Sidegate Lane Battery Recycling Facility

Air Emissions Risk Assessment (AERA)

Suez Recycling and Recovery UK

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Basis of Report

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Executive Summary

SLR Consulting Limited was commissioned by SUEZ Recycling and Recovery UK to undertake an Air Emissions Risk Assessment (AERA) for a proposed lithium battery recycling facility at the existing SUEZ site on Sidegate Lane, Northampton. The assessment supports an Environmental Permit application and evaluates the potential impact of emissions on human health and ecological receptors.

The facility will process up to 20,000 tonnes of lithium batteries annually, with emissions controlled via two extraction and abatement systems comprising Local Exhaust Ventilation (LEV), ATEX-rated (rated for explosive atmospheres) bag filters and carbon filters.

The AERA has followed Environment Agency (EA) guidance and used the AERMOD dispersion model to predict pollutant concentrations under worst-case operational scenarios.

The pollutants assessed included ammonia (NH_3), hydrogen chloride (HCl), hydrogen fluoride (HF), mercury (Hg), sulphur dioxide (SO_2), sulphuric acid (H_2SO_4), particulate matter (PM_{10} and $PM_{2.5}$), and volatile organic compounds (VOCs, as benzene).

The assessment compared predicted concentrations against Environmental Assessment Levels (EALs), Critical Levels (C_{Le}) and Critical Loads (C_{Lo}) and for both human and ecological receptors.

The results indicate that:

- Emissions of most pollutants are insignificant at all human receptor locations;
- SO_2 emissions exceed the 15-minute EAL offsite, but only in a limited area near the site boundary, and not at an area of relevant exposure;
- No exceedances of EALs are predicted at existing residential receptors; and
- The predicted contributions to C_{Le} and C_{Lo} are considered to cause 'no likely significant effects' at the Upper Nene Valley, SPA, and 'no significant pollution' at Finedon Top Lodge Quarry LWS.

The AERA concludes that the proposed operations (in consideration of the specified extraction and abatement systems) will not result in unacceptable air quality impacts.

1.0 Introduction

SLR Consulting Limited (SLR) has been instructed by SUEZ Recycling and Recovery UK Limited (SUEZ) to prepare an Air Emissions Risk Assessment (AERA) in support of an Environmental Permit (EP) application for a new battery recycling facility at the existing SUEZ facility at Sidegate Lane, Northampton (the 'Site').

The existing SUEZ facility at Sidegate Lane is currently operated as an Open Windrow Composting (OWC) and Waste Transfer Station (WTS) and is regulated under an existing EP (EPR/EPR/XP3092NX). Although the site is permitted to operate as an OWC, this activity is not currently undertaken. The site currently operates as a WTS only.

1.1 The Proposed Operations

It is proposed to undertake Lithium battery recycling at the Site, with a capacity of 20,000 tonnes per annum.

Battery treatment will include discharge, dismantling, shredding, and separation of outputs for recovery. The targeted treatment outputs include battery cell materials including black mass, copper and aluminium. The treatment plant has been designed and commissioned for the mechanical treatment of lithium-ion batteries.

As part of the battery recycling operation, lithium-ion batteries will be stored and treated on site. The treatment operation will consist of battery discharge, dismantling, shredding, and subsequent separation and sorting of shredder outputs to send for further recovery. The site will also receive other Lithium-ion battery scrap materials, sourced from battery manufacturing or in support of other waste recycling for separation and sorting. Batteries of other chemistries and fluorescent tubes will be accepted for storage and transfer only.

A dust extraction management system would serve the entire battery treatment process. The extraction management system would comprise two separate purpose-built extraction and abatement systems, each comprising Local Exhaust Ventilation (LEV) (extracting air from the processes), abatement plant and a dispersion stack.

One extraction and abatement system would serve the shredder, and a second system would serve the sorting plant.

The shredder is fitted with dust extraction management including a purpose-built Local Exhaust Ventilation (LEV) system with abatement provided by a baghouse filter and carbon filters (for adsorption of Volatile Organic Compounds (VOC).

All parts of the sorting plant benefit from dust extraction management utilising a second LEV system fitted with a baghouse filter.

Both systems would minimise the emission of fine particles from the proposed processes through abatement. Lithium battery recycling would only take place when the extraction and abatement systems are operational. The two extraction and abatement systems will discharge to atmosphere via two stacks at a height greater than that of the existing building's roof.

1.2 Scope and Objective

The objective of the study is to assess the impact of potentially significant emissions on local air quality and compare against the relevant Air Quality Standards (AQS) and Environment Assessment Levels (EALs).

The AERA has considered the potential risk of short-term and long-term impacts on both human and ecological receptors. Impacts have been assessed against relevant EALs for the protection of human health and against Critical Levels (C_{Le}) and Critical Loads (C_{Lo}) for the protection of vegetation and ecosystems. This assessment follows the Environment Agency's AERA guidance the Environment Agency's (EA) Air emissions risk assessment for your environmental permit guidance (termed the 'AERA guidance' herein).

Specific reference has been made to the assessment of emission to air for the proposed permit limits as referred to in the draft 'Appropriate measures for waste batteries – early consultation draft' (no date) permitted facilities', channelled emissions to air from the mechanical treatment of waste batteries where Associated Emission Levels (AEL) have been defined.

The following pollutants have been considered for assessment within this AERA:

- Ammonia (NH_3);
- Hydrogen chloride (HCl);
- Hydrogen fluoride (HF);
- Mercury (Hg);
- Particulate Matter (PM_{10} and $PM_{2.5}$);
- Sulphuric acid (H_2SO_4);
- Sulphur dioxide (SO_2); and
- Total Volatile Organic Compounds (TVOC).

There are several groups of pollutants which have no designated ELVs, EALs or suitable Best Available Techniques AELs (BAT-AEL) to apply within the assessment process. As such, and in line with existing permitting facilities, the following pollutants and have not been assessed within this AERA:

- Dioxin-like Polychlorinated biphenyls (PCBs)
- Dioxins and Furans (PCDD/F)
- Brominated flame retardants (BFRs)
- Metals and metalloids excluding mercury

It is anticipated that 'Improvement Conditions (IC)' values for these pollutant groups will be set as part of the EP.

2.0 Legislation and Relevant Guidance

The facility is regulated under the Environmental Permitting Regulations (EPR) 2016, as amended[1]. The EPR prescribes emission limit values for certain pollutants into the air from certain plant.

2.1 Permitting Guidance

Guidance Notes produced by the Department for Environment, Food and Rural Affairs (DEFRA) provide a framework for regulation of installations and additional technical guidance produced by the Environmental Agency (EA) are used to provide the basis for permit conditions.

Of relevance to the assessment is the '*Air emissions risk assessment for your environmental permit*'[2] (the AERA guidance). The purpose of this guidance is to assist operators to assess risks to the environment and human health when applying for a permit under the EPR.

The EA also provides specific guidance for assessing impacts on ecological sites known as AQTAG.06[3].

2.2 National Air Quality Legislation and Guidance

A dual set of regulations, separately applicable to National and Local Government, are currently operable within the UK.

2.2.1 Air Quality Standards Regulations

The Air Quality Standards Regulations 2010[4] (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC), and the Fourth Daughter Directive (2004/107/EC) within UK legislation, in order to align and mirror European obligations. The AQSR includes Limit Values which are legally binding ambient concentration thresholds which, however, are only applicable at specific locations (Schedule 1: AQSR)[5]. Carriageways or central reservations of roads, and any location where the public do not have access (e.g. industrial sites), are exempt. On this basis, if a sampling point does not comply with the siting locations, then strict comparison to the AQSR Limit Values cannot be made.

Following the UK's withdrawal from the EU, the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[6] was introduced to mirror revisions to supporting EU legislation.

The responsibility of achieving the AQSR (and European equivalent Directives) is a national obligation for Central Government who undertake assessments on an annual basis. Local Authorities have no statutory obligation to achieve the AQSR or the European equivalent Directives, unless otherwise instructed to assist Central Government under Ministerial Direction.

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[1] UK Statutory Instruments, 2016 No. 1154 The Environmental Permitting (England and Wales) Regulations 2016

[2] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[3] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014.

[4] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.

[5] Schedule 1 of the 2010 AQSR provides the locations of the sampling points where the AQSR Limits Values can be assessed.

[6] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, Statutory Instrument No. 1313, The Stationary Office Limited.

2.2.2 Air Quality Strategy

Part IV of the Environment Act 1995 (as amended by the Environment Act 2021) requires the Secretary of State to review the national Air Quality Strategy (AQS) every five years and modify this as necessary. It also established the system of Local Air Quality Management (LAQM) for Local Authorities to regularly review and assess air quality within their administrative area.

The Air Quality (England) Regulations 2000 (as amended) ('the Regulations') provide the statutory basis for the Air Quality Objectives Local Authorities must adhere to under LAQM in England.

The latest AQS for England was published in 2023[7]. The AQS provides the delivery framework for air quality management across England for local authorities and summarises the air quality standards and objectives operable within England for the protection of public health and the environment. The Environment Agency, and designated relevant public authorities, must have regard to this strategy when exercising functions of a public nature that could affect the quality of air. The Environment Agency's role in relation to Local Air Quality Management (LAQM) is as follows[8]:

> *"The Environment Agency is committed to ensuring that any industrial installation or waste operation we regulate will not contribute significantly to breaches of an AQS objective.*
>
> *It is a mandatory requirement of EPR legislation that we ensure that no single industrial installation or waste operation we regulate will be the sole cause of a breach of an EU air quality limit value. Additionally, we have committed that no installation or waste operation will contribute significantly to a breach of an EU air quality limit value."*

2.3 Environmental Assessment Limits

The EA has produced EALs which are a pollutant concentration in ambient air at which no significant risks to public health are expected. The EALs mirror Limit Values where possible and provided additional values for pollutants from industrial operations not included within the AQSR or AQS.

The EALs for the purpose of assessment, for the protection of human health are provided in Table 2 1.

It has been conservatively assumed that all TVOC is Benzene.

