SUNNICA ENERGY FARM

EN010106

Volume 2

Appendix 16D Unplanned Atmospheric Emissions from Battery Energy Storage Systems (BESS)

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

11 November 2022
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Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Sunnica Energy Farm

Appendix 16D Unplanned Atmospheric Emissions from Battery Energy Storage Systems (BESS)

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Author	Sunnica Energy Farm Project Team

Version	Date	Status of Version
Rev 0	12 November 2021	Application Version
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1 Introduction

1.1.1 The report has been prepared by AECOM for Sunnica Ltd to consider the potential consequences of unplanned emissions to air from the use of battery technology within the proposed Sunnica Energy Farm. Since submission of the Outline Battery Fire Safety Management Plan (OBFSMP) for the Scheme in November 2021, the document has subsequently been peer reviewed and updated by Paul Gregory, a battery safety and testing consultant with significant experience of large-scale battery abuse and suppression testing, specialising in battery energy storage system (BESS) validation testing, compliance and certification. This Unplanned Atmospheric Emissions from BESS report has been updated in line with the OBFSMP.

1.1.2 The scope of this study includes:

a. a review of potential emissions to air from out-gassing and from fire;

b. consideration of the potential magnitude of emissions;

c. consideration of likely rates of dilution between potential emission locations and sensitive receptors located outside the application Sites; and

d. consideration of the likely consequences of emissions to air from the proposed battery energy storage systems (BESS).

1.2 Background

1.2.1 Battery technologies are used at renewable energy generation facilities to store electrical power so it can be supplied to the national grid when it is most needed. In the case of a solar farm this may be during the hours of darkness, for example.

1.2.2 The BESS on Sunnica East Site A (plots E18 and E33) and Sunnica West Site A (plot W17) will consist of a compound and battery array. Details of the design for the BESS elements, including their power and energy ratings, and their final container dimensions and appearance, are currently in development and, therefore, the assessment has been based on maximum parameters which would not be exceeded (as set out in **Chapter 3:Scheme Description** of this Environmental Statement **[EN010106/APP/6.1]**) and the design principles are secured by a requirement in Schedule 2 of the DCO). At this stage it is known that:

a. Battery cells will be either NMC (Nickel Manganese Cobalt) or Lithium Iron Phosphate (LiFePO4) chemistry;

b. Battery cells will be sealed by design and have no free electrolyte;

c. Modules will contain cells separated by a thermal barrier;

d. Modules will be stacked vertically in racks. The battery modules will contain cells separated by a thermal barrier or an air gap to prevent one cell affecting the temperature of the adjacent one, with the modules themselves also separated from one another by another thermal barrier or an air gap. The rack design will have been tested to unit level UL 9540A or 3rd Party Fire & Explosion rack testing to demonstrate that rack-to-rack thermal runaway

propagation does not occur, or will propagate in a safe and controlled process that does not result in deflagration events which compromise BESS structural integrity;

e. and separated by thermal barriers from each other;

f. Each rack will be separated with thermal barriers on the sides. Single rows of racks will be open in the front and back whereas double row racks (i.e. back to back racks) will have thermal barriers at the back of the rack only; and

2 The racks will be housed in metal containers up to 17m (length) x 5m (width) x 6m (height).Emissions from Incident Fires

2.1 Potential sources of emissions to air

2.1.1 The battery technologies proposed for the Sites are based on sealed cells with no excess electrolyte. This removes the potential for venting or out-gassing of gaseous substances during normal operational use.

2.1.2 If the battery cells become damaged by heat or are burnt within a fire affecting a single module, a rack of modules or multiple racks, then the combustible materials consumed in the fire could give rise to a range of organic and inorganic air pollutants. This situation is true of any incident fire and sets of emission factors have been collated by the Environment Agency (Ref 1) for incident fires involving automobiles, buildings and waste materials, for example. A standardised set of emission factors for BESS is not currently available from the Environment Agency and, therefore, equivalent data must be sourced from manufacturers and the research literature.

2.1.3 In 2016 a U.S. based organisation, The Fire Protection Research Foundation (FPRF), published a report (Ref 2) on ‘Hazard Assessment of Lithium Ion Battery Energy Storage Systems’ that included gas sample measurements from batteries subjected to external and internal ignition tests for BESS up to 100 kWh size. While the total BESS size at Sunnica may be greater than 100 kWh, the modular nature of BESS means useful lessons can be learnt from studies undertaken using a BESS that is not the same size as is proposed for the Sunnica site. The gases were measured near the tested unit, and included methane (chemical formulae CH_4), chlorine (chemical formulae Cl_2), hydrogen fluoride (chemical formulae HF) and carbon monoxide (chemical formulae CO).

2.1.4 The observations from the FPRF tests included:

a. The 100kWh BESS unit was located outdoors for the test and with no fire suppressant system in operation was on fire for 3.7 hours until it had burnt out.

b. A maximum concentration of 50 parts per million (ppm) of carbon monoxide (CO) was detected in the first 30 minutes of the test and this decreased to near zero during the main period of self-sustaining combustion, which is not unexpected for a fire occurring outdoors.

c. Chlorine and methane were not detected (<1 ppm) during the test.

d. Hydrogen fluoride (HF) was detected at concentrations > 100 ppm (i.e. over range for the detector used) after 30 minutes and then for the duration of the fire.

