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Consulting Engineers Limited

SUEZ Recycling and Recovery UK Ltd

Beddington Lane AD Facility

Air Quality Schedule 5 Response

1 Introduction

SUEZ Recycling and Recovery UK Ltd (the Applicant) submitted an application for an environmental permit (EP, ref: EPR/NP3522SM/A001) to operate an anaerobic digestion (AD) facility (the Facility) at Beddington Lane, London Borough of Sutton (the Site). Fichtner produced the Dispersion Modelling Assessment[1] (the original assessment) submitted with the EP application.

The Environment Agency (EA) issued a request for more information (referred to as a Schedule 5 request) which included the following request regarding air quality:

> **Air quality impact assessment**
>
> *31. Provide an updated air quality impact assessment to include emissions of ammonia and volatile organic acids from the biogas upgrading plant and the abatement plant, in addition to emissions from the CHP engine and flare. Include the model input files in your response for auditing.*
>
> *Reason: the submitted modelling (Ref: S3932-0030-0005SMN EP Application Dispersion Modelling Assessment_r1 dated 20.12.2023) only covered emissions from the CHP and the flare. No assessment of potential emissions from the gas upgrading plant has been considered.*

The Applicant sought clarification regarding this request to determine which species of volatile organic acids would require assessment, as the speciation of emissions is not known at this stage. The EA advised that it can be assumed that all volatile organic acids (a type of volatile organic compound (VOC)) can be assumed to be benzene as a worst-case.

In addition, the supplier for the gas upgrading plant has confirmed that there will be no emissions of ammonia or VOCs associated with the operation of the gas upgrading plant. As such, this source has been excluded from this assessment.

The assessment methodology is unchanged from that presented in the original assessment, except for the items identified in section 2.1.

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[1] Fichtner ref: S3932-0030-0005SMN EP Application – Dispersion Modelling Assessment

2 Updated Air Quality Impact Assessment

2.1 Methodology

2.1.1 Emissions parameters

The dispersion model has been updated to include emissions from the odour abatement system. The emissions parameters for this source are provided in Table 1. The location of the source is shown in Figure 1 of Appendix A. The upper end of the range of best available techniques-associated emission levels (BAT-AELs) for channelled emissions from the biological treatment of waste, as per BAT 34 of the Waste Treatment BAT Conclusions document, are 20 mg/m³ for ammonia and 40 mg/m³ for VOCs. The applicant proposes to apply emission limit values (ELVs) below these values, as shown in Table 1. The technology provider for the odour abatement system has confirmed that these values can be achieved using the technology proposed.

Table 1: Source data – odour abatement system stack

Item	Unit	Value
Stack data		
Height	m	18.3
Internal diameter	m	1.44[1]
Stack location	m, m	529663.9, 166499.9
Flue gas conditions		
Temperature	°C	20[2]
Volume at reference conditions (0°C, no correction for water or oxygen content)	Nm³/h	81,717
	Nm³/s	22.70
Volume at actual conditions	Am³/h	87,700
	Am³/s	24.36
Flue gas exit velocity	m/s	15
Emissions		
Ammonia proposed ELV	mg/Nm³	9
Ammonia release rate (at ELV)	g/s	0.204
VOC proposed ELV	mg/Nm³	15
VOC release rate (at ELV)	g/s	0.340
Notes:		
[1] Sized to achieve 15 m/s efflux velocity.		
[2] Modelled at ambient temperature for the assessment submitted with the planning application; amended to 20°C based on data from the technology provider to allow calculation of pollutant release rate at ELVs expressed at reference conditions.		

Emissions from the CHP engine and flare have been retained in the model, with the parameters unchanged. As detailed in the original assessment, the impact of emissions of VOCs from the CHP engine is considerably higher than from the flare, and the CHP engine and flare will not operate

concurrently. Therefore, the impact of emissions from the odour abatement system has been considered alone and in-combination with the CHP engine emissions. There are no ammonia emissions associated with the operation of the CHP engine or flare.

2.1.2 Sensitive receptors

The impact of emissions has been assessed at the point of maximum impact outside of the installation boundary and at the same sensitive receptor locations as presented in the original assessment, with the exception of E18 – Beddington Farmlands. On review, it has been determined that the receptor location originally used lies slightly outside of this ecological site. The original and revised receptor location are presented in Table 2 and shown in Figure 2 of Appendix A.

Table 2:   Revised receptor location

Receptor	Original location		Revised location	
	X	**Y**	**X**	**Y**
E18	529575	166500	529512	166386

As the revised receptor location is further from the Site, the predicted process contributions (PCs) from the CHP engine and flare are lower than presented in the original assessment. Therefore, it is not considered necessary to re-assess the impact of emissions of oxides of nitrogen and sulphur dioxide from the CHP engine and flare on this receptor. The emissions have been included when assessing nitrogen and acid deposition at the revised receptor location.

2.1.3 Air quality assessment levels

Table 3 and Table 4 summarise the air quality assessment levels (AQALs) used in this assessment.