'Dust' has been represented as Particulate Matter (PM). PM is classified in terms of its aerodynamic diameter; with PM_{10} relating to particles with an aerodynamic diameter of less than 10µm. Other smaller relevant fractions of particulate matter such as $PM_{2.5}$ (aerodynamic diameter less than 2.5µm) are a sub-fraction of the PM_{10} fraction i.e. PM_{10} includes $PM_{2.5}$. To maintain a conservative approach to the assessment of PM (dust) and to compare against respective EALs, it has been assumed that all PM from the plant is in the size fraction PM_{10} and $PM_{2.5}$.

[7] DEFRA, Air Quality Strategy: Framework for Local Authority Delivery, (2023).

[8] Regulating to Improve Air Quality. AQPG3, version 1, Environment Agency, 14 July 2008.

Table 2-1 Environmental Assessment Limits (EAL) (µg/m³)

Pollutant	Long Term (Annual)	Long Term (Monthly Mean)	Short Term (24 hour)	Short Term (1 hour)	Short Term (15-minute)
Ammonia (NH_3)	180 b)	a)	a)	2500 b)	a)
Hydrogen chloride (HCl)	a)	a)	a)	750 C)	a)
Hydrogen fluoride (HF)	a)	16	a)	160 C)	a)
Mercury (Hg)	0.06 d)	a)	a)	0.6 d)	a)
'Dust 'as Particulates (PM_{10})	40 e)	a)	50 (90.4th percentile) e)	a)	a)
'Dust 'as Particulates ($PM_{2.5}$)	20 e)	a)	a)	a)	a)
Sulphuric acid (H_2SO_4)	10 b)	a)	a)	300 b)	a)
Sulphur dioxide (SO_2)	a)	a)	125 (99.18th percentile) e)	350 (99.73rd percentile) e)	266 (99.90th percentile) e)
VOC as Benzene (C_6H_6)	5 e)	a)	30 e)	-	a)

Table Notes:

a) *No EAL or Objective for averaging period*
b) *Old EAL derivation method from EH40/2001 OEL*
c) *EPAQS Halogen and Hydrogen Halides (2006)*
d) *Hazard characterisation method for determining TCA (2023)*
e) *AQSR Limit Value / AQS Objective*

According to DEFRA published Technical Guidance LAQM.TG(22)[9], air quality standards should only apply to locations where:

> '*members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Authorities should not consider exceedances of the objectives at any location where relevant public exposure would not be realistic*'.

Thus, short term standards (EAL) (such as the 1-hour standards) should apply to areas which may be regularly frequented by the public, even for a short period of time. Longer term standards (EAL), such as annual means, should apply at houses or other locations which the public can be expected to occupy on a continuous basis. These EALs do not apply to exposure at the workplace.

[9] DEFRA, Local Air Quality Management Technical Guidance (TG22), April 2021.

Table 2-2 Relevant Exposure Criteria

Averaging Period	Standards should apply at:	Standards should not apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	Any outdoor locations where members of the public might be reasonably expected to spend one hour or longer.	Kerbside sites where public would not be expected to have regular access
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	-

2.4 Protection of Ecological Receptors

Sites of nature conservation importance at a European, national and local level are provided environmental protection with respect to air quality. Environmental Quality Standards exist for nature conservation sites known as 'Critical Levels' C_{Le}'s (for airborne concentrations) and 'Critical Loads' C_{Lo}'s (for deposition of nitrogen or acid forming compounds).

EA guidance[10] requires that designated ecological sites should be screened against relevant standards if they are located within the following set distances from the facility:

- 2km for a designated Site of Special Scientific Interest (SSSI) or local nature sites (ancient woods, local wildlife sites and national and local nature reserves); and
- 10km for a designated Special Protection Areas (SPA), Special Areas of Conservation (SAC) or Ramsar sites.

C_{Le} are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The relevant C_{Le} for the protection of vegetation and ecosystems are specified within the UK air quality regulations and AERA guidance, as transposed in Table 2-3.

Table 2-3 Relevant Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	Critical Level (µg/m^3)	Habitat and Averaging Period
NH_3	3	Annual mean (all ecosystems)
HF	0.5	Weekly mean
HF	5	Daily Mean

[10] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screening-for-protected-conservation-areas

Pollutant	Critical Level (µg/m^3)	Habitat and Averaging Period
SO_2	20	Annual mean (all ecosystems)

C_{Lo}'s are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Deposition of nitrogen and sulphur can cause eutrophication and acidification; the relevant C_{Lo} are presented in Section 5.4.

3.0 Assessment methodology

The atmospheric dispersion modelling has been undertaken with due consideration to the EA's AERA guidance. The modelling approach is based upon the following stages:

- review of installation specification and operational envelope to define emission sources, pollutant emission rates and characteristics;
- identification of sensitive receptors;
- compilation of the existing air quality baseline and review of local air quality;
- prediction of process contribution through dispersion modelling; and
- evaluation against relevant AQALs for both human and ecological receptors.

3.1 Modelled Pollutants

In reference to AERA guidance, the following pollutant averaging periods have been considered.

Table 3-1 Modelled Pollutant Averaging Periods

Pollutant	Modelled Short-term	Modelled Long-term
NH_3	Max 1-hour	Annual mean
HCl	Max 1-hour	n/a
HF	Max 1-hour	Monthly mean
Hg	Max 1-hour	24-hour mean (long term)
PM_{10}	90.41 percentile of 24-hour means	Annual mean
$PM_{2.5}$	n/a	Annual mean
H_2SO_4	Max 1-hour	Annual mean
SO_2	99.90 percentile of 15-minute means 99.73 percentile of 1-hour means 99.18 percentile of 24-hour means	Annual mean
C_6H_6	Max 24-hours	Annual mean

3.2 Modelled Scenarios

A single scenario has been modelled to consider continuous operation of the battery recycling facility with the proposed extraction and abatement systems in place (as defined in Section 3.3 below).

3.3 Quantification of Emissions

The source and emission parameters applied within the modelling are presented in Table 3-2 and Table 3-3. The location of the stacks are presented in Section 3.4.2.

Mass emissions from the extraction and abatement systems have been defined in application of the AELs detailed within 'Appropriate measures for waste batteries – early consultation draft' (no date) permitted facilities'.

Table 3-2 Source Parameters

Emission Parameter	System 1	System 2
Location (NGR)	491477, 270279	491476, 270281

Emission Parameter	System 1	System 2
Release height (above ground level)	11.63 m	11.63 m
Stack diameter	0.4m	0.4m
Actual Efflux velocity	20 m/s	20 m/s
Actual Emission temperature	Ambient [a)]	Ambient [a)]
Actual flow	2.5 m^3/hr [a)]	2.5 m^3/hr [a)]
Table notes: a) The 'ambient' option within Aermod has been selected. This equates the emission temperature with the ambient temperature within the meteorological data file.		

Table 3-3 Emissions Parameters

Pollutant	System 1 and 2	
	AEL (mg/m^3)	Mass Emissions Rate (g/s)
NH_3	10	0.02222
HCl	10	0.02222
HF	1	0.00222
Hg	0.007	0.00002
PM_{10}	5	0.01111
$PM_{2.5}$	5	0.01111
H_2SO_4	10	0.02222
SO_2	150	0.33333
C_6H_6	30	0.06667

3.4 Model Setup

For this assessment the AERMOD model[11] has been applied; this model is widely used and accepted by the EA for undertaking such assessments and is considered a suitable model for this type of assessment.

3.4.1 Model Domain / Receptors

The modelling has been undertaken using a receptor grid across a map of the study area. Pollutant exposure isopleths are generated by interpolation between receptor points and superimposed onto the map. This method allows the maximum ground level concentration outside the Site boundary to be assessed.

A nested receptor grid extending 10km from the Site was applied as follows:

- 200m x 200m at 20m grid resolution;
- 500m x 500m at 50m grid resolution;
- 1000m x 1000m at 100m grid resolution;
- 2000m x 2000m at 200m grid resolution; and
- 5000m x 5000m at 500m grid resolution.

[11] Software used: Lakes AERMOD View, (Executable Aermod_24142).

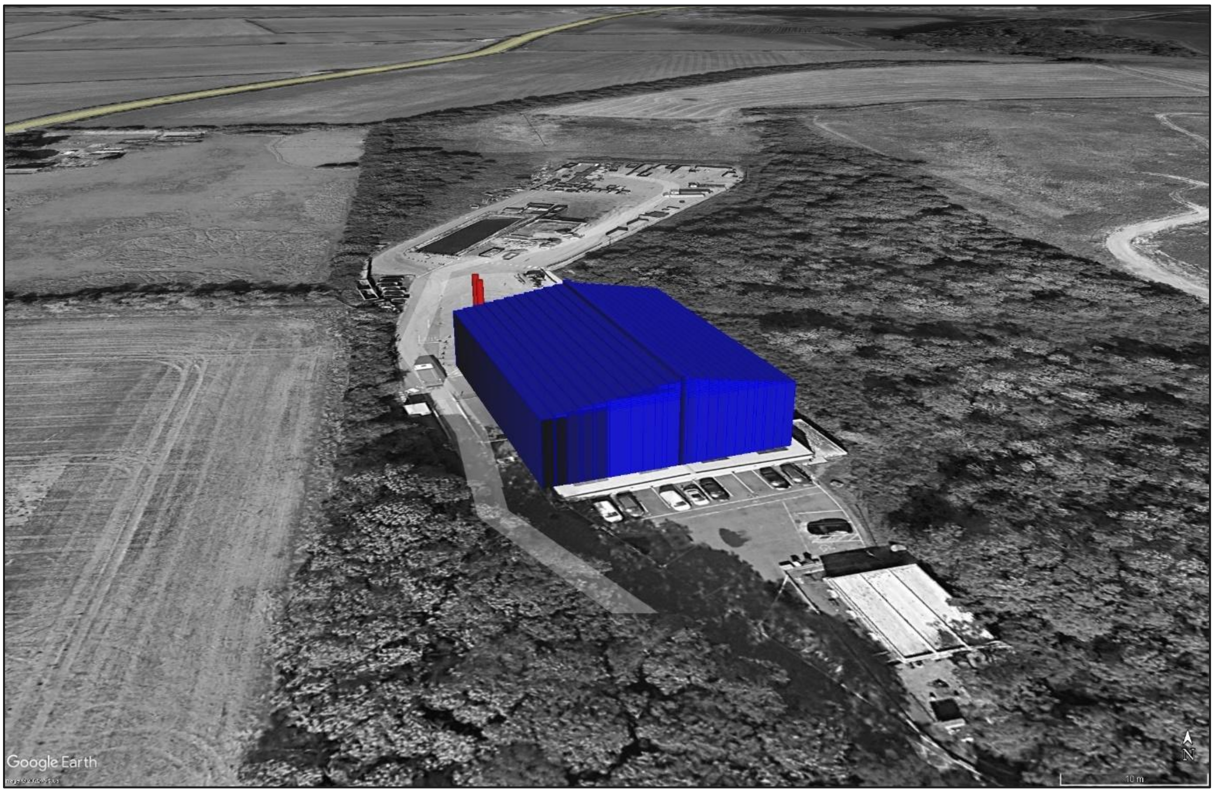
In addition, the modelling of discrete sensitive receptor locations (as described in Section 5.1.1) was undertaken to assess the impact at relevant exposure locations and to facilitate the discussion of results.