2.1.5 From the FPRF study the emissions of potential concern are considered to be HF and CO. The conclusion that HF emissions occur is supported by the small scale laboratory trials undertaken by Anderson et al. at the SP Technical Research Institute of Sweden (Ref 3).

2.1.6 Although Anderson et al.'s study used small 26650 type cells, laptop battery packs (including housings) or extracts of electrolytes, rather than it being a BESS scale study, it also had access to monitoring equipment that was capable of more precise measurements over a larger concentration range. The observations from Anderson et al. included:

e. Hydrogen fluoride was always detected in combustion tests.

f. Concentrations of hydrogen fluoride in the exhaust duct of the test apparatus were managed by the operator to enable concentrations of between 30 ppm and 50 ppm to be reported, as this aided the study of the relative comparison of hydrogen fluoride and other pollutant abundance. Consequently, the reported concentrations of hydrogen fluoride that are presented as ppm values in this study are not representative of hydrogen fluoride concentrations near to source, as the volume of air passing through the duct and the resulting dilution rate is unknown.

g. Cells burnt when at 100% SOC (state of charge) produced less hydrogen fluoride than cells at 50% SOC.

h. Anderson provides an example of scaling the cell test results up to represent a plug in hybrid vehicle (PHEV) containing 432 similar cells, that could potentially emit a total of between 400g and 1200 g of hydrogen fluoride if combusted. The lower value being for cells at 100% SOC.

2.1.7 Some information is publicly available on hydrogen fluoride content of BESS rack systems from the Cleve Hill Development Consent Order application. While BESS are modular and can be scaled to meet the demands of a specific project, a container (17mx5mx6m) is unlikely to hold more than 35 racks due to the available space within a container. As racks are separated by thermal barriers, there would be a delay in heat transfer between racks in the event of a fire and it is likely that the first modules or racks to catch fire would burn out before racks further away within the container would catch fire, assuming no operational fire suppressant system). It should be noted that Sunnica Energy Farm has included a fire detection and suppression system as part of the BESS design. A conservative approach of assuming a maximum of 5 racks with a self-sustaining fire at one time was assumed by manufacturer Leclanche SA (Ref 4) with a total hydrogen fluoride content of 2.07 kg with 5 racks.

2.1.8 In summary, only emissions of hydrogen fluoride are likely to occur at concentrations that may pose a hazard to health at off-site receptor locations and assessment criteria for the protection of public health are consider in section 2.2. Emissions of methane, chlorine and carbon monoxide are not considered further

in this report, as they are unlikely to be emitted at measurable concentrations and therefore could not cause elevated concentrations at any receptor location.

2.2 Assessment Criteria

2.2.1 Public Health England (PHE) publish Incident Management guidance for specific air pollutants including hydrogen fluoride (Ref 5). These documents summarise the physical and chemical properties of the substance and the hazard they pose to human health. Internationally recognised best practice emergency response guidelines are reported by PHE.

2.2.2 Emergency response planning guideline (EPRG) values, that start at ERPG-1 and increase in concentration to EPRG-3. The EPRG-1 criteria define “the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects”.

2.2.3 Acute exposure guideline level (AEGL) values start at AEGL-1 and increase in severity of health outcome to AEGL-3. The AEGL-1 criteria define the “level of the chemical in air or above which the general population could experience notable discomfort”.

2.2.4 The values adopted as being most protective of receptors (or the most conservative in terms of likely impacts on receptors) surrounding the solar farm are listed in Table 1. Concentrations of 1 ppm and 2 ppm of hydrogen fluoride gas are equivalent to 0.82 milligrams per cubic meter (mg/m^3) and 1.64 mg/m^3 respectively. The time periods used for EPRG and AEGL are based on different considerations, but for the purposes of this assessment they represent a maximum concentration value in a 10 minute period. These concentration values are also valid at an averaging time of 1 hour, which is the resolution of the meteorological data used in this assessment.

Table 1: Summary of Emergency Response Criteria

Substance	EPRG-1 Value (ppm)	Time period for EPRG	AEGL-1 (ppm)	Time period for AEGL
HF	2	10 minutes & up to 1 hour	1	10 minutes & up to 8 hours

3 Dispersion and Dilution

3.1 Introduction

3.1.1 Any gaseous pollutants emitted from a fire at a BESS would be transported from the BESS towards receptor locations by the air movements occurring at the time of the emission to air. These movements are determined by the direction of the wind and also the amount of turbulent mixing of the air as it blows towards the receptor location. Differences in the temperature of the plume of air containing the emission and the surrounding air can also affect the vertical movement of the pollutants. To help understand the minimum rates of dilution likely to occur to

pollutant concentrations as they disperse from the source of the emission to receptor locations, the dispersion has been modelled.