Table 3:   Air Quality Assessment Levels (AQALs)

Pollutant	AQAL (µg/m³)	Averaging Period	Source
Ammonia	180	Annual	Air Emissions Guidance[1]
	2,500	1 hour	Air Emissions Guidance
VOCs (Benzene)	5	Annual	Air Emissions Guidance
	30	24 hours	Air Emissions Guidance
Note: [1] Air emissions risk assessment for your environmental permit, EA, last updated 7 January 2025			

Table 4:   Critical Levels for the protection of vegetation and ecosystems

Pollutant	Concentration (µg/m³)	Measured as	Source
Ammonia	1	Annual mean where lichens and bryophytes are an important part of the ecosystem's integrity	Air Emissions Guidance / APIS[1]
	3	Annual mean for all higher plants	Air Emissions Guidance / APIS
Note: [1] Air Pollution Information System website, www.apis.ac.uk			

In addition to the Critical Levels set out in the table above, APIS provides habitat specific Critical Loads for nitrogen and acid deposition. These are unchanged from the original assessment.

2.1.4 Deposition calculation

The original assessment did not include the calculation of deposition for ammonia. Table 5 is an update of Table 27 from the original assessment including the factors used for ammonia, as taken from the Habitats Directive AQTAG06[2] (March 2014).

Table 5: Deposition Factors

Pollutant	Deposition Velocity (m/s)		Conversion Factor ($\mu g/m^2/s$ to kg/ha/year)
	Grassland	Woodland	
Nitrogen dioxide	0.0015	0.003	96.0
Sulphur dioxide	0.0120	0.024	157.7
Ammonia	0.0200	0.030	259.7

The deposition flux from ammonia has been added to that from nitrogen dioxide to calculate the total nitrogen deposition flux. In accordance with the methodology detailed in the original assessment this has been divided by 14 to convert from kgN/ha/yr to keq/ha/yr to calculate the contribution of nitrogen to acid deposition.

2.1.5 Background pollutant concentrations

The annual mean background concentration of benzene is taken as 1.08 $\mu g/m^3$, as per the original assessment. Background concentrations of ammonia were not defined in the original assessment. The maximum from within 3 km has been obtained from the APIS background mapping for the assessment of impacts on human health. Receptor-specific ammonia concentrations have been obtained from APIS for any impacts on ecological receptors that cannot be screened out as 'insignificant' (refer to section 2.2.2).

2.2 Results

2.2.1 Human health

The results at the point of maximum impact, based on the maximum over the five years of modelled weather data and assuming continual operation at the proposed ELVs, are shown in Table 6.

For the calculation of the predicted environmental concentration (PEC) the short term background concentrations are taken to the twice the annual mean background concentrations, in accordance with the stated methodology in the original assessment.

Impacts that cannot be screened out as 'insignificant' are highlighted.

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[2] Air Quality Advisory Group, AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, March 2014

Table 6:   Dispersion modelling results – point of max impact outside of installation boundary

Pollutant	Quantity	AQAL	Bg Conc.	PC				Max PEC	
				Odour stack		Odour stack + CHP engine		µg/m³	% of AQAL
				µg/m³	% of AQAL	µg/m³	% of AQAL		
VOCs (as benzene)	Annual mean	5	1.08	3.34	**66.72%**	3.72	**74.48%**	4.80	96.08%
	Daily mean	30	2.16	18.40	**61.34%**	20.29	**67.63%**	22.45	74.83%
Ammonia	Annual mean	180	1.10	2.00	**1.11%**	-	-	3.10	1.72%
	Hourly mean	2,500	2.20	37.62	1.50%	-	-	39.82	1.59%

The hourly mean ammonia PC is less than 10% of the AQAL and can be screened out as 'insignificant'. Although the annual mean ammonia PC exceeds 1% of the AQAL at 1.11% of the AQAL and cannot be screened out as 'insignificant' based on the PC, the PEC is well below 70% the AQAL. Therefore, there is no risk of exceedance of the annual mean AQAL for ammonia and the impact is 'not significant'. An illustrative plot file of the annual mean ammonia PC is provided as Figure 3 of Appendix A.

The maximum annual and daily mean PCs for VOCs as benzene exceed the screening criteria. However, there are no areas of relevant exposure with regard to the annual and daily mean AQALs in close proximity to the Site. The maximum impact of combined emissions from the odour abatement system and CHP engine at any modelled receptor is presented in Table 7 and plot files of the annual and daily mean PC of VOCs as benzene provided as Figure 4 and Figure 5 of Appendix A. As the annual mean ammonia impact at the point of maximum impact cannot be screened out as 'insignificant', the PC at the maximum impacted receptor has been presented for completeness. Impacts that cannot be screened out as 'insignificant' are highlighted.