3.4.2 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations. Building downwash has been considered for buildings that have a maximum height equivalent to at least 40% of the emission height and which are within a distance defined as five times the lesser of the height or maximum projected width of the building.

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Structures input to the model are represented in Figure 3-1.

Figure 3-1 Modelled Buildings & Sources

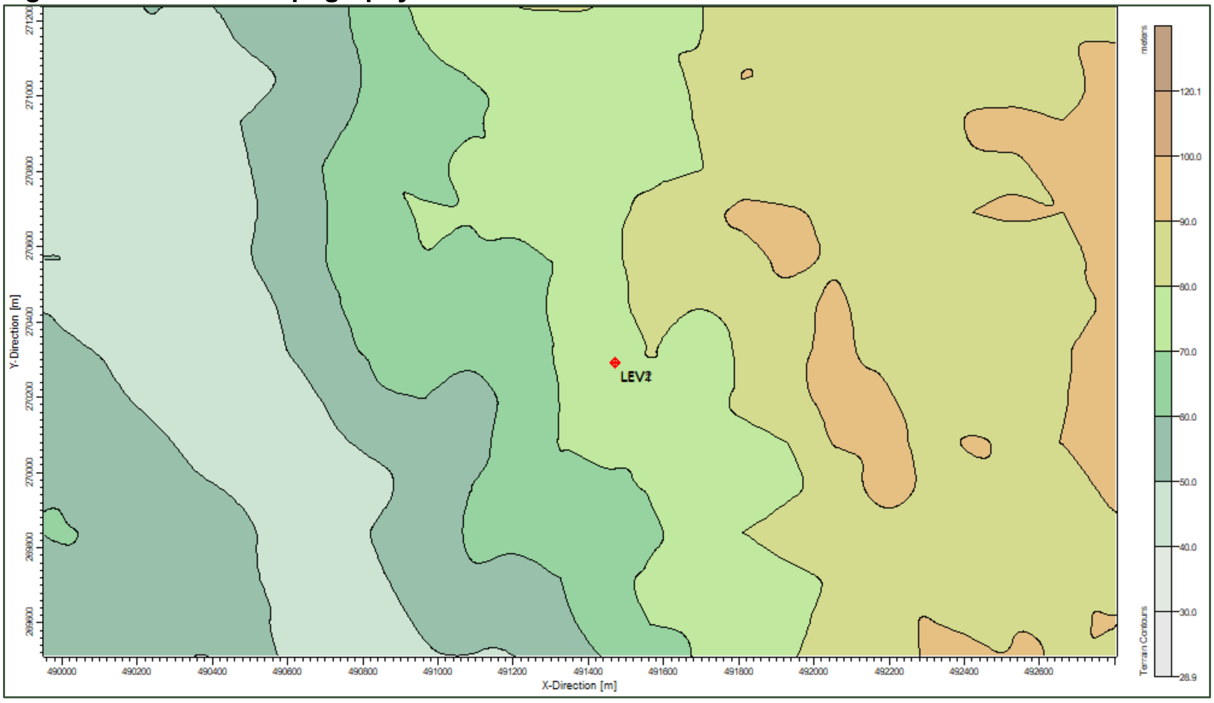


3.4.3 Topography

The presence of elevated terrain can affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

AERMOD utilises digital elevation data to determine the impact of topography on dispersion from a source. Topography was incorporated within the modelling using 30m resolution Shuttle Radar Topography Mission (SRTM) terrain data files. Data was processed by the AERMAP function within AERMOD to calculate terrain heights, as presented in Figure 3-2.

Figure 3-2 Modelled Topography



3.4.4 Meteorological Data Preparation

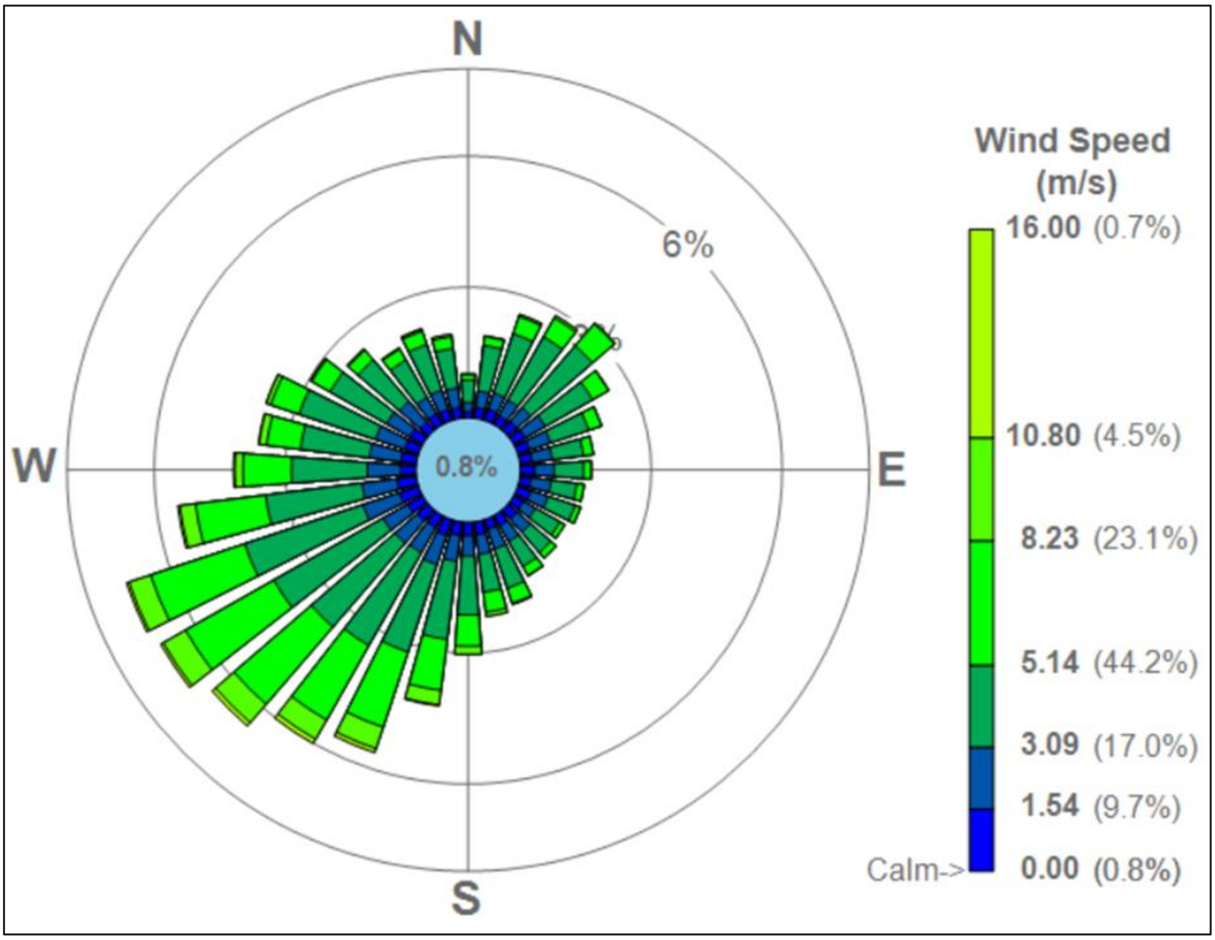
As there are no nearby meteorological recording stations considered representative of the Site locale, Numerical Weather Prediction (NWP) data has been utilised for the study. Five consecutive years of hourly-sequential NWP data covering the period 2020-2024 (inclusive) was acquired based on the Site location and converted to the required surface and profile formats for use in AERMOD using AERMET View meteorological pre-processor. Details specific to the meteorological station location were used to define surface roughness, albedo and bowen ratio in the conversion as presented in Table 3-4.

Table 3-4 Applied Surface Characteristics

Zone (Start)	Zone (end)	Albedo	Bowen Ratio	Surface Roughness (m)
0	30	0.18	0.62	0.083
30	60	0.18	0.62	0.088
60	90	0.18	0.62	0.088
90	120	0.18	0.62	0.087
120	150	0.18	0.62	0.088
150	180	0.18	0.62	0.087
180	210	0.18	0.62	0.087
210	240	0.18	0.62	0.088
240	270	0.18	0.62	0.087
270	300	0.18	0.62	0.087
300	330	0.18	0.62	0.081
330	0	0.18	0.62	0.064

A windrose presenting the frequency of wind speed and direction, as applied within the assessment is provided in Figure 4-3. Prevailing winds are from the south and southwestern sectors.

Figure 3-3 Wind Rose of NWP Meteorological Data (2020-2024 Average)



3.4.5 Dispersion Model Uncertainty

Model validation studies[12] for AERMOD generally suggest that these dispersion models are for the vast majority of cases able to predict maximum short-term high percentiles concentrations well within a factor of two and the latest evaluation studies for AERMOD show the composite (geometric mean) ratio of predicted to observed short-term averages from 'test sites' (where real-time monitoring data is available to validate model performance), to be between 0.96 and 1.2.