3.1.2 The calculations have made use of the atmospheric dispersion model ADMS (version 5.2.4). As a definitive emission rate will not be known until later in the detailed design stage, once battery technology and the number of modules, racks and containers is fixed, the dispersion model has not been used to predict absolute impacts at specific receptor locations. Instead, a nominal unit emission rate has been used to calculate concentrations close to the source and at fixed nodes that are at 50m increments downwind, for all wind directions in 10 degree segments. The relative concentration at the nodes is expressed as the amount of dilution compared to the near source concentration. This is then displayed as a colour scale on a polar plot overlaid onto base mapping.

3.1.3 The dispersion modelling has been undertaken using 5 years of hourly sequential meteorological data from Stanstead Airport, to represent approx. 43,800 sets of meteorological conditions that have been observed. Stanstead Airport is the closest monitoring location to the site which collects all the parameters required for dispersion modelling. The values reported represent the minimum amount of dilution (maximum concentration at the receptor) predicted in any 1 hour period (100th percentile). In addition, the 99th percentile (upper 1% of cases) and 90th percentile (upper 10% of cases) values have also been calculated to provide context to the likelihood of each outcome. If the magnitude of the maximum (100^{th} percentile) concentration was very similar to the 99^{th} or 90^{th} percentile value then the likelihood of those meteorological conditions being present at the time of the fire is high. If the 100^{th} percentile concentration value is much larger in magnitude than the 99^{th} or 90^{th} percentile values, then the predicted concentration would only occur under meteorological conditions that are very unusual and that may only occur for a small number of hours per year.

3.2 Emission Parameters

3.2.1 As the exact emissions from the BESS cannot be meaningfully estimated at present, the modelling is based on emissions that have been modelled as a volume source, at a nominal emission rate of 1 $\mu g/m^3/s$.

3.2.2 A number of simplifications have been made to the model to ensure the assessment approach is precautionary and provides an upper estimate of likely outcomes. Near source temperatures in excess of 300 °C can be reasonably expected to be present, which would result in the plume rising rapidly, reducing near-ground concentrations. However, the source term used has been a volume source with no initial vertical momentum and the temperature has been modelled as if it was emitted at ambient air temperature. These two assumptions represent a very conservative approach in terms of dispersion modelling as they remove the vertical momentum of the emission, consequently, the predicted near ground level concentrations from the model are considerably higher than would be experienced under real world conditions, as the plume has been modelled without that initial vertical momentum caused by the fire.

3.2.3 The emission parameters modelled are summarised in Table 2, and they are discussed in the following sections.

Table 2: Emission Parameters and General Model Conditions Included with the Model

Variable	Input
Surface Roughness at source	0.5 m
Receptors	Polar grid centred at location of source. Nodes at 50 m intervals, segments at 10 degrees intervals.
Emissions	Indicative scenario at unit emission rate
Sources	A single volume source 2 m (length) by 2 m (width)
Volume Source Vertical height	2 m, located between 1 m and 3 m above ground
Emission Temperature	Ambient (15 °C)
Exit Velocity	None
Emission Rate	1 µg/m^3/s
Source Location	Indicative location within plot for each BESS
Meteorological data	5 years of hourly sequential data from Stansted meteorological station (2014 – 2015 – 2016 - 2017 – 2019*) * See paragraph 3.4.2 for an explanation of the years used.

3.3 Modelling Domain

3.3.1 The model outputs are at nodes on a polar coordinate grid extending 1.5 km from the source (i.e. 1.5 km radius circle) with grid nodes at 50 m intervals along each of the 36 segments (one every 10 degrees).

3.4 Meteorology

3.4.1 The dispersion of emissions from a point source is largely dependent on atmospheric stability and turbulent mixing in the atmosphere, which in turn are dependent on wind speed and direction, ambient temperature, cloud cover and the friction created by buildings and local terrain.