Table 7: Impact of VOCs (as benzene) at maximum impacted modelled receptor location

Pollutant	Quantity	Receptor	PC		PEC	
			µg/m³	% of AQAL	µg/m³	% of AQAL
Ammonia	Annual mean	R21	0.37	0.21%	1.47	0.82%
VOCs (as benzene)	Annual mean	R21	0.763	**15.26%**	1.843	36.86%
	Daily mean	R21	8.31	**27.71%**	10.47	34.91%

As shown in Table 7, at the maximum impacted receptor (R21, 1 Therapia Lane) the annual mean ammonia PC is less than 1% of the AQAL and is screened out as 'insignificant'. The PC of VOCs as benzene, including emissions from both the odour abatement system and the CHP engine, is approximately 15% of the AQAL; however, the PEC is much less than 70% of the AQAL. Similarly, daily mean PC is approximately 28% of the daily mean AQAL, but the PEC is less than 35% of the AQAL. These results are based on the highly conservative assumption that all VOCs are emitted as benzene. Therefore, there is there is no risk of exceedance of any AQAL for benzene or any other VOCs, and the impact is 'not significant'.

Figure 4 and Figure 5 shows that there are no areas of relevant exposure (dwellings, schools, hospitals, etc, or hotels or gardens of residential properties for daily mean concentrations) where the PC is significantly higher than at R21. As such, no significant effects on human health are predicted.

2.2.2 Ecology

2.2.2.1 Airborne emissions

The maximum annual mean ammonia PC at ecological receptors is presented in Table 8

As a conservative measure it has been assumed that lichens and bryophytes are an important part of the ecosystem's integrity at all designated sites and the more stringent Critical Level of 1 µg/m³ applied as part of the assessment. If the impact cannot be screened out a detailed review of the site been undertaken to determine whether lichens and bryophytes are likely to be present.

Table 8:   Annual mean ammonia PC at Designated Ecological Sites

Ref	Site name	Annual mean ammonia	
		µg/m³	% of CL of 1 µg/m³
European designated sites (within 10 km) and UK designated sites (within 2 km)			
E1	Wimbledon Common	0.002	0.19%
E2	Richmond Park	0.001	0.12%
Local nature sites (within 2 km)			
E3	Spencer Road Wetlands	0.042	4.16%
E4	Wandle Valley Wetland	0.037	3.70%
E5	The Spinney Carshalton	0.040	4.00%
E6	Wilderness Island	0.041	4.15%
E7	Bandon Hill Cemetery	0.013	1.34%
E8	Caraway Place Pond	0.043	4.34%
E9	Croydon Cemetery Complex	0.226	22.62%
E10	Land North of Goat Road	0.023	2.29%
E11	Mill Green LWS	0.032	3.16%
E12	Mitcham Common	0.054	5.40%
E13	St Mary's Court Wildflower Area, Bute Road	0.026	2.55%
E14	Waddon Ponds	0.027	2.74%
E15	Wandle Park	0.022	2.25%
E16	Upper River Wandle	0.030	2.96%
E17	River Wandle SMI	0.026	2.62%
E18	Beddington Farmlands	0.733	73.29%
E19	Beddington Park SBI	0.099	9.87%
E20	Therapia Lane Rough	0.334	33.41%
E21	Queen Elizabeth Walk	0.018	1.78%

As shown, the ammonia PC is less than 1% of the Critical Level at the European and UK designated sites considered, and less than 100% of the Critical Level at the local nature sites considered. Therefore, all ammonia impacts are screened out as 'insignificant'.

2.2.2.2   Deposition of emissions

The nitrogen and acid deposition resulting from ammonia emissions from the odour abatement system has been added to the deposition due to NOx and sulphur dioxide emissions from the CHP engine. Refer to the original assessment for details of the Critical Loads and levels of background deposition applied. The results are presented in Appendix B. As shown, the PC is less than 1% of the relevant Critical Loads at European and UK designated sites and less than 100% of the Critical Loads at local nature sites. Therefore, all impacts can be screened out as 'insignificant'.

3 Summary

This updated air quality impact assessment has been produced in response to the Schedule 5 request issued by the EA. The impact of emissions of ammonia and VOCs from the odour abatement system has been quantified using dispersion modelling, along with emissions of VOCs from the other on-site sources. The impact of emissions has been assessed against the relevant AQALs for the protection of human health and Critical Levels and Loads for the protection of ecosystems. The Applicant proposes ELVs of 9 mg/m³ for ammonia and 15 mg/m³ for VOCs for emissions from the odour abatement system.

Based on the results of the dispersion modelling, all impacts of emissions on human health and ecology can be screened out as either 'insignificant' or 'not significant' at all areas of relevant exposure and discrete receptor locations.