[12] AERMOD: Latest Features and Evaluation Results, EPA-454/R-03-003, June 2003 (United States Environmental Protection Agency).

4.0 Approach to Assessment of Impact

4.1 Operational Envelope

The processing of the model outputs has assumed that the proposed battery recycling operations (and both extraction and abatement systems modelled) would be undertaken continuously at maximum capacity, continuously for 24-hours-per-day and 365-days-per-year, reflecting a precautionary approach.

4.2 Treatment of Model Output

The assessment of impacts against the standards (as outlined in Section 3.4 and 3.5) was undertaken utilising the model outputs as described in Table 4-1 below using suitable conversion factors as detailed in EA AERA guidance.

Table 4-1 Model Outputs

Averaging Period	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
15-minute	99.9 percentile of 15-minute means (for SO_2 only)	1.34 x PC + 2x annual mean background
1-hour max	Maximum 1-hour output	PC + 2x annual mean background
1-hour max	99.73 percentile of 1-hour means (for SO_2 only)	PC + 2x annual mean background
24-hour max	99.18 percentile of 24-hour means (for SO_2 only)	PC + 2x annual mean background
24-hour max	Maximum 24-hour output	PC + 2x annual mean background
24-hour max	90.4 percentile of 24-hour means (for PM_{10} only)	PC + annual mean background
24-hour (long term)	24-hour mean output	PC + annual mean background
Weekly mean	Maximum 1-hour output	0.31 x PC + annual mean background
Monthly mean	Monthly mean output	PC + annual mean background
Annual	Annual mean output	PC + annual mean background

4.3 Assessment of Impact and Significance

4.3.1 Human Receptors

To assess the potential impact on air quality, the predicted exposure is compared to the standards and the results of the dispersion modelling have been presented in the form of tabulated concentrations at discrete receptor locations.

In accordance with the EA's AERA guidance, the impact is considered to be insignificant if:

- the long-term process contribution is <1% of the long term AQAL; and
- the short-term process contribution is <10% of the short term AQAL.

For process contributions that cannot be considered insignificant further assessment has been undertaken and the Predicted Environmental Concentration (PEC: PC + background pollutant concentration) determined for comparison as a percentage of the relevant EAL.

According to EA guidance, no further assessment is needed if the PEC remains below the EAL and BAT-AELs are met. if the resulting PEC is below the EAL (AQAL), and the applied emission levels comply with the Best Available Technology (BAT) requirements.

4.3.2 Ecological Receptors

4.3.2.1 Calculation of Contribution to Critical Levels

Modelled PCs have been directly assessed as a percentage of the C_{Le}'s relevant to this assessment, which as presented in Section 5.4.

4.3.2.2 Calculation of Contribution to Critical Loads

Deposition rates were calculated using empirical methods recommended by the EA AQTAG06[13]. Deposition flux was calculated using the following equation:

Dry deposition flux (µg/m^2/s) = ground level concentration (µg/m^3) x deposition velocity (m/s)

AQTAG06 notes that the dry deposition flux of SO_4^{2-} (arising from the chemical conversion of SO_2) should not be considered in local modelling (i.e. in modelling the process contribution), however where a sulphate aerosol is emitted directly the deposition should be account for. To align with this approach, emissions of H_2SO_4 have been treated as a sulphate aerosol.

The applied deposition velocities are as shown in Table 4-2.

Table 4-2 Applied Deposition Velocities

Chemical Species	Recommended deposition velocity (m/s)	
SO_2	Grassland	0.012
	Woodland	0.024
HCl	Grassland	0.025
	Woodland	0.060
NH_3	Grassland	0.020
	Woodland	0.030
H_2SO_4 (as Sulphate aerosol SO_4^{2-})	All	0.010

Critical Loads – Eutrophication

The C_{Lo}'s for nitrogen deposition (N) are recorded in units of kgN/ha/yr. The deposition PC is converted from µg/m^2/s to units of kgN/ha/year by multiplying the dry deposition flux by a standard conversion factor as presented in Table 4-3.

Table 4-3 Applied Eutrophication Conversions Factors

Chemical Species	Conversion Factor
NH_3	260

[13] Environment Agency, AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air, March 2014 version.

Critical Loads – Acidification

The predicted deposition rates are converted to units of equivalents (keq/ha/year), which is a measure of how acidifying the chemical species can be, by multiplying by the dry deposition flux (µg/m^2/s) specific conversion factor as presented in Table 4-4.

Table 4-4 Applied Acidification Conversions Factors

Chemical Species	Conversion Factor
H_2SO_4 and SO_2	9.84
HCl	8.63
NH_3	18.5

Calculation of PC as a percentage of Acid Critical Load Function

The calculation of the process contribution of N and S to the acid C_{Lo} function has been carried out according to the guidance on APIS, which is as follows:

> *'The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less that CLminN only the acidifying effects of sulphur from the process need to be considered:*
>
> *Where PEC N Deposition < CLminN*
>
> *PC as % CL function = (PC S deposition/CLmaxS)*100*
>
> *Where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.*
>
> *Where PEC N Deposition > CLminN*
>
> *PC as %CL function = ((PC of S+N deposition)/CLmaxN)*100'*

4.3.2.3 Significance of Effect on Ecological Receptors

In addition to the AERA guidance, the EA's Operational Instruction 66_12[14] details how the air quality impacts on ecological sites should be assessed. This guidance provides risk-based screening criteria to determine whether impacts will have 'no likely significant effects for European sites, 'no likely damage' for Sites of Special Scientific Interest (SSSIs), or 'no significant pollution' for other sites, as follows:

- PC does not exceed 1% long-term C_{Le} and/or C_{Lo} or that the PEC does not exceed 70% long-term C_{Le} and/or C_{Lo} for European sites and SSSIs;
- PC does not exceed 10% short-term C_{Le} for European sites and SSSIs; and
- PC does not exceed 100% of the short-term or long-term C_{Le} and/or C_{Lo} at other sites.

[14] EA Working Instruction 66_12 – Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation.

5.0 Baseline Environment

5.1 Site Setting and Sensitive Receptors

The Site is located, off Sidegate Lane, at approximate National Grid Reference (NGR) x491500, y270250, Wellingborough, Finedon, North Northamptonshire, England, NN8, approximately 1.4 km northeast of Wellingborough.

The permit boundary extends to the north and south within a wider Suez 'Ownership Boundary' extending to the east, north and south encompassing an area of un-designated woodland and a capped landfill bounding this woodland, approximately 100m from the sources.

The 'Ownership Boundary' is bounded by agricultural land on all sides. The nearest residential properties are farmhouses, with the closest located approximately 200m northwest of the Site Boundary. The closest large settlement is approximately 1.2 km north of the Site Boundary.

5.1.1 Human Receptors

Table 5-1 and Figure 5-1 presents the human receptor locations which have been selected to inform relevant exposure. These receptors have been selected as the closest and worst-case receptors within the modelling domain.

The assessment has also been undertaken utilising a nested receptor grid (as presented in Section 3.4.1) to allow potential short-term exposure to be assessed at all locations outside the 'Ownership boundary'.

Figure 5-1 Site Setting and Modelled Receptors

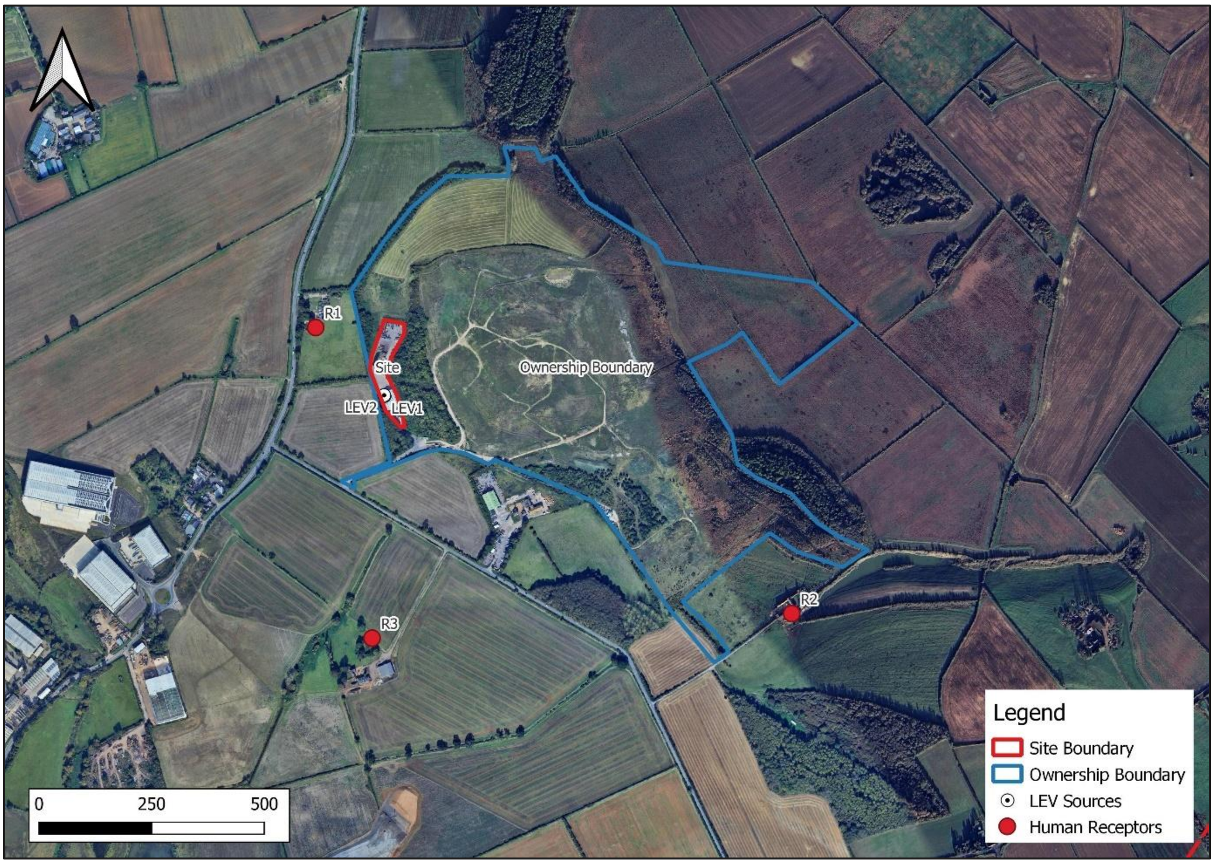


Table 5-1 Modelled Discrete Receptors – Human Receptors

Reference	Receptor Location		Flagpole height (m)
	X	Y	
R1 – Farmhouse	491324	270432	1.5
R2 – Farmhouse	492381	269796	1.5
R3 – Farmhouse	491450	269742	1.5

5.1.2 Ecological Receptors

There are designated ecological sites located within the relevant screening distances of the Site boundary (Figure 5-2).

