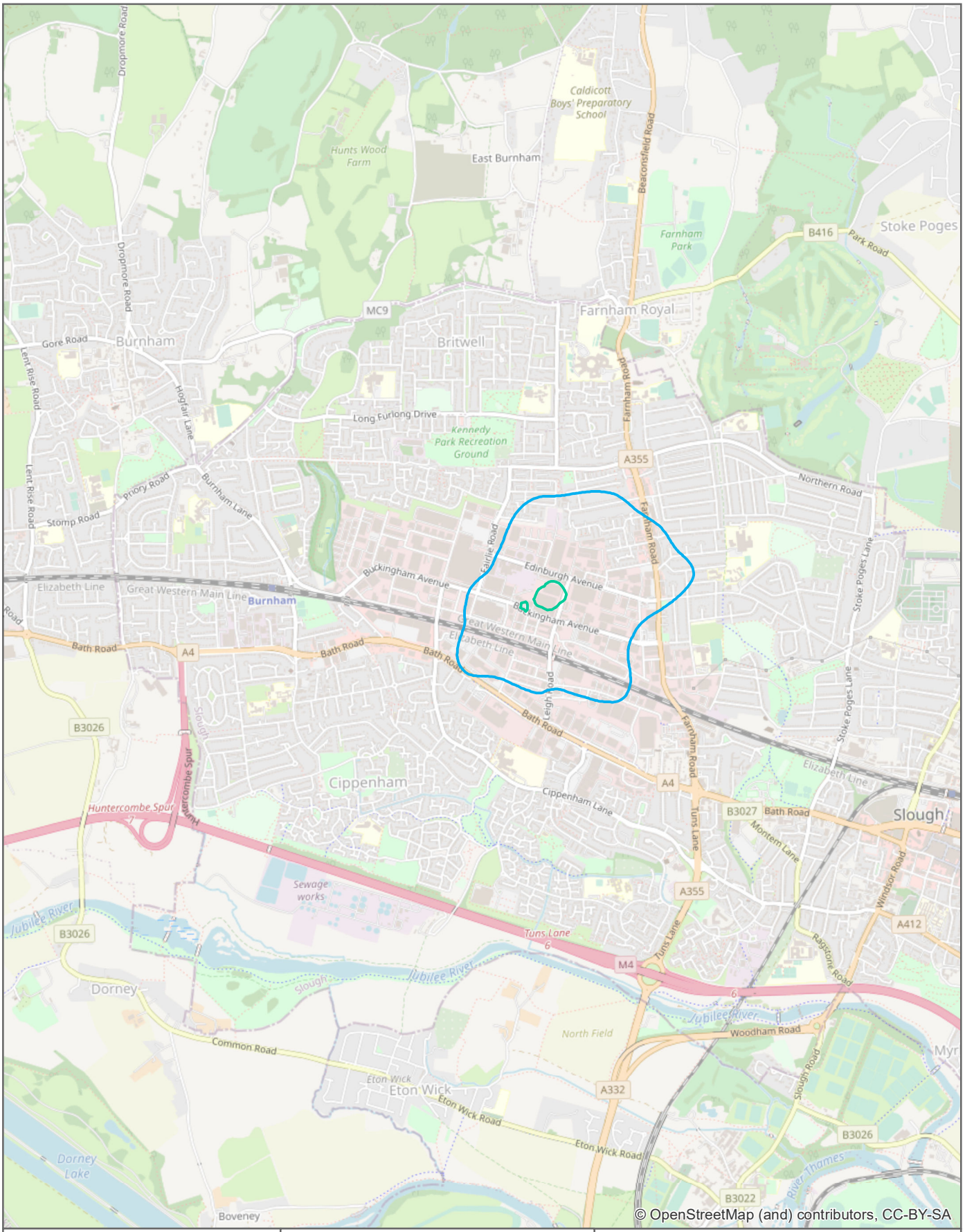
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_AnnMean_EP_ExCa_A02.mxd



µg/m³

- 26.005
- 26.05
- 26.1
- 30
- 40

0 250 500 750 1,000 1,250
Meters

N

PEC for NO_2 annual mean (µg/m³) - emergency power for LD13x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 05/10/2020	APPROVED:

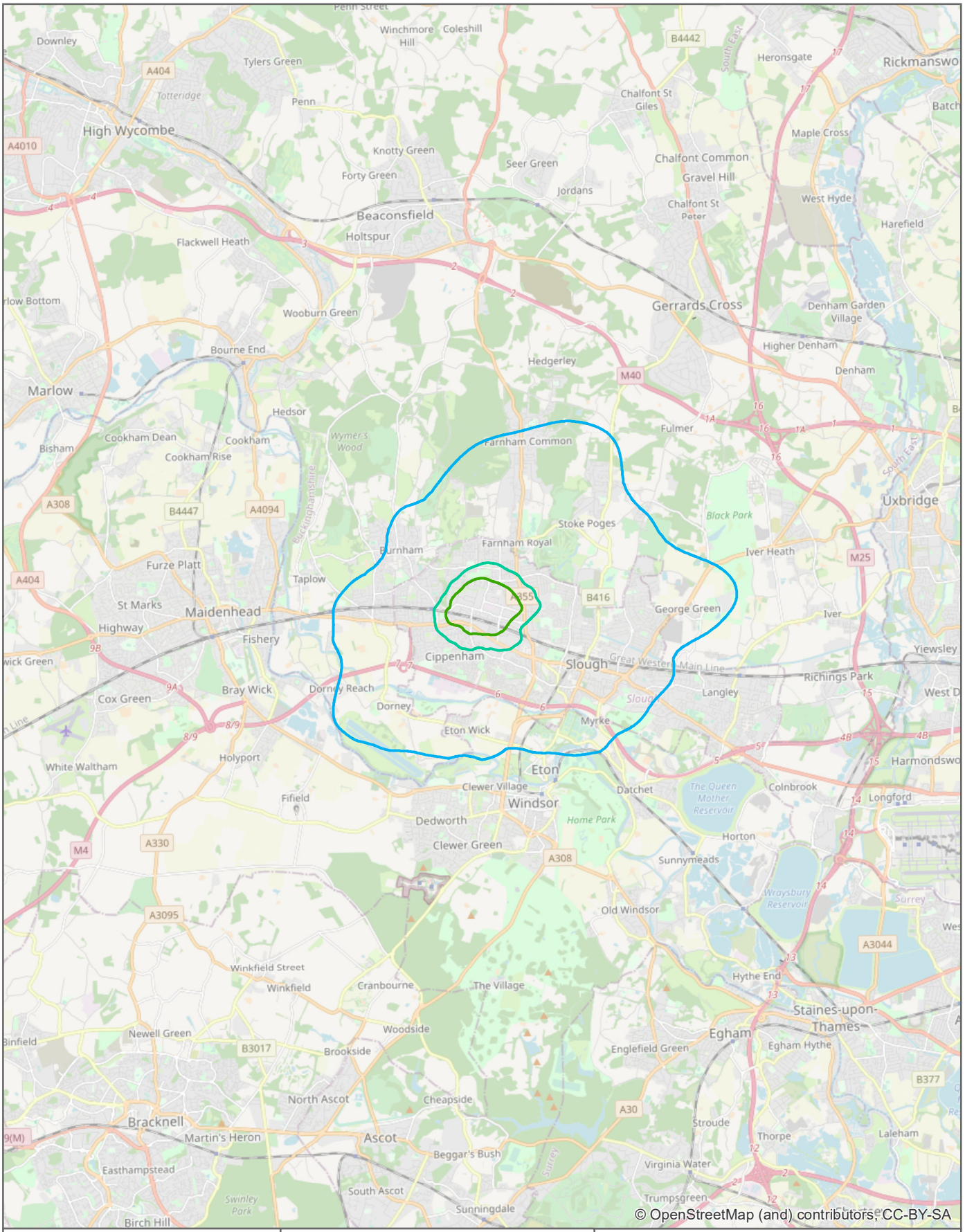
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_AnnMean_EP_LD13x_A02.mxd



µg/m³

- 26.005
- 26.05
- 26.1
- 30
- 40

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 annual mean (µg/m³) - maintenance of Extended Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 02/10/2020	APPROVED:

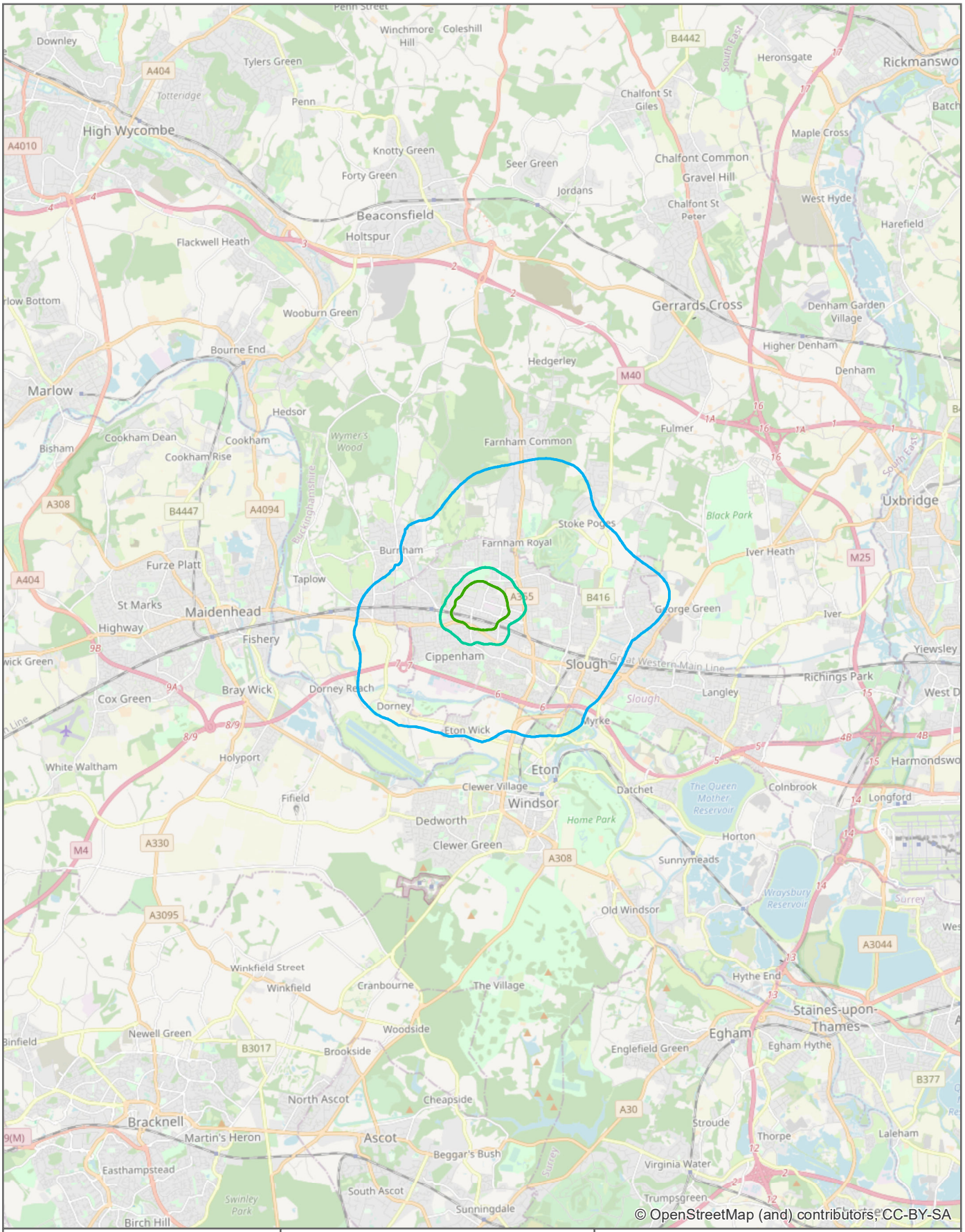
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_AnnMean_Maint_ExCa_A01.mxd



µg/m³

- 26.005
- 26.05
- 26.1
- 30
- 40

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 annual mean (µg/m³) - maintenance of Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 02/10/2020	APPROVED:

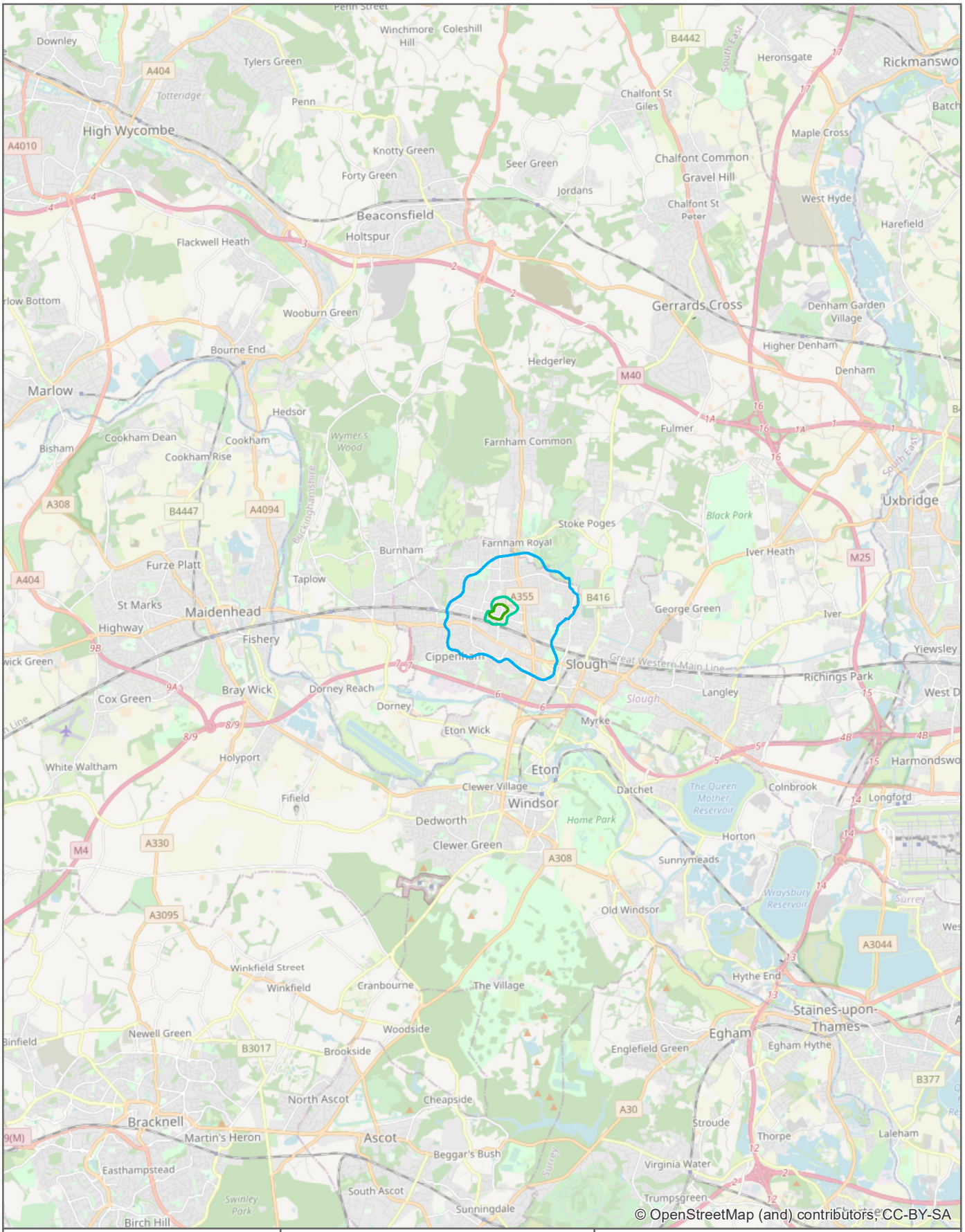
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_AnnMean_Maint_Ca_A01.mxd



µg/m³

- 26.005
- 26.05
- 26.1
- 30
- 40

0 1 2 3 4 5
Kilometers

N

PEC for NO_2 annual mean (µg/m³) - maintenance of LD13x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 02/10/2020	APPROVED:

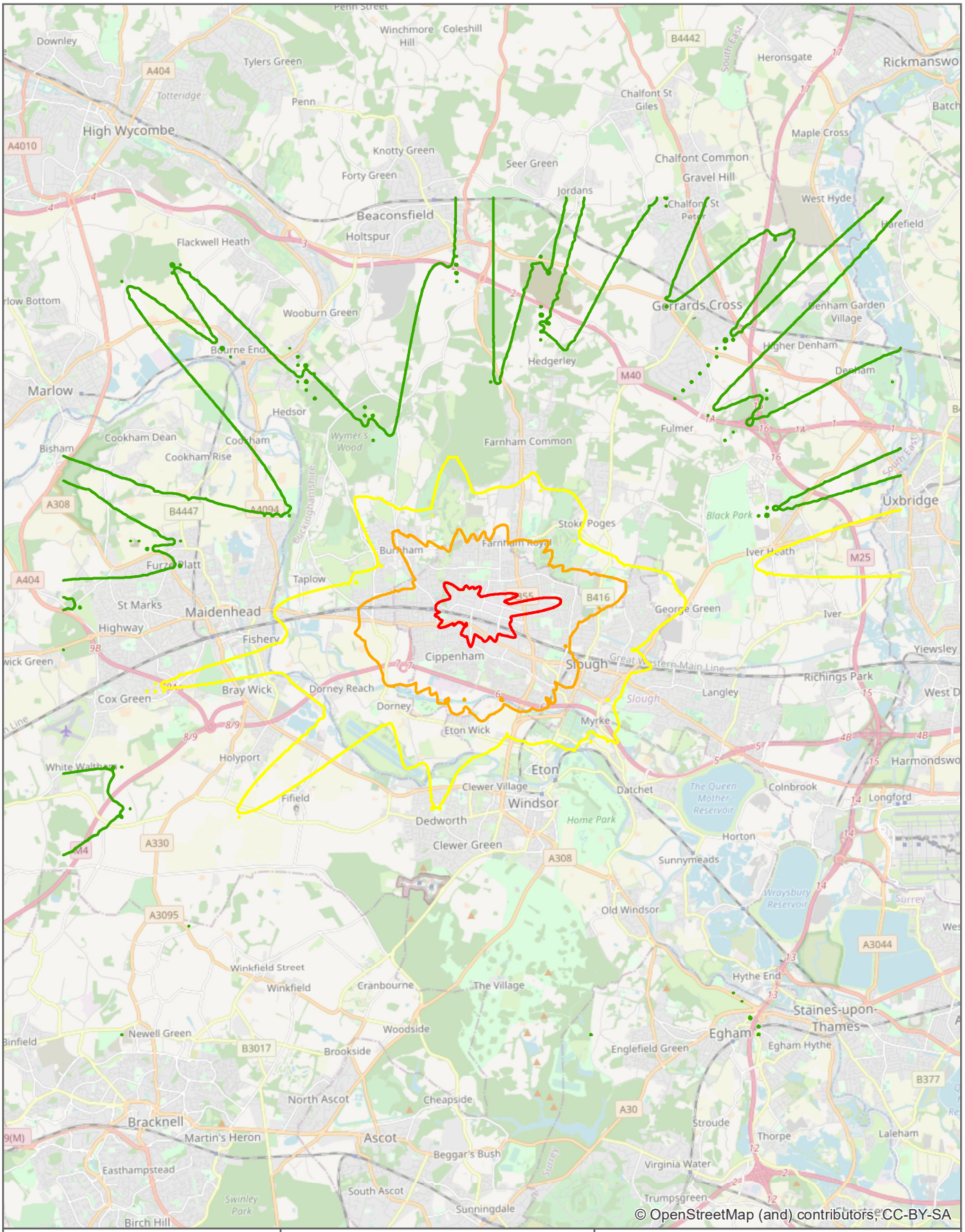
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PEC_NO2_AnnMean_Maint_LD13x_A01.mxd



µg/m³

- 3
- 7.5
- 15
- 75

0 1 2 3 4 5
Kilometers

N

PC for NO_x 24-hour maximum, 100th percentile (µg/m³) - emergency power for Extended Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 26/03/2012	APPROVED:

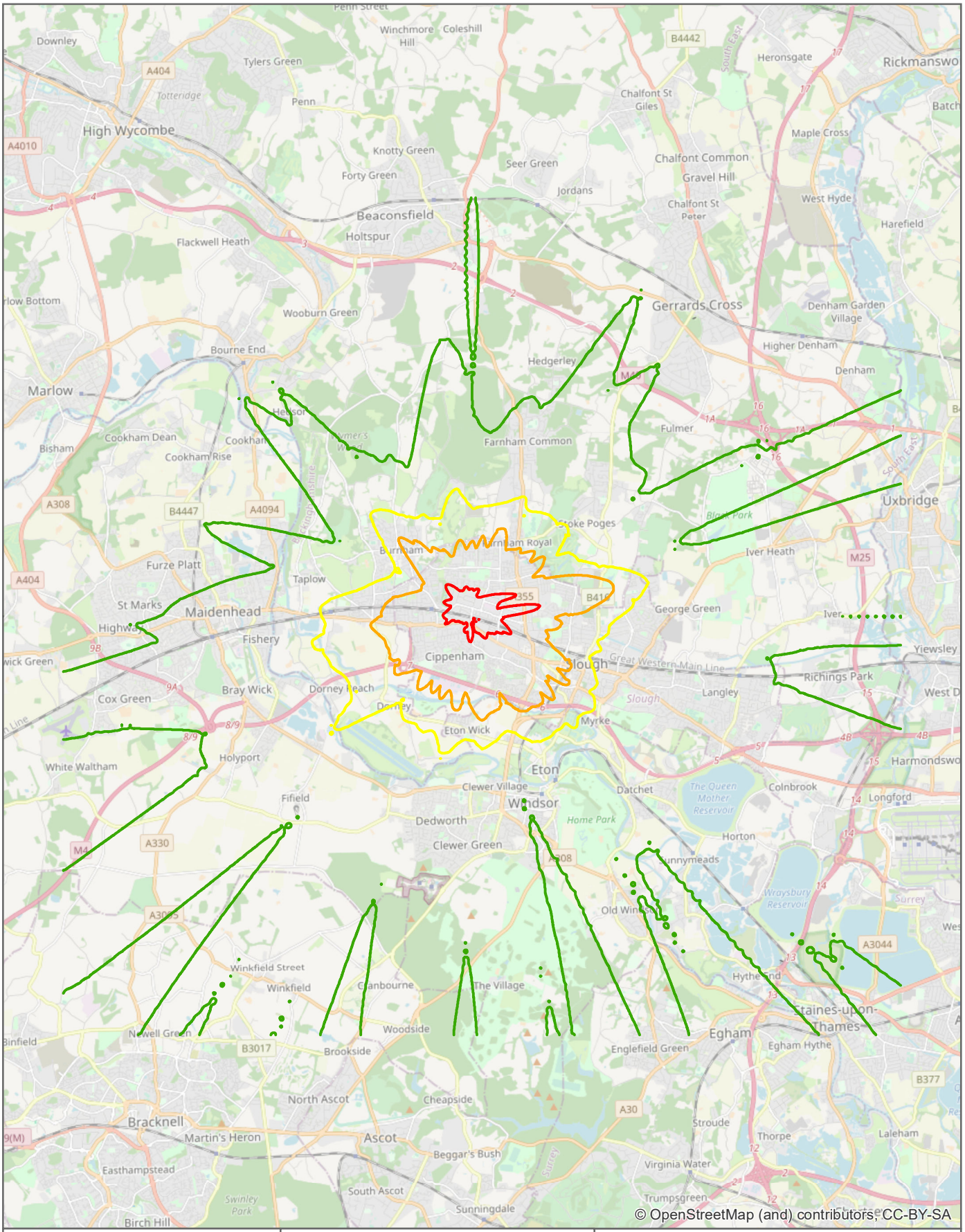
ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

Path: C:\Users\john.lee\Documents\OneDrive - ERM\Projects\0420743_EquinixSloughCampus\MAPS\0420743_PC_NOX_24hrMax_100PCT_EP_ExCa_A01.mxd



µg/m³

- 3
- 7.5
- 15
- 75

0 1 2 3 4 5
Kilometers

N

PC for NO_x 24-hour maximum, 100th percentile (µg/m³) - emergency power for Campus

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 26/03/2012	APPROVED:

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Equinix

PROJECTION: British National Grid

SOURCE: See map frame

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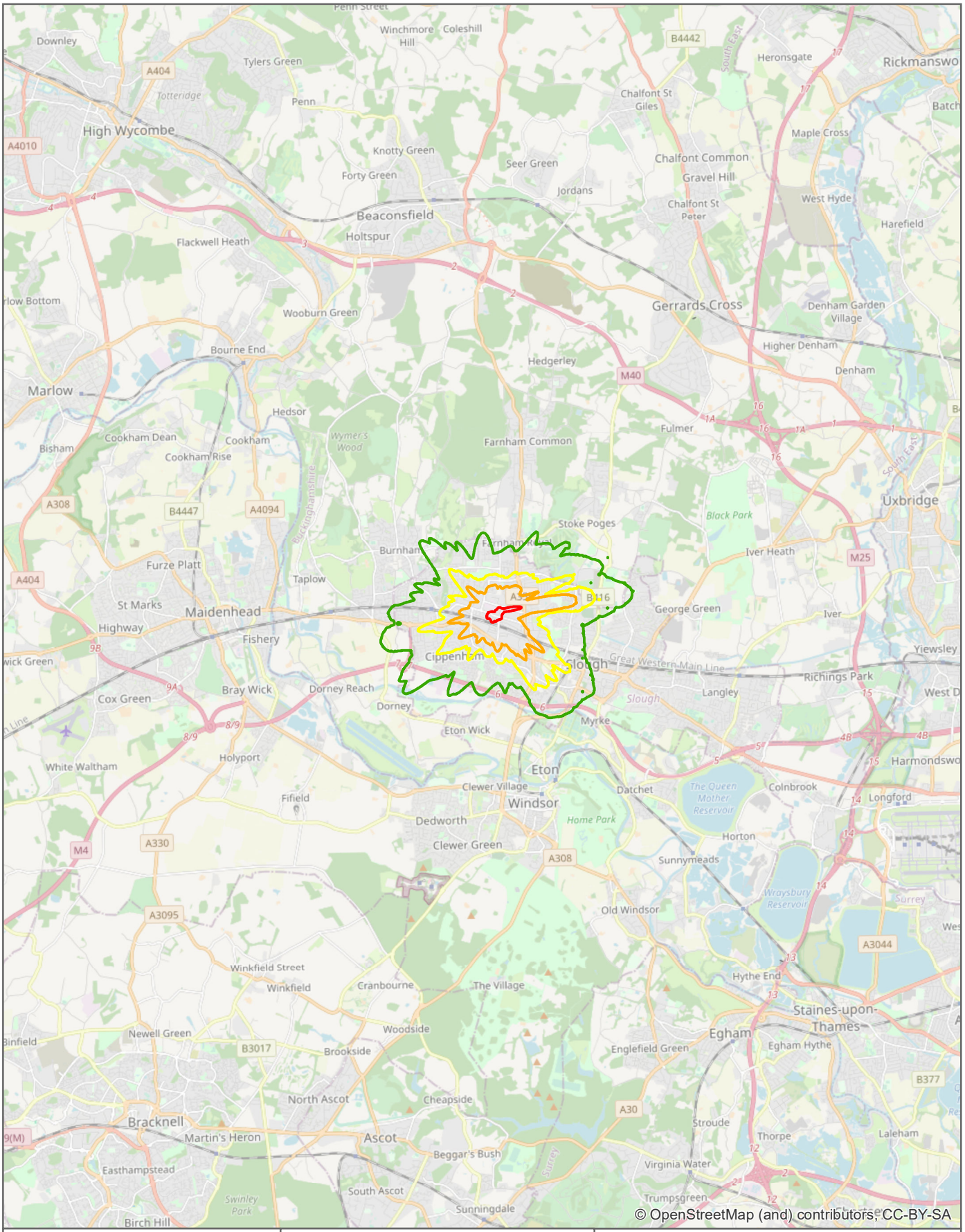

µg/m³

- 3
- 7.5
- 15
- 75

0 1 2 3 4 5
Kilometers

N

PC for NO_x 24-hour maximum, 100th percentile (µg/m³) - emergency power for LD13x

SCALE: See Scale Bar	VERSION: A
SIZE: A4	DRAWN: JTL
PROJECT: 0420743	CHECKED: YV
DATE: 26/03/2012	APPROVED:

ERM

Equinix

PROJECTION: British National Grid

SOURCE: See map frame

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