Yours sincerely

FICHTNER Consulting Engineers Limited

Stuart Nock
Senior Environmental Consultant
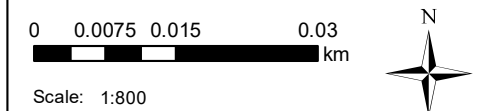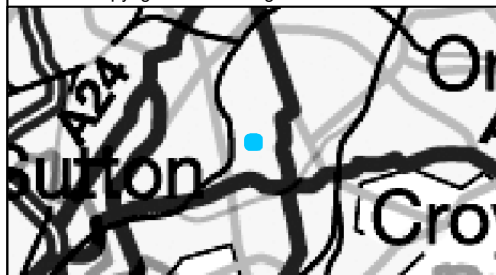
Rosalind Flavell
Lead Consultant

Appendices

A Figures

Legend

- Installation Boundary
- Odour stack
- CHP Stack
- Flare Stack
- Buildings Modelled

CHP container

CHP ancillary

CHP ancillary 1

Digester 2

Digester 1

Digester 3

Buffer tank 2

Buffer tank 1

Odour control building

SBR tank

Process building

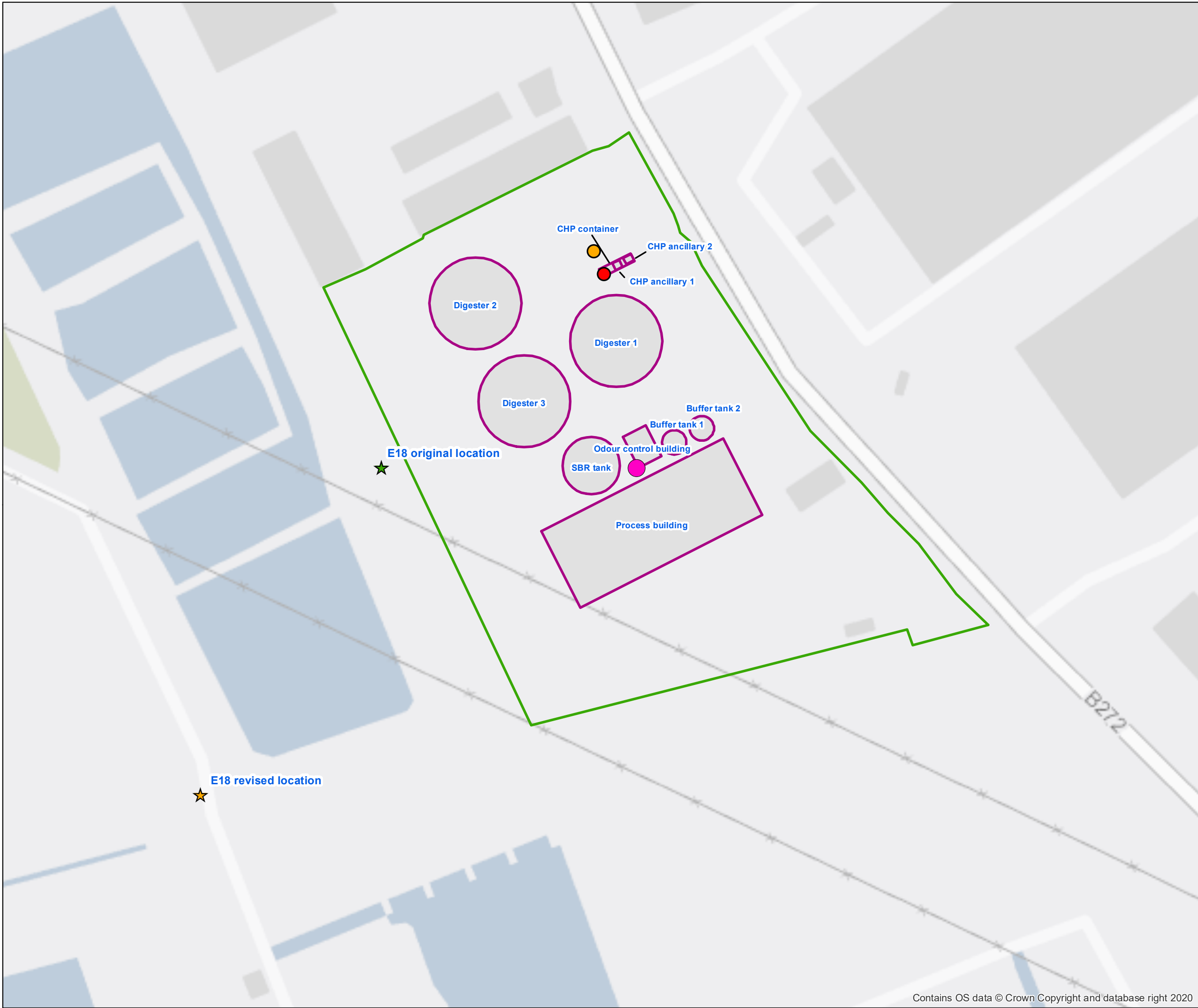| Client: | SUEZ Recycling and Recovery UK |
Site:	Beddington Lane AD Facility
Project:	Air Quality Schedule 5 Response
Title:	

Figure 1: Buildings and Sources Modelled

| Drawn by: Stuart Nock | Date: 02/04/2025 |

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0   0.0075 0.015   0.03
km

Scale: 1:800

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Legend

- Installation Boundary
- ● Odour stack
- ● CHP Stack
- ● Flare Stack
- Buildings Modelled

