Air Quality Assessment

Somerset Farm, Murrow

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Executive Summary

Redmore Environmental Ltd was commissioned by Murrow AD Plant Ltd to undertake an Air Quality Assessment in support of an Environmental Permit Variation for Murrow Anaerobic Digestion facility at Somerset Farm, Murrow.

The facility has the potential to cause air quality impacts as a result of atmospheric emissions from combustion processes on site. As such, an Air Quality Assessment was required in order to determine baseline conditions and quantify potential effects.

Dispersion modelling was undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the relevant combustion plant. The results indicated that impacts on pollutant concentrations were not predicted to be significant at any human receptor location in the vicinity of the site.

Impacts were also predicted at sensitive ecological habitats. The results indicated that emissions from the plant were not predicted to significantly affect existing conditions at any designation.

Impacts were predicted based on a worst-case assessment scenario of the combustion plant constantly emitting the maximum anticipated concentration of each pollutant throughout an entire year. As such, predicted pollutant concentrations are likely to overestimate actual impacts.

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Murrow AD Plant Ltd to undertake an Air Quality Assessment in support of an Environmental Permit Variation for Murrow Anaerobic Digestion (AD) facility at Somerset Farm, Murrow.

1.1.2 The facility has the potential to cause air quality impacts as a result of emissions from combustion processes on site. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and quantify potential effects.

1.2 Site Location and Context

1.2.1 Murrow AD plant is located on land at Somerset Farm, Murrow, at National Grid Reference (NGR): 537342, 304756. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 Biogas generated by the AD process is combusted within four Combined Heat and Power (CHP) units in order to generate electricity and heat. Two of these can also operate on liquid natural gas. In addition, the site features an emergency back-up generator and a biogas upgrader, as well as a single flare which are used to vent biogas during abnormal operation.

1.2.3 The operation of the CHP units may result in atmospheric emissions from the combustion of gaseous fuels. These have the potential to cause air quality impacts at sensitive locations within the vicinity of the site and have therefore been quantified within this report.

1.2.4 It should be noted that the generator and flare only operate during emergency situations. In addition, the biogas upgrader includes a carbon filter to prevent hydrogen sulphide releases during operation. As such, emissions from these sources are not considered to be significant and were not included within the assessment.

2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) and subsequent amendments include Air Quality Limit Values (AQLVs) for the following pollutants:

- Nitrogen dioxide (NO_2);
- Sulphur dioxide (SO_2);
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
- Particulate matter with an aerodynamic diameter of less than 2.5µm;
- Benzene (C_6H_6); and,
- Carbon monoxide (CO).

2.1.2 Air Quality Target Values were also provided for several additional pollutants.

2.1.3 The Air Quality Strategy (AQS) was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published on 28th April 2023[1]. The document contains standards, objectives and measures for improving ambient air quality, including a number of Air Quality Objectives (AQOs). These are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.1.4 Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m³)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum

[1] The AQS: Framework for Local Authority Delivery, DEFRA, 2023.

Pollutant	Air Quality Objective	
	Concentration (µg/m³)	Averaging Period
SO_2	125	24-hour mean, not to be exceeded on more than 3 occasions per annum
	350	1-hour mean, not to be exceeded on more than 24 occasions per annum
	266	15-minute mean, not to be exceeded on more than 35 occasions per annum
C_6H_6	5	Annual mean
CO	10,000	8-hour running mean

2.1.5 Table 2 summarises the advice provided in DEFRA guidance[2] on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objective Should Apply At	Objective 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 and 8-hour mean	All locations where the annual mean objective would apply, together with hotels 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.

[2] Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	-

2.2 Environmental Assessment Levels

2.2.1 An Environmental Assessment Level (EAL) is the concentration of a substance, which, in a particular environmental medium, the regulators regard as an appropriate comparator value. This enables comparison between the environmental effects of different substances in that medium and between environmental effects in different media, enabling the summation of those effects.

2.2.2 Ideally EALs to fulfil this objective would be defined for each pollutant:

- Based on the sensitivity of particular habitats or receptors (in particular three main types of receptor should be considered, protection of human health, protection of natural ecosystems and protection of specific sensitive receptors, e.g. materials, commercial activities requiring a particular environmental quality);
- Be produced according to a standardised protocol to ensure that they are consistent, reproducible and readily understood;
- Provide similar measure of protection for different receptors both within and between media; and,
- Take account of habitat specific environmental factors such as pH, nutrient status, bioaccumulation, transfer and transformation processes where necessary.