There are large number of small, fragmented LWS within the 2km screening distance, the worst-case location is at the ‘Finedon Lodge Quarry’. This location has been modelled to represent a highest impact at any LWS.

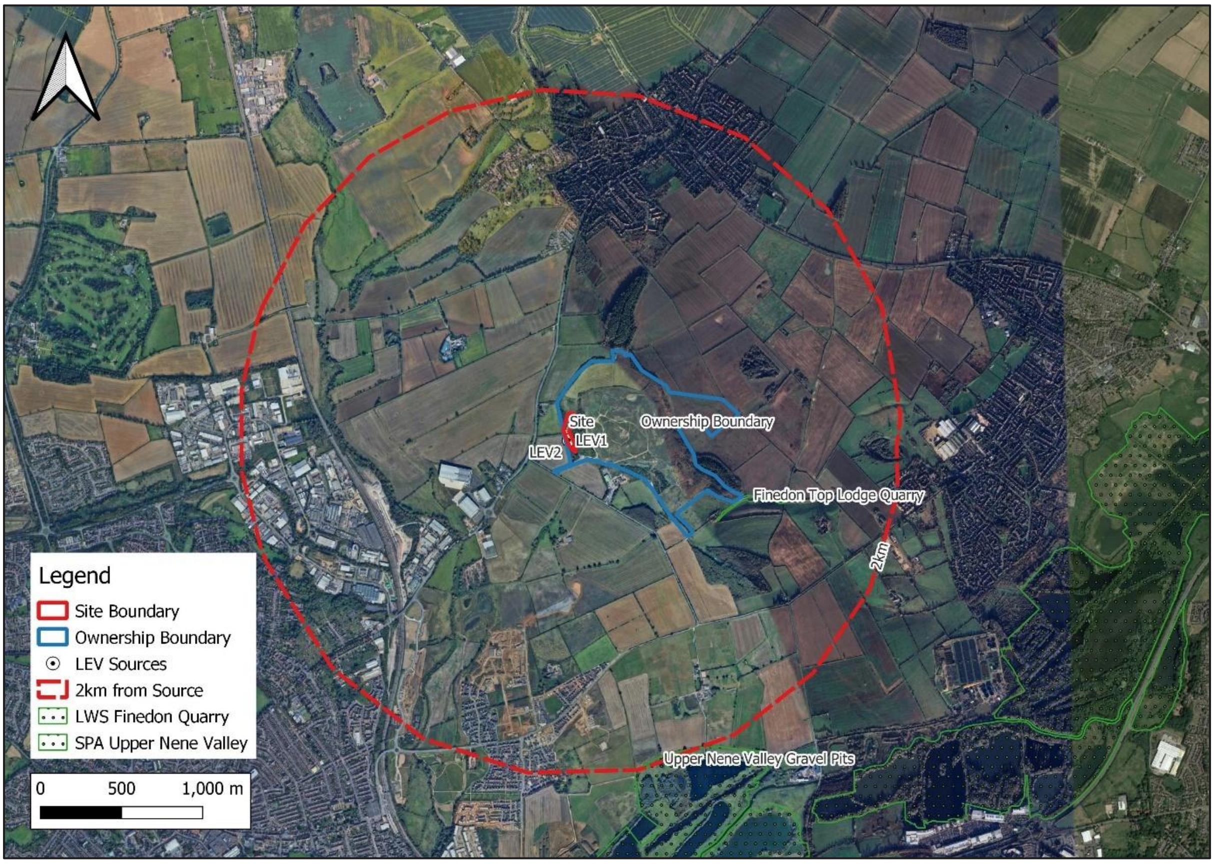
There is a single SPA within the 10km screening distance, which is the large and expansive ‘Upper Nene Valley’ SPA. This site has been represented by discrete receptors along the closest boundary to present the highest impact.

These ecological sites, and the sensitive habitat(s) identified at the sites, are presented in Table 5-2.

Table 5-2 Designated Ecological Sites

Reference	Site	Designation	Sensitive Interest Features
ER1	Finedon Top Lodge Quarry	LWS	Calcareous Grassland
ER2	Upper Nene Valley	SPA	Calcareous Grassland

Figure 5-2 Modelled Designated Ecological Site Locations



5.2 Ambient Air Quality

5.2.1 Local Air Quality Management

The Site is located within the administrative area of North Northamptonshire Council (NNHC), which has no designated Air Quality Management Areas (AQMA). The closest AQMA to the Site is located approximately 18km west, in West Northamptonshire (Northampton AQMA No.3) and is designated for nitrogen dioxide only. As this designation concerns pollutants not emitted by the sources within this assessment, AQMAs have not been considered further.

5.2.2 Monitoring Data

NNHC does not have any automatic monitoring sites in the council's administrative area. In additional several pollutants within this assessment are not routinely measured by local authorities. A review of monitoring networks managed by the EA as the UK's national monitoring sites on behalf of DEFRA and the Devolved Administrations has been undertaken.

A summary of the most representative monitoring data from national monitoring sites is presented within the following sections.

5.2.2.1 Ammonia (NH_3)

NH_3 is monitored as part of the Ammonia Network, part of the UKEAP: National Ammonia Monitoring Network. The nearest monitoring location is Monks Wood. The average monthly concentrations have been acquired and used in the assessment as a representative background concentration as presented in Table 5-3.

Table 5-3 Ammonia - Air Quality Monitoring Data

Monitoring Station	Monitoring network	Site Classification	x	y	Distance from site (m)	Measured Data (2024)
Monks Wood (UKA00639)	National Ammonia Network	Rural Background	519947	279568	33 km	1.15 µg/m3

5.2.2.2 Hydrogen Chloride (HCl)

Hydrogen chloride (HCl) is monitored as part of the Acid Gas and Aerosol Network, part of the UK Eutrophying and Acidifying Pollutants (UKEAP) Network. The nearest monitoring location which has provision of data for HCl 'Chilbolton'. The maximum daily mean concentrations in the most recent years of measured data and is provided in Table 5-4.

Table 5-4 Hydrogen Chloride - Air Quality Monitoring Data

Monitoring Station	Monitoring network	Site Classification	x	y	Distance from site (m)	Measured Data (2024)
Chilbolton Observatory (UKA00614)	Acid Gases & Aerosol Network	Rural Background	439390	139078	~140km	0.3 µg/m^3

5.2.2.3 Hydrogen Fluoride (HF)

The Expert Panel on Air Quality Standards (EPAQS) published a draft report entitled 'Guidelines for halogen and hydrogen halides in ambient air for protecting human health against acute irritancy effects'[15]. Hydrogen fluoride is primarily emitted from anthropogenic sources such as waste incineration, coke production, brick manufacturing, and primary aluminium production. The report notes that only a small number of measurements of ambient concentrations of hydrogen fluoride have been made in the UK. All of these have been made in the vicinity of industrial plants with most below limits of detection. In heavily polluted areas, typical daily inhalation intakes were noted to be in the range of 0.05–2 $\mu g/m^3$, and in some cases may reach up to 3 $\mu g/m^3$. As the background levels reported by EPAQS are linked to areas with known emissions, a review of Environmental Permits (via the Public Register[16]) within 5km of the Site has been undertaken to check for any local sources that might support applying the EPAQS values which did not indicate any sources of HF (e.g. brick works or coal power stations) within this search area. Therefore, a representative value of 0.05 $\mu g/m^3$ has been assumed to represent the monthly mean and maximum 1 hour background concentration across the modelling domain.

5.2.2.4 Mercury (Hg)

Monitoring of metals is currently carried out on behalf of DEFRA at 25 sites around the UK (termed the Heavy Metals Monitoring Network (HMMN)). Gaseous Hg data is not available at nearby HMMN sites; therefore, the closest representative rural background station 'Chilbolton' has been used to provide measured data as provided in Table 5-5, which has been used to represent the 24-hour mean (long term) and 1-hour averaging periods.

Table 5-5 Mercury - Air Quality Monitoring Data

Monitoring Station	Monitoring network	Site Classification	x	y	Distance from site (m)	Measured Data (2024)
Chilbolton Observatory (UKA00614)	Automatic Mercury Network	Rural Background	439390	139078	~140km	0.0014 $\mu g/m^3$ (Annual Average) 0.0021 $\mu g/m^3$ (Maximum 1 hour

5.2.2.5 Sulphur dioxide (SO_2), Particulates (PM) and Benzene (C_6H_6)

In lieu of more local automatic monitoring sites for SO_2, PM and C_6H_6, suitable site-specific values for rural locations, away from monitoring stations, are available from DEFRA background pollutant concentration data on a 1km x 1km spatial resolution provided by through the UK Air Information Resource (AIR) website. This is routinely used to support LAQM and Air Quality Assessments.

Mapped background concentrations for PM_{10} and $PM_{2.5}$ are based upon the 2021 base year. Benzene and SO_2 concentrations are based upon a 2001 base year (the most up to date DEFRA mapping projections).