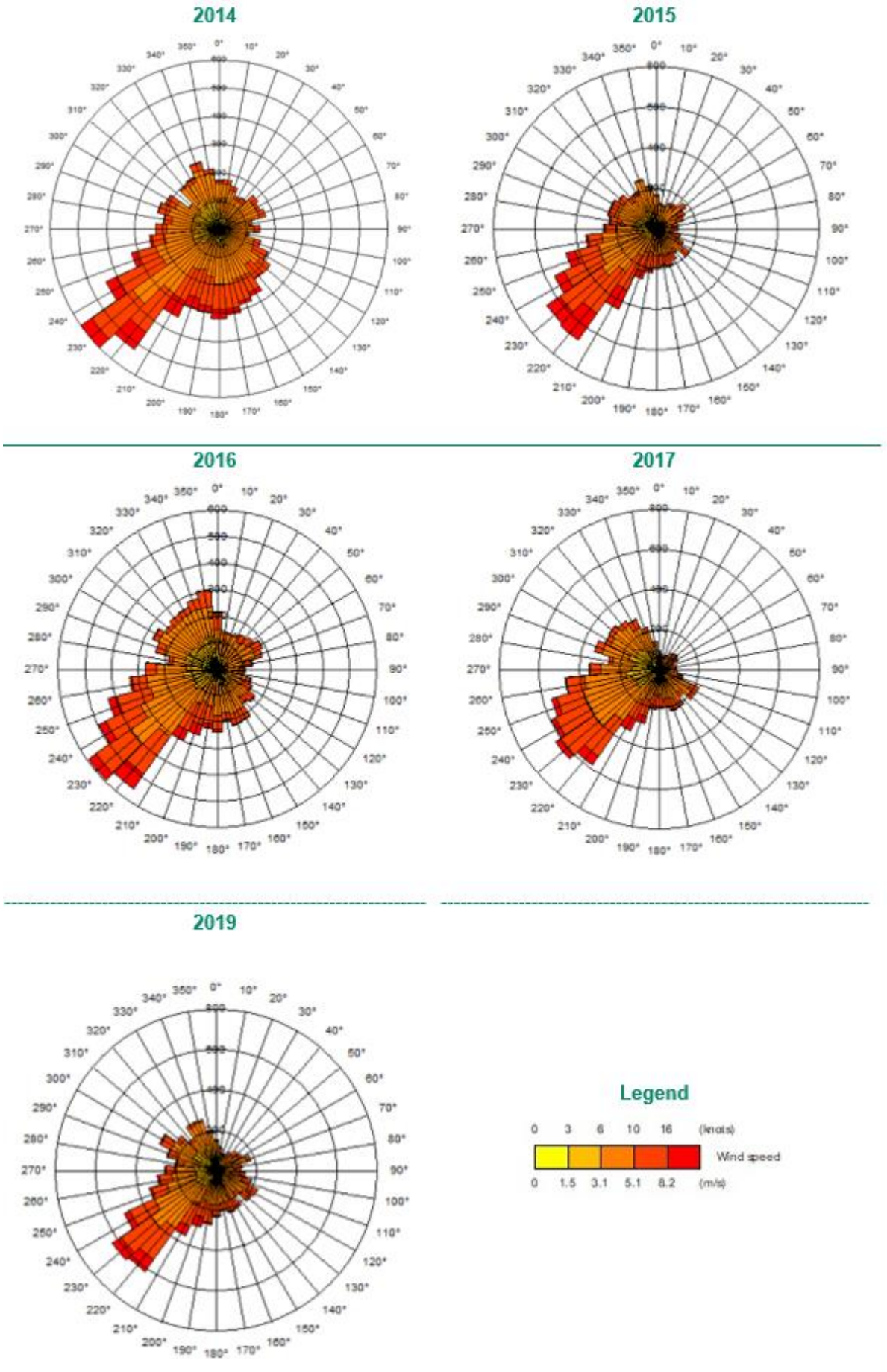
3.4.2 Actual observed hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the site that is modelled. This is usually achieved by selecting a meteorological station as close to the site as possible, although other stations may be used if the local terrain and conditions vary considerably, or if the station does not provide sufficient data. For point sources, such as stacks, the Environment Agency recommends the use five years of the recent available meteorological data be used in modelling assessments to ensure that all typical weather conditions are considered within the modelling. Data for 2014 to 2017 had been used previously for the assessments and 2019 data was added as a

more recent year. Data for 2018 could have been used in place of the 2014 data but it would have made no material difference to the assessment as similar range of conditions are experienced year after year at this location.

3.4.3 The meteorological site used in the modelling was Stansted Airport for the years 2014 – 2017 and 2019. The meteorological site is located between 45 and 50km north-north-east of the Scheme. The meteorological conditions at the airport are considered representative of those experienced at the site.

3.4.4 The wind-roses for Stanstead Airport meteorological data are shown in Figure 1.

Figure 1: Wind-roses for Stansted Airport



3.5 Building and Terrain Effects

3.5.1 Another variable that can have a significant effect on the dispersion of emissions from sources is the presence of buildings or structures near to the emissions points. The wind field can become entrained into the wake of buildings, which causes the wind to be directed to ground level more rapidly than in the absence of a building. If an emission is entrained into this deviated wind field, this can give rise to elevated ground-level concentrations. Building effects are typically considered where a structure of height greater than 40% of the stack height is situated within 8 to 10 stack heights of the emissions source. There are no buildings fitting these criteria close to any source location, therefore no buildings were included in the model.

3.5.2 The ADMS model is capable of including topographical data, if required. There are two parameters (surface roughness and terrain) which can be employed in the model to describe local topography.

3.5.3 Surface roughness describes the degree of ground turbulence caused by the passage of winds across surface structures. Ground turbulence is greater in urban areas than in rural areas, for example, due to the presence of tall buildings.

3.5.4 The Scheme is situated on a plain adjacent mostly to agricultural land and surrounded by a few towns and villages. A surface roughness of 0.5m, corresponding to parkland and open suburbia has been selected to represent the local terrain, in line with previous models carried out for the construction traffic emissions impact assessment.

3.5.5 Site-specific terrain data has not been used in the model, as typically terrain data will only have a marked effect on predicted concentrations where hills with gradient of more than 1 in 10 are present in the vicinity of the source, which is not the case at this site.