Receptor E18

- ★ Original location
- ★ Revised location

CHP container
CHP ancillary 2
CHP ancillary 1

Digester 2
Digester 1
Digester 3

Buffer tank 2
Buffer tank 1
Odour control building
SBR tank

Process building

E18 original location

E18 revised location

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Site: Beddington Lane AD Facility
Project: Air Quality Schedule 5 Response
Title:

Figure 2: Revised E18
Receptor Location

Drawn by: Stuart Nock | Date: 02/04/2025
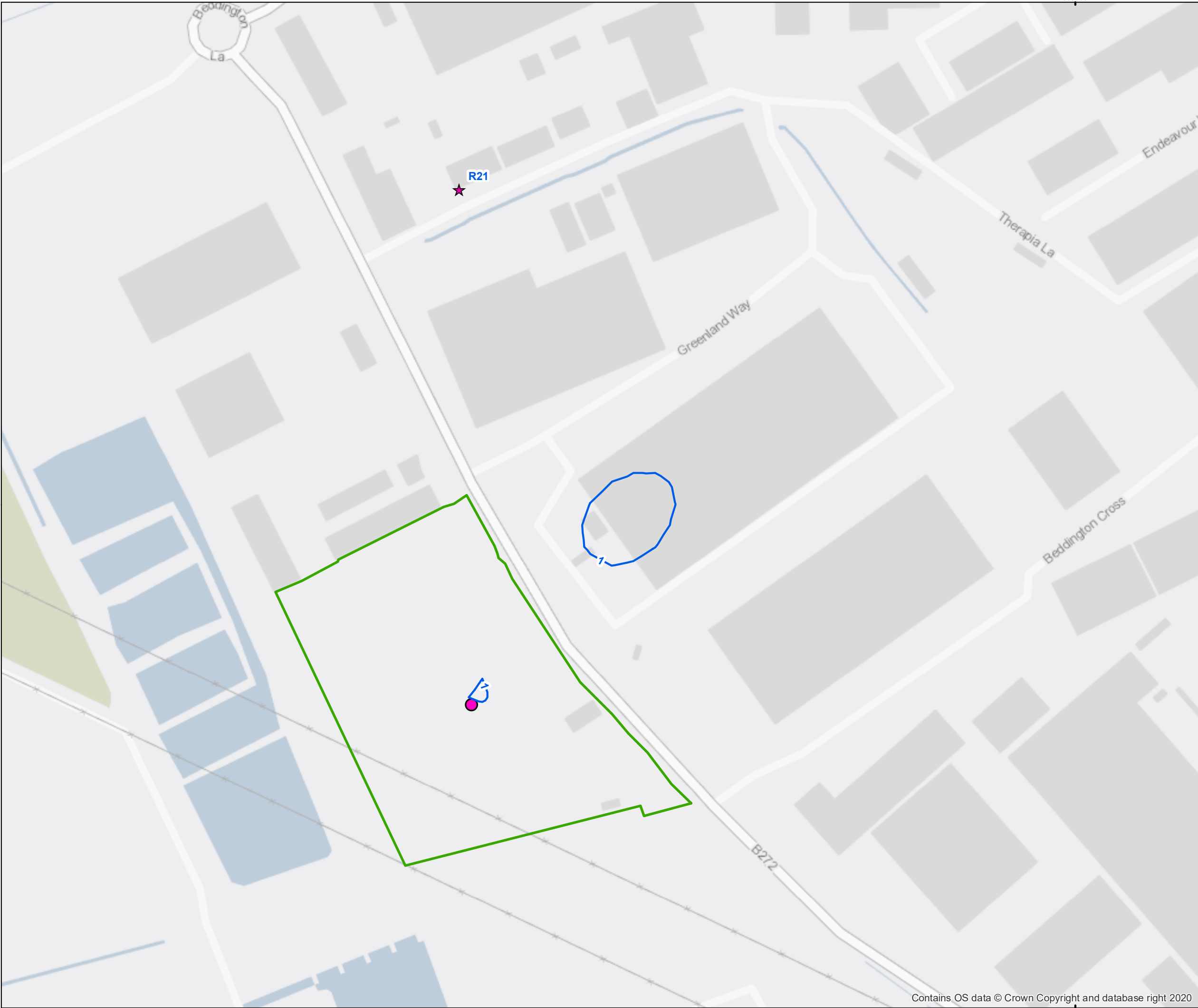© Crown copyright database right 2025

0 0.0125 0.025   0.05
km
Scale: 1:1,250

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B272

Legend

- Installation Boundary
- Odour stack
- Human receptors
- Annual mean ammonia as % of AQAL - odour stack

530000

R21

Beddington La

Endeavour

Therapia La

Greenland Way

Beddington Cross

B272

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Site:	Beddington Lane AD Facility
Project:	Air Quality Schedule 5 Response
Title:	