In April 2021, Corby Borough Council, Kettering Borough Council, East Northamptonshire District Council and the Borough Council of Wellingborough merged to become the current NNHC, a new unitary authority. 2021 base year background maps have been downloaded for NNHC and 2001 base year background maps have been downloaded for

[15] Expert Panel on Air Quality Standards (EPAQS) (2005) 'Guidelines for halogen and hydrogen halides in ambient air for protecting human health against acute irritancy effects'

[16] https://environment.data.gov.uk/public-register

'Wellingborough Council'. Table 5-6 presents the maximum predicted concentrations across the grid tile containing the Site.

Table 5-6 DEFRA Background Maps Annual Mean Concentration (µg/m³)

Nature of Projection	PM_{10}	$PM_{2.5}$	C_6H_6	SO_2
2021 base, 2025 projection	13.2	7.1	-	-
2001 base, 2010 projection	-	-	0.28	2.52

5.2.2.6 Sulphuric acid (H_2SO_4)

Suitable background data for sulphuric acid is not readily available from the Acid Gas and Aerosol Network. H_2SO_4 is primarily emitted from anthropogenic sources associated with coal burning, waste incineration and other industrial processes and is more commonly associated with its role in the formation of acid rain as a transboundary pollutant.

As there are no large industrial emitters within reasonable distance of the Site, existing concentrations are anticipated to be low. As H_2SO_4 can condense onto existing atmospheric particles to form sulphate aerosols it can be considered suitable to use 'particulate sulphate' as a proxy for background concentration.

The closest data available for 'particulate sulphate' is from 'Chilbolton' monitoring station. Chilbolton recorded, in 2024, an annual average concentration of 'sulphate in PM_{10}' and 'sulphate in $PM_{2.5}$' of 1.2 and 1.1 µg/m³ respectively. It has therefore been considered to use 1.2 µg/m³ to represent background annual mean concentrations representative of H_2SO_4.

5.3 Baseline Conditions at Human Receptors

The background concentrations at human receptors applied within this assessment have been determined in consideration of the data available, as presented in the section above. Where required, short-term background concentrations are determined in reference to the method outlined within the AERA guidance (short-term background concentration of a substance is twice its long-term concentration). This represents a precautionary approach. The background concentrations applied at human receptors within this assessment are presented within Table 5-7, blank values are where no relevant EAL is required.

Table 5-7 Baseline Conditions at Human Receptors (µg/m³)

Substance	Annual mean	24 Hour mean	Monthly Mean	1 hour mean
NH_3	1.15	-	-	2.3
HCl	-	-	-	0.3
HF	-	-	0.05	0.05
Hg	-	0.00142	-	0.0021
PM_{10}	13.20	13.20	-	-
$PM_{2.5}$	7.10	-	-	-
H_2SO_4	1.20	-	-	2.40
SO_2	-	2.52	-	5.04
C_6H_6	0.28	0.45	-	-

5.4 Baseline Conditions at Ecological Receptors

The APIS support tool has been used to provide information on background pollutant concentrations, current deposition rates and C_{Lo}'s as presented in the Tables below, based on values taken from the most appropriate APIS grid square to the modelled sources.

Table 5-8 Baseline Concentrations for Critical Levels

Reference	Ecological Site	Habitat	Background SO_2 Annual Mean (µg/m^3)	Background HF Daily Mean (µg/m^3)	Background NH_3 Annual Mean (µg/m^3)
ER1	LWS	Calcareous grassland	1.69	0.05 a)	1.47
ER2	SPA	Calcareous grassland	1.90	0.05 a)	1.50

Table Note:

a) *APIS does not provide background concentrations, value has been substituted from Section 5.2.2.3.*

Table 5-9 Baseline Concentrations for Nitrogen Critical Loads

Reference	Ecological Site	Habitat	Current Load (kg N/ha/yr)	Critical Load Range (kg N/ha/yr)	Critical Load Applied (kg N/ha/yr)
ER1	LWS	Calcareous grassland	28.60	10-20	10
ER2	SPA	Calcareous grassland	28.90	10-20	10

Table 5-10 Baseline Concentrations for Acid Critical Loads

Reference	Ecological Site	Habitat	Critical Load Function (k_{eq}/ha/yr)		Current Load (k_{eq}/ha/yr)
			CLmaxS	CLmaxN	N+S
ER1	LWS	Calcareous grassland	4	4.856	2.04
ER2	SPA	Calcareous grassland	4	4.856	2.04

6.0 Assessment Results

The results of the detailed dispersion modelling are presented in the following sections.

6.1 Human Environmental Assessment Levels

6.1.1 Ammonia (NH_3)

Modelled PCs against the relevant EALs are presented in the following Tables. The results demonstrate that:

- PC to long term (annual mean) can be described as insignificant at all receptors as the predicted PC is less than 1% of the EAL.
- PC to short term (1-hour) can be described as insignificant at all receptors as the predicted PC is less than 10% of the EAL.

Table 6-1 NH_3 Annual Mean Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	180	0.1	0.1%
R2 - Resi	180	0.1	<0.1%
R3 - Resi	180	<0.1	<0.1%

Table 6-2 NH_3 Maximum 1 Hour Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL
Max offsite	2500	21.4	0.9%
R1 - Resi	2500	8.8	0.4%
R2 - Resi	2500	7.7	0.3%
R3 - Resi	2500	5.7	0.2%

6.1.2 Hydrogen Chloride (HCl)

Modelled PCs against the relevant EAL are presented in the following Table. The results demonstrate the PC to short term (1-hour) can be described as insignificant at all receptors as the predicted PC is less than 10% of the EAL.

Table 6-3 HCl Maximum 1 Hour Concentrations (µg/m^3)

Receptor	EAL	PC (µg/m^3)	PC as % of EAL
Max offsite	750	21.4	2.9%
R1 - Resi	750	8.8	1.2%
R2 - Resi	750	7.7	1.0%
R3 - Resi	750	5.7	0.8%

6.1.3 Hydrogen Fluoride (HF)

Modelled PCs against the relevant EALs are presented in the following Tables. The results demonstrate that:

- PC to long term (monthly mean) can be described as insignificant at all receptors as the predicted PC is less than 1% of the EAL.

- PC to short term (1-hour) can be described as insignificant at all receptors as the predicted PC is less than 10% of the EAL.

Table 6-4 HF Monthly Mean Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	16	<0.1	0.2%
R2 - Resi	16	<0.1	0.1%
R3 - Resi	16	<0.1	0.1%

Table 6-5 HF Maximum 1 Hour Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL
Max offsite	160	2.1	1.3%
R1 - Resi	160	0.9	0.6%
R2 - Resi	160	0.8	0.5%
R3 - Resi	160	0.6	0.4%

6.1.4 Mercury (Hg)

Modelled PCs against the relevant EALs are presented in the following Tables. The results demonstrate that:

- PC to long term (24 hour mean (long term)) can be described as insignificant at all receptors as the predicted PC is less than 1% of the EAL.
- PC to short term (1-hour) can be described as insignificant at all receptors as the predicted PC is less than 10% of the EAL.

Table 6-6 Hg 24 hour mean (long term) Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	0.06	<0.01	0.2%
R2 - Resi	0.06	<0.01	0.1%
R3 - Resi	0.06	<0.01	<0.01%

Table 6-7 Hg Maximum 1 Hour Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	0.6	<0.01	1.0%
R2 - Resi	0.6	<0.01	0.9%
R3 - Resi	0.6	<0.01	0.7%

6.1.1 Sulphur dioxide (SO_2)

Modelled PCs against the relevant EAL are presented in the following Tables. The results demonstrate that:

- The PC to short term (24-hour,1 hour and 15 min averaging periods) cannot be described as insignificant at all receptors as the predicted PC is above 10% of the EAL at modelled receptors. The PEC is however less than 70% of the EAL at modelled receptors.
- The maximum offsite PEC is however above 70% and exceeds the EAL for the 15-min 99.9th percentile. This impact occurs however at an area which is not considered relevant for exposure (refer to Appendix B for contour output)

Table 6-8 SO_2 24-hour Mean (99.18%ile) Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL	Background	PEC	PEC as % of EAL
R1 - Resi	125	24.8	19.8%	2.5	27.3	21.9%
R2 - Resi	125	9.5	7.6%	2.5	12.0	9.6%
R3 - Resi	125	8.0	6.4%	2.5	10.5	8.4%

Table 6-9 SO_2 1-hour Mean (99.73%ile) Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL	Background	PEC	PEC as % of EAL
Max offsite	350	235.2	67.2%	2.5	237.7	67.9%
R1 - Resi	350	81.0	23.1%	2.5	83.5	23.9%
R2 - Resi	350	58.2	16.6%	2.5	60.7	17.4%
R3 - Resi	350	37.5	10.7%	2.5	40.0	11.4%

Table 6-10 SO_2 15-minute Mean (99.9%ile) Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL	Background	PEC	PEC as % of EAL
Max offsite	266	339.4	127.6%	5.0	344.5	129.5%
R1 - Resi	266	143.4	53.9%	5.0	148.4	55.8%
R2 - Resi	266	107.0	40.2%	5.0	112.0	42.1%
R3 - Resi	266	74.2	27.9%	5.0	79.2	29.8%

6.1.2 Particulate matter (PM_{10})

Modelled PCs against the relevant EALs are presented in the following Tables. The results demonstrate that:

- PC to long term (annual average) can be described as insignificant at all receptors as the predicted PC is less than 1% of the AQAL.
- PC to short term (24 hour) can be described as insignificant at all receptors as the predicted PC is less than 10% of the AQAL.

Table 6-11 PM_{10} Annual Mean Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	40	0.1	0.2%
R2 - Resi	40	<0.1	0.1%
R3 - Resi	40	<0.1	0.1%

Table 6-12 PM_{10} 24-hour Mean (90.41%ile) Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	50	0.2	0.5%
R2 - Resi	50	0.1	0.2%
R3 - Resi	50	0.1	0.1%

6.1.3 Particulate matter ($PM_{2.5}$)

Modelled PCs against the relevant EAL are presented in the following Table. The results demonstrate that the long term (annual average) PC can be described as insignificant at all receptors as the predicted PC is less than 1% of the AQAL.