3.6 Results of dilution modelling

3.6.1 The conventional output from a consequence model would be a plot illustrating a series of rings denoting a maximum concentration at a stated distance from the source. The output from the dilution modelling is similar with the plots showing rings of nodes at 50 m increments from the source, with the dilution factor illustrated using a colour scale. Table 3 illustrates the smallest rate of dilution likely to be experienced under any meteorological conditions (the 100th percentile), Table 3 also illustrates a dilution rate that would be achieved under 99% (8672 out of 8760 hrs per year) of meteorological conditions and a dilution rate that would be achieved under 90% (7884 out of 8760 hours per year) of meteorological conditions. In real world terms, these represent the lowest level of dilution and longest distances to achieve that level for the stated percentage of the year.

3.6.2 The Figures A1 to A3 (see Table 3) indicate that source concentrations would be diluted to 1/1000th of the source concentration (a dilution factor of 0.001) within 550 m under any meteorological conditions (the 100th percentile) likely to occur at the application site. The same level of dilution is likely to occur under 99% of meteorological conditions within 350 m to the E and SE of the source, 250 m to the NE of the source and within 150 m to the W and NW of the source (these results apply equally to wherever the BESS is located on the Sites).

3.6.3 Source concentrations would be diluted to 1/1000th of the source concentration (a dilution factor of 0.001) under 90% of the meteorological conditions likely to occur at the application Sites (see Table 3), within 50m or less for all wind directions.

3.6.4 For any emission rate at the source, the use of the minimum (100th percentile) dilution rate gives an estimate of dilution rates that is approximately ten times more precautionary that the use of the 90% value. As such it represents an extreme combination of meteorological conditions that are unlikely to occur should there be a fire incident.

Table 3: Dilution with distance from source

Distance from source (m)			
Direction from Source	Dilution factor of 0.001 for 100% of meteorological conditions	Dilution factor of 0.001 for 99% of meteorological conditions	Dilution factor of 0.001 for 90% of meteorological conditions
60° NE	550 m	250 m	50 m
90° E	550 m	350 m	50 m
150° SE	550 m	350 m	50 m
270° W	500 m	100 m	< 50 m
320° NW	550 m	150 m	50 m
*based on 2015 meteorological data as highest impact in period 2014, 2015, 2016, 2017 and 2019.			

4 Likely Consequences of Battery Emissions

4.1.1 At present the scale of the modules and numbers of racks has still to be confirmed for Sunnica Energy Farm. Based on information from section 2 of this Appendix, indicative scenarios to represent the potential emissions of hydrogen fluoride are summarised in Table 4.

4.1.2 The central estimate of hydrogen fluoride content that could be emitted has been taken as 2 kg which is rounded from the estimate published by LeClanche SA for the Cleve Hill Development Consent Order. A lower estimate based on 50% of the central estimate and an upper estimate of 150% of the central estimate are included in Table 4 to reflect uncertainty about the SOC of the cells at the time of a fire incident (SOC effect observed by Anderson et al.).

4.1.3 The hydrogen fluoride has been assumed to be released at a steady rate during a fire and a time period based on the FPRF BESS fire test of 3 hours has been adopted as the shorter time period. A longer 6 hour fire period has been adopted as a lower emission rate condition.

Table 4: Indicative Emission Rates

Scenario	HF content in 5 racks	Duration of Fire	Concentration in 2 m x 2 m x 2 m volume at source	Dilution factor to achieve AEGL-1 value of 0.82 mg/m^3	Indicative distance to achieve AEGL-1 value for 100% of meteorological conditions (m)
Lower HF_ shorter fire	1 kg	3 hrs	12 mg/m^3	0.068	< 50 m
Lower HF_ longer fire	1 kg	6 hrs	6 mg/m^3	0.136	< 50 m
Central HF_ shorter fire	2 Kg	3 hrs	24 mg/m^3	0.034	50 to 100 m
Central HF_ longer fire	2 Kg	6 hrs	12 mg/m^3	0.068	< 50 m
Upper HF_ shorter fire	3 Kg	3 hrs	36 mg/m^3	0.023	50 m to 100 m
Upper HF_ longer fire	3 Kg	6 hrs	18 mg/m^3	0.046	50 m to 100 m

4.1.4 Assuming a BESS facility that takes the form of a 5 rack fire before fire control measures bring the fire under control, emissions of HF could cause concentrations over time periods of 10 minutes, 1 hour or up to 6 hours that are below the AEGL-1 value at locations within 100 m of the fire. In most instances the AEGL-1 value would be achieved within the Order limits and in all cases in a shorter distance than that to the nearest sensitive receptors.

4.1.5 Given the specification reached in detailed design will be required (by a requirement to the DCO) to be consistent with the parameters assumed in this study (i.e. 1 kg to 3 kg of HF from a 5 rack fire) then the potential consequence at actual receptor locations surrounding the BESS at plots W17, E18 and E33 would be exposure to hydrogen fluoride at concentrations below the AEGL-1 value.