Figure 3: Annual mean ammonia

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0   0.02   0.04   0.08
km

Scale: 1:2,000

N

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Legend
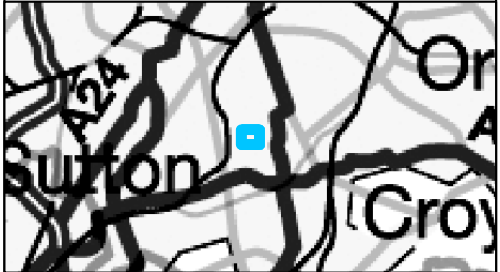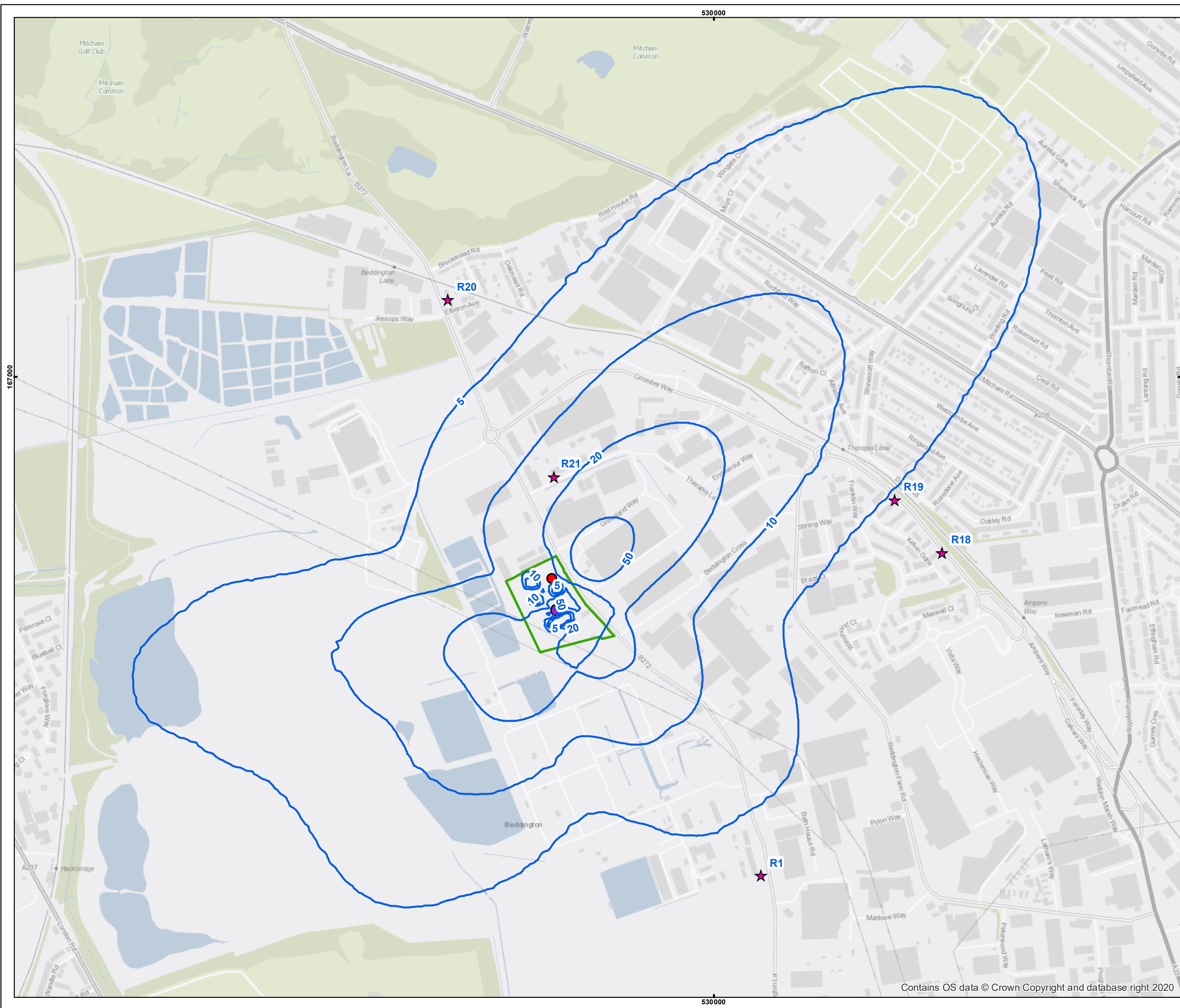
Installation Boundary

Odour stack

Biogas CHP Engine Stack

Human receptors

Annual mean VOCs as benzene as % of AQAL - odour stack + CHP engine

Note: Assumes all VOCs emitted as benzene

Client:	SUEZ Recycling and Recovery UK
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Title:	

Figure 4: Annual mean VOCs as Benzene

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Scale: 1:7,500

0   0.075   0.15   0.3
km

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Legend

- Installation Boundary
- Odour stack
- Biogas CHP Engine Stack
- Human receptors
- 24-hour mean VOCs as benzene as % of AQAL - odour stack + CHP enginet