Table 6-13 $PM_{2.5}$ Annual Mean Concentrations (µg/m^3)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	20	0.1	0.4%
R2 - Resi	20	<0.1	0.1%
R3 - Resi	20	<0.1	0.1%

6.1.4 VOC as Benzene

Modelled PCs against the relevant EALs are presented in the following Tables. The results demonstrate that:

- The PC to long term (annual) and short term (24 hour), cannot be described as insignificant at all receptors as the predicted PC is above 1% and 10% of respective EALs.
- The long term (annual) PEC is less than 70% of the EAL at modelled receptors and is below the EAL.
- The short term (annual) PEC is greater than 20% of the EAL at modelled receptors but is below the EAL.

Table 6-14 VOC Annual Mean Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL	Background	PEC	PEC as % of EAL
R1 - Resi	5	0.4	8.7%	0.28	0.7	14.3%
R2 - Resi	5	0.2	3.0%	0.28	0.4	8.6%
R3 - Resi	5	0.1	2.6%	0.28	0.4	8.2%

Table 6-15 VOC 24-hour Mean Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL	Background	PEC	PEC as % of EAL
R1 - Resi	30	7.2	23.9%	0.45	7.6	25.4%
R2 - Resi	30	3.2	10.5%	0.45	3.6	12.0%
R3 - Resi	30	2.5	8.3%	0.45	2.9	9.8%

6.1.5 Sulphuric acid (H_2SO_4)

Modelled PCs against the relevant EAL are presented in the following Tables. The results demonstrate that:

- The PC to long term (annual) cannot be described as insignificant at all receptors as the predicted PC is above 1% of the EAL.
- The long term (annual) PEC is less than 70% of the EAL at modelled receptors and is below the EAL.
- PC to short term (24 hour) can be described as insignificant at all receptors as the predicted PC is less than 10% of the AQAL.

Table 6-16 H_2SO_4 Annual Mean Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL	Background	PEC	PEC as % of EAL
R1 - Resi	10	0.1	1.4%	1.2	1.3	13.4%
R2 - Resi	10	0.1	0.5%	1.5	1.6	15.5%
R3 - Resi	10	<0.1	0.4%	1.5	1.5	15.4%

Table 6-17 H_2SO_4 1-hour Mean Concentrations (µg/m³)

Receptor	EAL	PC	PC as % of EAL
R1 - Resi	50	0.2	0.5%
R2 - Resi	50	0.1	0.2%
R3 - Resi	50	0.1	0.1%

6.2 Ecological Receptors

The maximum predicted impacts across the identified ecological sites are presented in the sections below.

6.2.1 Critical Levels

The results of the assessment of impacts on C_{Le}'s are presented in the following tables. The findings are as follows:

- LWS impacts.
  - the long-term PC is less than 100% of the long term CLe's.
  - the short-term PC is less than 100% of the short term CLe's.
- SPA impacts.
  - the short-term PC is less than 10% of the short term CLe's
  - the long-term PC is less than 1% of the long term NH_3 CLe's, but above 1% of the SO_2 CLe, but the PEC is for SO_2 is less than 70% of the CLe.

It can be concluded that the impacts will cause 'no likely significant effects' at the SAC and 'no significant pollution' at the LWS.

Table 6-18 NH_3 - Predicted Critical Levels (µg/m³)

Site	Averaging Period	Applied C_{Le}	PC (µg/m³)	PC as % of C_{Le}	Background	PEC	PEC as %
ER1 - LWS	Annual mean	3	0.05	1.68%	1.47	1.52	50.7%
ER2 - SPA	Annual mean	3	0.02	0.52%	1.50	1.52	50.5%

Table 6-19 SO_2 - Predicted Critical Levels (µg/m³)

Site	Averaging Period	Applied C_{Le}	PC (µg/m³)	PC as % of C_{Le}	Background	PEC	PEC as %
ER1 - LWS	Annual mean	20	0.76	3.8%	1.69	2.45	12.2%
ER2 - SPA	Annual mean	20	0.23	1.2%	1.90	2.13	10.7%

Table 6-20 HF - Predicted Critical Levels (µg/m³)

Site	Averaging Period	Applied C_{Le}	PC (µg/m³)	PC as % of C_{Le}	Background	PEC	PEC as %
ER1 - LWS	Daily Mean	5	0.11	2.20%	0.05	0.16	3.20%
ER1 - LWS	Weekly Mean	0.5	0.03	6.8%	0.05	0.08	16.8%
ER2 - SPA	Daily Mean	5	0.05	1.01%	0.05	0.10	2.01%
ER2 - SPA	Weekly Mean	0.5	0.02	3.1%	0.05	0.07	13.1%

6.2.2 Critical Loads

The results of the assessment of impacts on CLo are presented in the following tables. The findings are as follows:

- The maximum predicted PC is less than 100% of the applied C_{Lo} for the LWS.
- The maximum predicted PC is less than 1% of the applied C_{Lo} for the SAC.

It can be concluded that the impacts will cause ‘no likely significant effects’ at the SAC and ‘no significant pollution’ at the LWS.

Table 6-21: Impact on Nitrogen Critical Load

Site	Applied C_{Lo} (kg N/ha/yr)	PC (kg N/ha/yr)	PC as % of CLo
ER1 - LWS	10	0.26	2.63%
ER2 - SPA	10	0.08	0.81%

Table 6-22: Impact on Acid Critical Load

Site	Applied C_{Lo} (keq/ha/yr)	PC (keq/ha/yr)	PC as % of CLo
ER1 - LWS	4.856	0.110	2.3%

Site	Applied C_{Lo} (keq/ha/yr)	PC (keq/ha/yr)	PC as % of CLo
ER2 - SPA	4.856	0.034	0.7%

7.0 Summary and Conclusions

The Air Emissions Risk Assessment (AERA) for the Sidegate Lane Battery Recycling Facility demonstrates that the proposed operations, incorporating best available techniques for emission control, will not result in significant adverse impacts on local air quality or designated ecological sites.

All modelled pollutants were found to be below the relevant Environmental Assessment Levels (EALs) at human receptors. Sulphur dioxide (SO_2) 15-minute averaging period did exceed the EAL. This is limited to a small area near the site boundary and does not affect residential or sensitive locations.

For ecological receptors, the predicted contributions to Critical Loads and Critical Levels are considered to cause 'no likely significant effects' for the Upper Nene Valley, SPA, and 'no significant pollution' for Finedon Top Lodge Quarry LWS.

The AERA concludes that the proposed operations (in consideration of the specified extraction and abatement systems) will not result in unacceptable air quality impacts.

Appendix A Modelling Checklist

Sidegate Lane Battery Recycling Facility

Air Emissions Risk Assessment (AERA)

Suez Recycling and Recovery UK

SLR Project No.: 416.066034.00001

3 July 2025

Table A-1: Modelling Checklist

Item	Yes/No	Details / Reason for Omission
Location map	Yes	Section 5.0
Site plan	Yes	Section 5.0
Pollutants modelled and relevant EALs	Yes	Section 2.3
Details of modelled scenarios	Yes	Section 4.0
Details of relevant ambient concentrations	Yes	Section 5.2
Model description and justification	Yes	Section 3.4
Special model treatment used	Yes	Section 3.4
Table of emission parameters used	Yes	Section 3.3
Details of modelled domain and receptors	Yes	Section 3.4
Details of meteorological data used	Yes	Section 3.4.4
Details of terrain treatment	Yes	Section 3.4.3
Details of building treatment	Yes	Section 3.4.2
Details of modelling deposition	Yes	Section 4.2
Model uncertainty and sensitivity	Yes	Section 3.4.5
Assessment of impacts	Yes	Section 6.0
Contour plots	Yes	Appendix B
Model input files	Yes	Appendix C

Appendix B   Contour Plots

Sidegate Lane Battery Recycling Facility

Air Emissions Risk Assessment (AERA)