4.1.6 The design of BESS includes a number of design elements to prevent, detect and control a fire should one occur. These include the use of batteries that are sealed by design so do not vent when in normal use and have no free electrolyte. The battery modules will contain cells separated by a thermal barrier to prevent one cell effecting the temperature of the adjacent one, with the modules themselves also separated from one another by another thermal barrier or an air gap. The thermal barrier is intended to ensure that should one cell/module heat up it will not impact on the adjacent cell/module so as to prevent a thermal cascade. The batteries will be controlled by charging management systems that will detect if a cell or battery is not operating correctly and the whole BESS will be fitted with a fire monitoring system so if one cell or module were to catch fire the fire suppression system will automatically be triggered to reduce the temperate and

ensure that the burning cell/module does not affect the other cells/modules in the BESS. These design features are set out in the Safety Management Plan, implementation of which is secured by a requirement to the DCO.

4.1.7 Therefore, in the unlikely event that a fire were to break out in a single cell or module it is very unlikely, given the control measures, that the fire would spread to the rest of the BESS. Even should all the systems fail and a large scale fire break out within one of the BESS containers then the resultant hydrogen fluoride concentration at the closest receptors would be below the level that PHE has identified as resulting in notable discomfort to members of the general population.

4.1.8 The expected hydrogen fluoride emissions will be checked against the assumptions in this report at detailed design stage (post-consent) once the make, model and layout of the BESS is known, and, if necessary, consequence modelling will be undertaken to demonstrate that the impacts associated with an unplanned fire would not exceed the effects outlined in this report or cause any significance adverse health effects to the local community.

5 References

Ref 1 Environment Agency, 2009, Review of emission factors for incident fires, Innovation for efficiency science programme, Science Report SC060037/SR3.

Ref 2 Fire Protection Research Foundation, 2016, Hazard Assessment of Lithium Ion Battery Energy Storage Systems, Final Report.

Ref 3 Anderson et al. 2013, Investigation of Fire emissions from Li-ion batteries, Report SP 2013:15, SP Technical Research Institute of Sweden

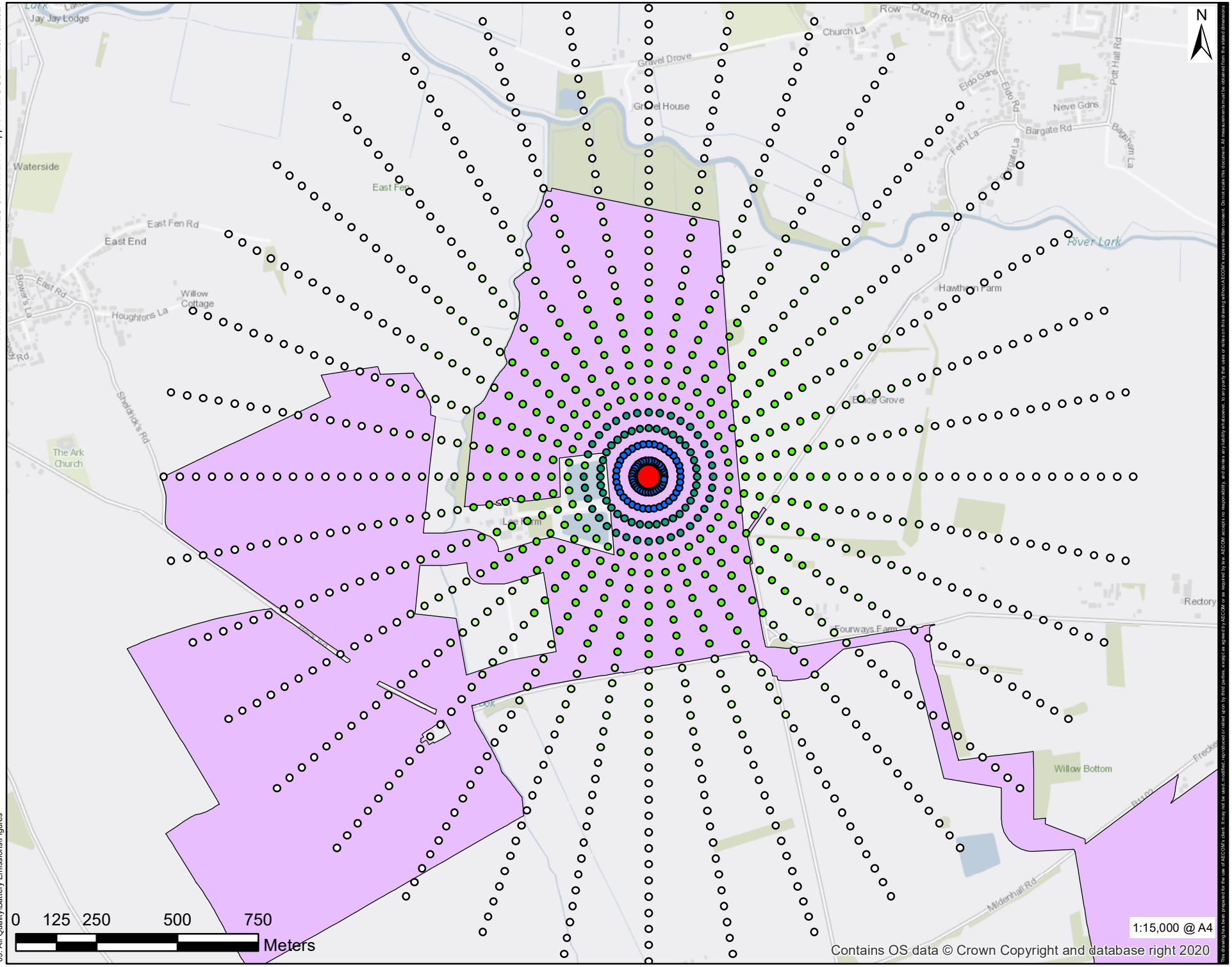
Ref 4 Leclanche SA, 2018, Cleve Hill Solar Park Air Quality Impact Assessment Li-ion Battery Fire, Appendix C.