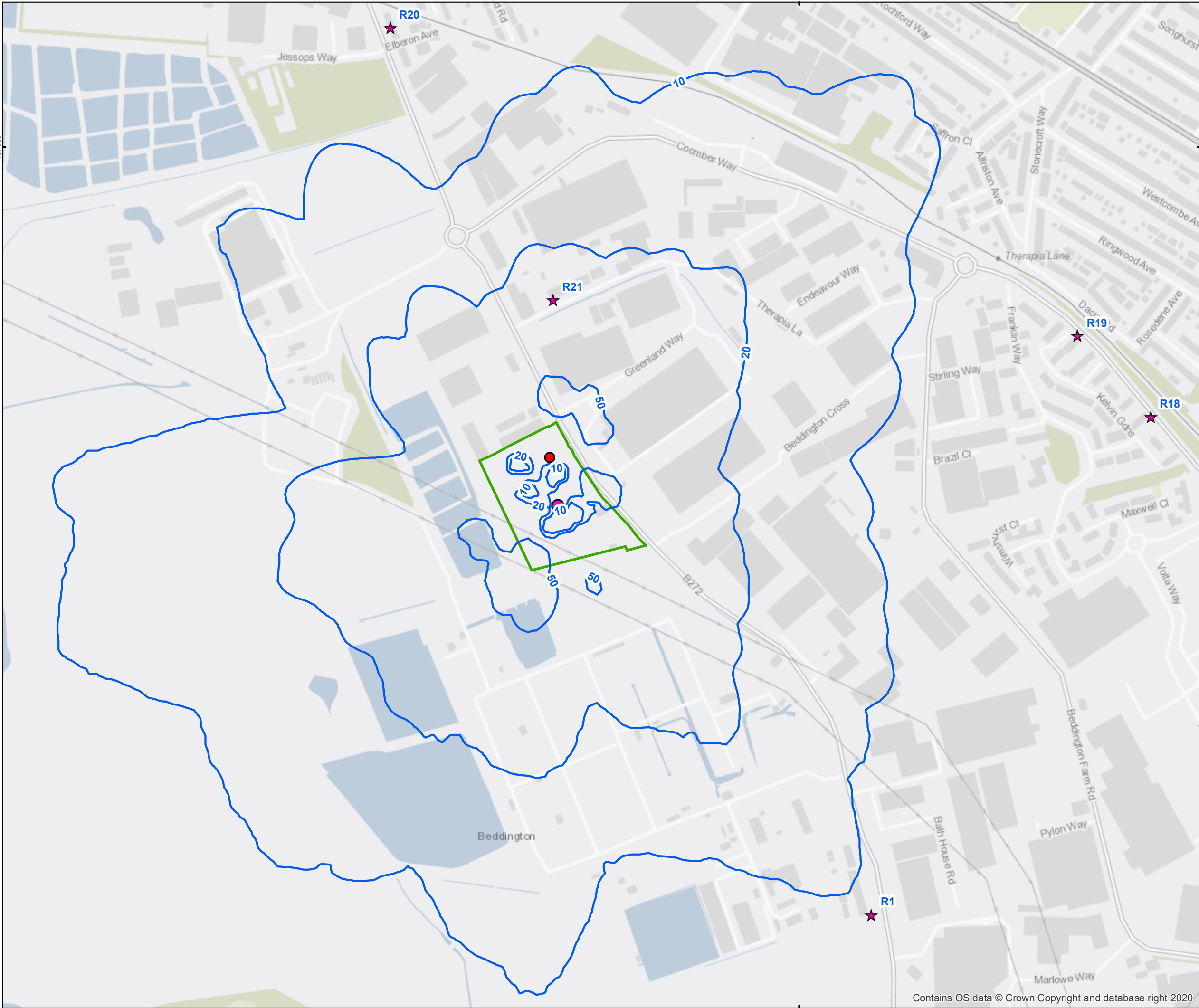Note: Assumes all VOCs emitted as benzene

Client:	SUEZ Recycling and Recovery UK
Site:	Beddington Lane AD Facility
Project:	Air Quality Schedule 5 Response
Title:	