Suez Recycling and Recovery UK

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3 July 2025

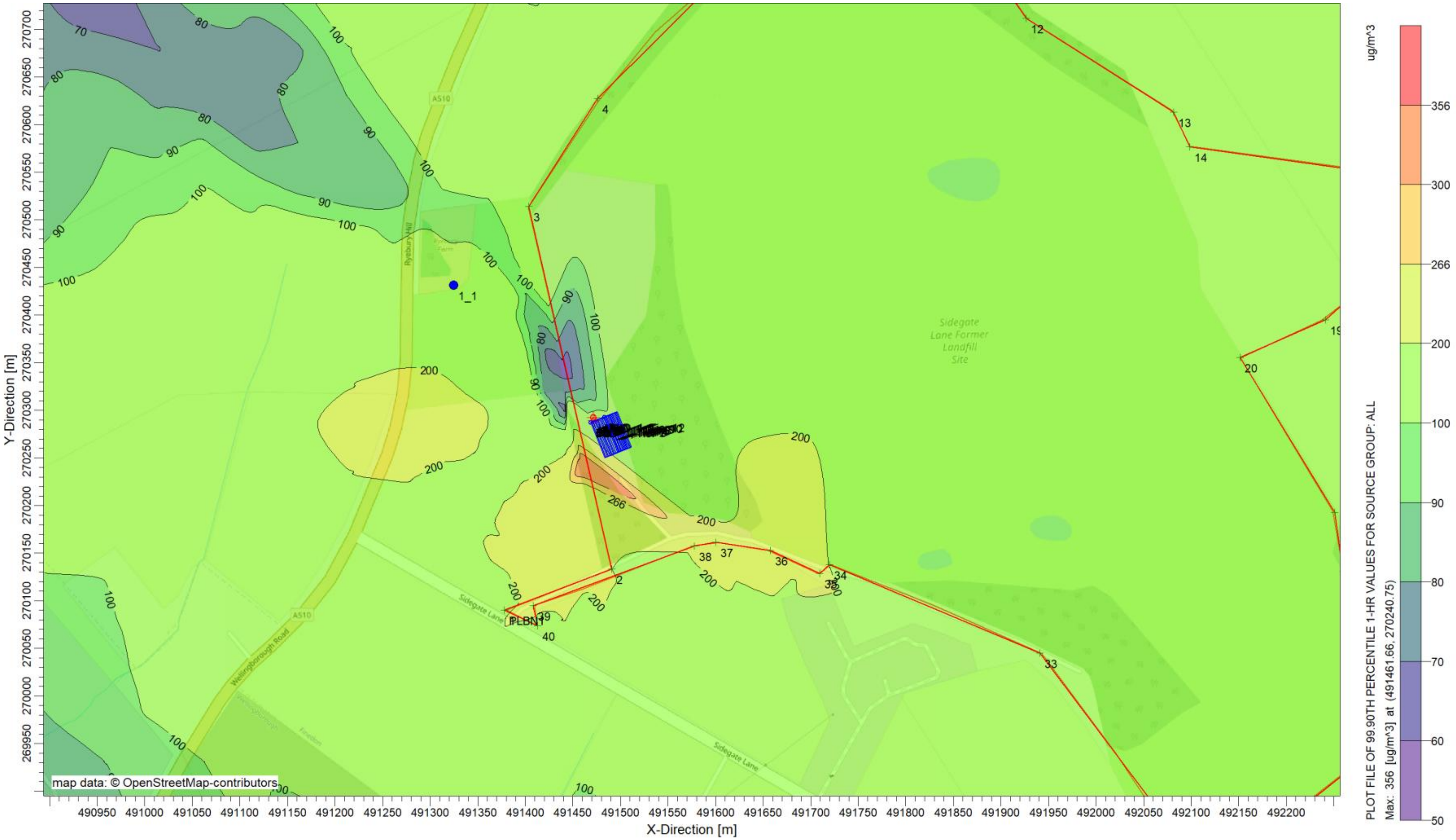

Figure B-1: Process Contribution - 99.90 percentile of 15-minute means SO_2

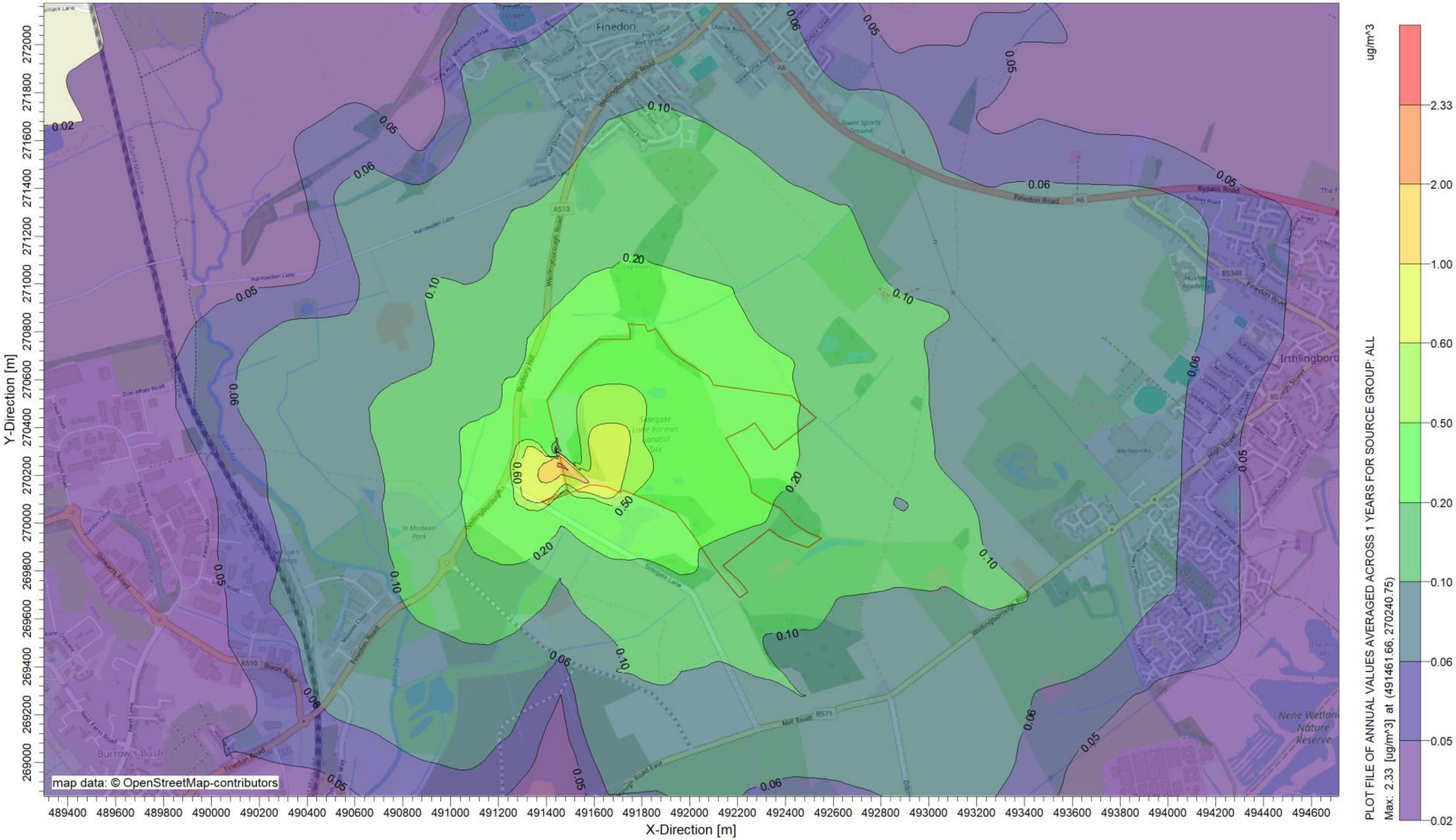

Figure B-2: Process Contribution - Annual Average VOC

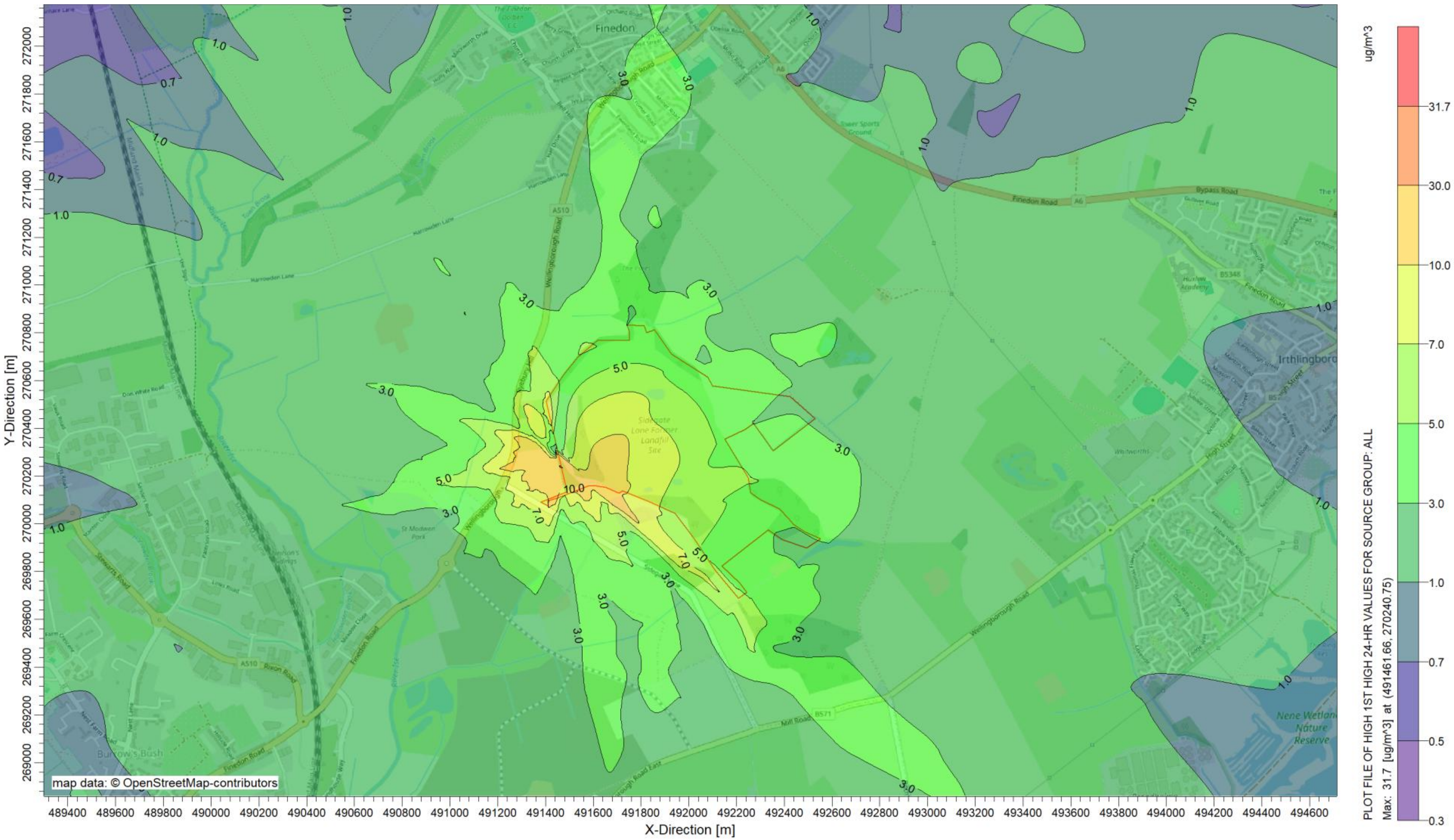

Figure B-3: Process Contribution - 24 Hour VOC

Appendix C Model Files (electronic only)

Sidegate Lane Battery Recycling Facility

Air Emissions Risk Assessment (AERA)

Suez Recycling and Recovery UK

SLR Project No.: 416.066034.00001

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Table A-2: Submitted Model Files

Model Files	Pollutants Modelled
SG_v2_ALL_20	LEV at 1 g/s
SG_v2_ALL_ECO_21	LEV at 1 g/s

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