Ref 5 Public Health England, 2021, Hydrogen Fluoride Incident Management

Annex A Document Copies

A.1 Dispersion Modelling Polar Plots

Figure A-1 Relative Dilution From Source Based on Maximum Value at Sunnica East Site A (E33)



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LEGEND

NormP100

- < 0.0005
- 0.0005 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01- 0.05
- 0.05 - 0.1
- > 0.1
- Source
- Site

NOTES

ISSUE PURPOSE
REPORT

PROJECT NUMBER
60589004

SHEET TITLE
Relative Dilution from Source Based on the Maximum Value at Sunnica East Site A (E33)

SHEET NUMBER
Figure A1

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Revision: 2
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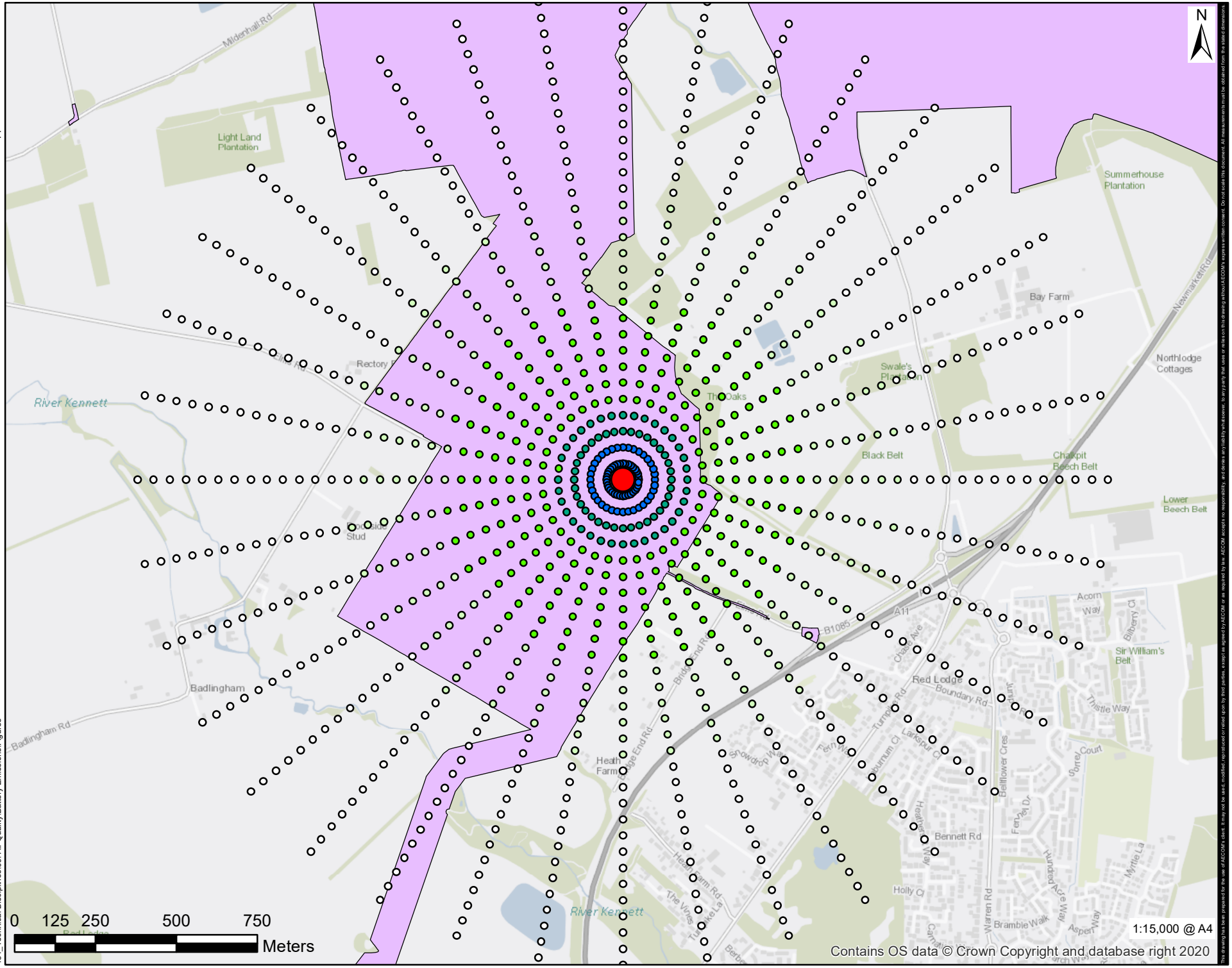
Figure A-2 Relative Dilution From Source Based on Maximum Value at Sunnica East Site B (E18)