Figure 5: 24-hour mean VOCs as Benzene

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Scale: 1:5,000

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B Deposition Results

Table 9: Results – nitrogen deposition

Ref	Site	NCL class	PC N dep kgN/ha/yr	% of Lower CL[1]
European designated sites (within 10 km) and UK designated sites (within 2 km)				
E1	Wimbledon Common SAC	Dry heaths	0.010	0.20%
E2	Richmond Park SAC	Not sensitive	-	-
Local nature sites (within 2 km)				
E3	Spencer Road Wetlands LNR	Rich fens	0.225	1.50%
		Woodland[2]	0.343	3.43%
E4	Wandle Valley Wetland LNR	Rich fens	0.200	1.34%
		Woodland	0.305	3.05%
E5	The Spinney Carshalton LNR	Woodland	0.328	3.28%
E6	Wilderness Island LNR	Grassland[3]	0.224	3.74%
		Woodland	0.341	3.41%
E7	Bandon Hill Cemetery LWS	Grassland	0.073	1.21%
		Woodland	0.110	1.10%
E8	Caraway Place Pond	Rich fens	0.234	1.56%
		Woodland	0.356	3.56%
E9	Croydon Cemetery Complex LWS	Grassland	1.220	20.33%
		Woodland	1.852	18.52%
E10	Land North of Goat Road LWS	Grassland	0.124	2.07%
		Woodland	0.188	1.88%
E11	Mill Green LWS	Grassland	0.171	2.85%
E12	Mitcham Common LWS	Grassland	0.291	4.85%
		Woodland	0.442	4.42%
E13	St Mary's Court Wildflower Area, Bute Road LWS	Grassland	0.138	2.30%
E14	Waddon Ponds LWS	Rich fens	0.148	0.99%
E15	Wandle Park LWS	Grassland	0.122	2.03%
		Woodland	0.185	1.85%
E16	Upper River Wandle LWS	Grassland	0.160	2.66%
		Woodland	0.243	2.43%
E17	River Wandle SMI	Grassland	0.141	2.36%
		Woodland	0.215	2.15%
E18	Beddington Farmlands SMI	Grassland	3.929	65.49%
		Woodland	5.955	59.55%
E19	Beddington Park SBI	Grassland	0.530	8.84%
		Woodland	0.804	8.04%

Ref	Site	NCL class	PC	
			PC N dep kgN/ha/yr	**% of Lower CL[1]**
E20	Therapia Lane Rough, SBI	Grassland	1.795	29.91%
		Woodland	2.722	27.22%
E21	Queen Elizabeth Walk SLI	Grassland	0.096	1.60%
		Woodland	0.146	1.46%

Note:

[1] *Refer to the original assessment for the Critical Loads applied.*

[2] *"Woodland" nitrogen critical load class = broadleaved deciduous woodland.*

[3] *"Grassland" nitrogen critical load class = non-Mediterranean dry acid and neutral closed grassland.*

Table 10: Results – acid deposition

Ref	Site	Acidity class	PC A dep keq/ha/yr	% of CL function[1]
European designated sites (within 10 km) and UK designated sites (within 2 km)				
E1	Wimbledon Common SAC	Dwarf shrub heath	0.001	0.21%
E2	Richmond Park SAC	Fen, marsh and swamp[2]	-	-
Local nature sites (within 2 km)				
E3	Spencer Road Wetlands LNR	Fen, marsh and swamp	-	-
		Woodland[3]	0.029	1.36%
E4	Wandle Valley Wetland LNR	Fen, marsh and swamp	-	-
		Woodland	0.026	0.93%
E5	The Spinney Carshalton LNR	Woodland	0.028	1.28%
E6	Wilderness Island LNR	Grassland[4]	0.018	1.36%
		Woodland	0.029	1.33%
E7	Bandon Hill Cemetery LWS	Grassland	0.006	0.13%
		Woodland	0.009	0.11%
E8	Caraway Place Pond	Fen, marsh and swamp	-	-
		Woodland	0.030	1.40%
E9	Croydon Cemetery Complex LWS	Grassland	0.098	7.24%
		Woodland	0.155	6.99%
E10	Land North of Goat Road LWS	Grassland	0.010	0.76%
		Woodland	0.016	0.75%
E11	Mill Green LWS	Grassland	0.014	1.05%
E12	Mitcham Common LWS	Grassland	0.023	1.75%
		Woodland	0.037	1.72%
E13	St Mary's Court Wildflower Area, Bute Road LWS	Grassland	0.011	0.25%
E14	Waddon Ponds LWS	Fen, marsh and swamp	-	-
E15	Wandle Park LWS	Grassland	0.010	0.87%
		Woodland	0.016	0.83%
E16	Upper River Wandle LWS	Grassland	0.013	0.95%
		Woodland	0.020	0.91%
E17	River Wandle SMI	Grassland	0.011	0.84%
		Woodland	0.018	0.81%
E18	Beddington Farmlands SMI	Grassland	0.312	23.28%
		Woodland	0.487	22.64%
E19	Beddington Park SBI	Grassland	0.042	3.16%
		Woodland	0.066	3.07%

Ref	Site	Acidity class	PC	
			PC A dep keq/ha/yr	% of CL function[1]
E20	Therapia Lane Rough, SBI	Grassland	0.143	10.54%
		Woodland	0.224	10.10%
E21	Queen Elizabeth Walk SLI	Grassland	0.008	0.18%
		Woodland	0.012	0.14%

Note:

[1] *Refer to the original assessment for the Critical Loads applied.*

[2] *Fen, marsh and swamp habitat not sensitive to acidification.*

[3] *"Woodland" acidity class = unmanaged broadleafed/coniferous woodland.*

[4] *"Grassland" acidity class = acid grassland.*