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LEGEND

NormP100

- < 0.0005
- 0.0005 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01- 0.05
- 0.05 - 0.1
- > 0.1
- Source
- Site

NOTES

ISSUE PURPOSE
REPORT

PROJECT NUMBER
60589004

SHEET TITLE
Relative Dilution from Source Based on the Maximum Value at Sunnica East Site B (E18)

SHEET NUMBER
Figure A2

Revision: 2 Drawn: EU Checked: PF Approved: GGDate: 29/10/2021

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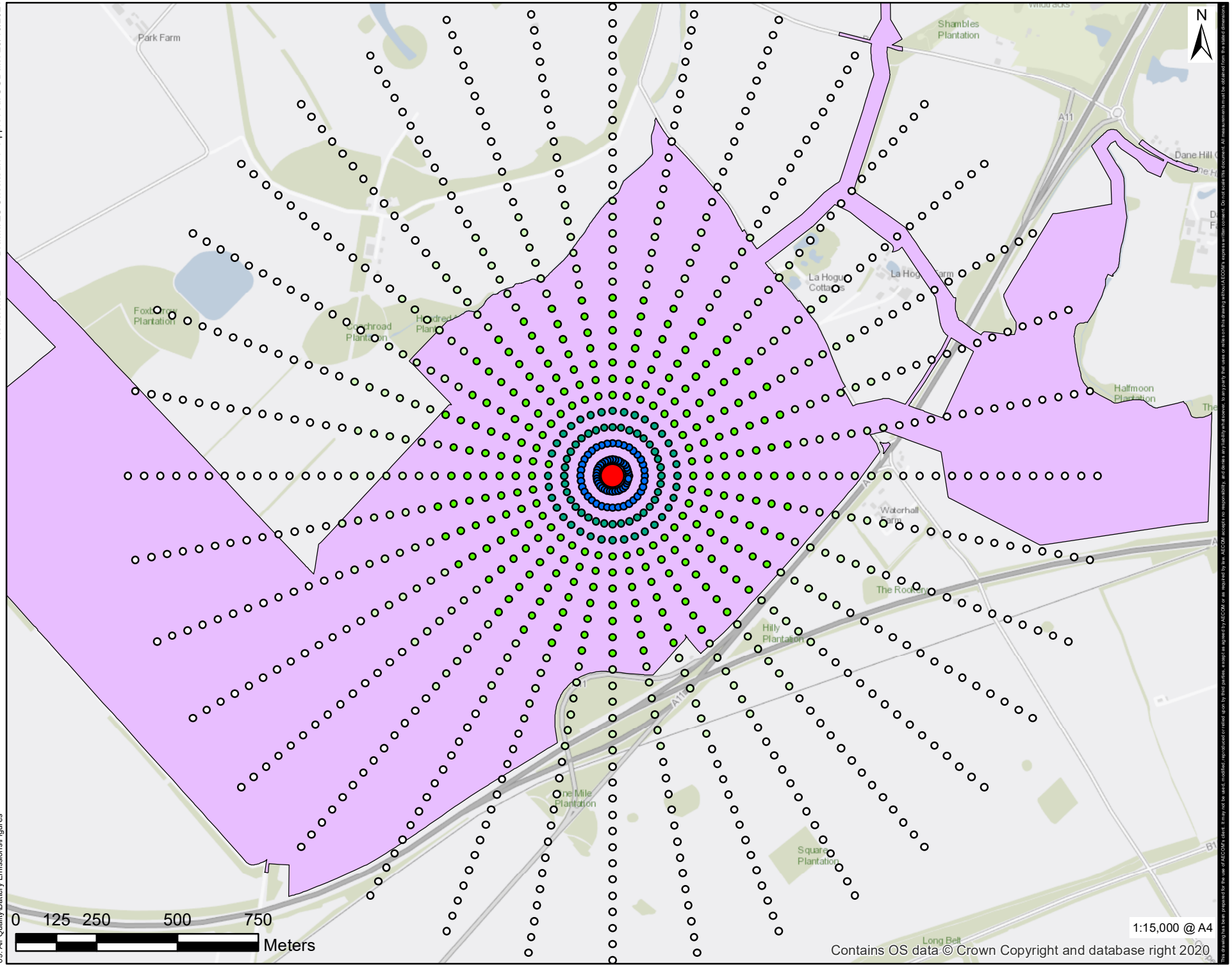
Figure A-3 Relative Dilution From Source Based on Maximum Value at Sunnica West Site A (W17)



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LEGEND

NormP100

- < 0.0005
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- 0.001 - 0.005
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- 0.01- 0.05
- 0.05 - 0.1
- > 0.1
- Source
- Site

NOTES

ISSUE PURPOSE
REPORT

PROJECT NUMBER
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SHEET TITLE
Relative Dilution from Source Based on the Maximum Value at Sunnica West Site A (W17)

SHEET NUMBER
Figure A3

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