2.2.3 EALs used in this assessment were obtained from Environment Agency (EA) guidance 'Air emissions risk assessment for your environmental permit' and are summarised in Table 3.

Table 3 Environmental Assessment Levels

Pollutant	Environmental Assessment Level (µg/m³)	
	Long Term (Annual)	Short Term (24-hour)
C_6H_6	-	30

2.3 Local Air Quality Management

2.3.1 Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Industrial Pollution Control Legislation

2.4.1 Atmospheric emissions from industry are controlled in the UK through the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. The operation of an AD plant is included within the Regulations. As such, the facility is required to operate in accordance with an Environmental Permit. Amongst conditions of operation are stated Emission Limit Values (ELVs) for various pollutants produced by the processes. Compliance with these conditions must be demonstrated through periodic monitoring requirements, which have been set in order to limit potential impacts in the surrounding area.

2.5 Critical Loads and Levels

2.5.1 A critical load is defined by the UK Air Pollution Information System (APIS)[3] as:

[3] UK Air Pollution Information System, www.apis.ac.uk.

"A quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"

2.5.2 A critical level is defined as:

"Concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge"

2.5.3 A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).

2.5.4 When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedence. A larger exceedence is often considered to represent a greater risk of damage.

2.5.5 Maps of critical loads and levels and their exceedences have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as means for preventing the risk of damage. However, even a decrease in the exceedence may infer that less damage will occur.

2.5.6 Table 4 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

Table 4 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration (µg/m³)	Averaging Period
Oxides of nitrogen (NO_x)	30	Annual mean
	75	24-hour mean
SO_2	20	Annual mean for higher plants

Pollutant	Critical Level	
	Concentration (µg/m³)	Averaging Period
	10	Annual mean for sensitive lichen communities and bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystem's integrity

2.5.7 Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been identified for the relevant designations considered within the assessment in Section 3.5.

3.0 BASELINE

3.1 Introduction

3.1.1 Existing air quality conditions in the vicinity of the site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

3.2 Local Air Quality Management

3.2.1 As required by the Environment Act (1995), as amended by the Environment Act (2021), Fenland District Council (FDC) has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO_2, 24-hour mean concentrations of PM_{10} and 15-minute mean concentrations of SO_2 are above the AQOs within the district. As such, four AQMAs have been declared, with the closest to the site described as follows:

> "Wisbech AQMA no.1 (SO_2) - An area in central Wisbech surrounding the HL Flood site."

3.2.2 The site is located approximately 9.2km south-west of the AQMA. It is considered unlikely that emissions from the facility would cause significant air quality impacts over a distance of this magnitude. As such, the designation was not considered further in the context of the assessment.

3.2.3 FDC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMAs have been designated.

3.3 Air Quality Monitoring

3.3.1 Monitoring of pollutant concentrations is undertaken by FDC throughout their area of jurisdiction. The closest survey site to the facility is approximately 3.2km south-west of the boundary. Due to the distance between the two locations, it is not considered likely that similar pollution levels would occur at these positions. As such, this source of data has not been considered further in the context of the assessment.

3.4 Background Pollutant Concentrations

3.4.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist Local Authorities in their Review and Assessment of air quality. The site is located in grid square NGR: 537500, 304500. Data for this location was downloaded from the DEFRA website[4] for the purpose of the assessment and is summarised in Table 5.

Table 5 Background Pollutant Concentration Predictions

Pollutant	Predicted 2024 Background Pollutant Concentration (µg/m^3)
NO_2	6.04
SO_2	2.31
C_6H_6	0.16
CO	237

3.4.2 It should be noted that background NO_2 is predicted for 2024, SO_2 and CO for 2001, and C_6H_6 for 2010. These are the most recent predictions available from DEFRA and are therefore considered to provide a reasonable representation of background concentrations in the vicinity of the site.

3.5 Sensitive Receptors

3.5.1 A sensitive receptor is defined as any location which may be affected by changes in air quality. These have been defined for human and ecological receptors in the following Sections.

Human Receptors

3.5.2 A desk-top study was undertaken in order to identify any human receptor locations in the vicinity of the site that required specific consideration during the assessment. These are summarised in Table 6.

[4] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html.

Table 6 Human Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - Willow Lodge	537272.8	304994.9
R2	Residential - Poplar House	537342.8	304942.5
R3	Residential - Coronation Cottage	537456.6	304927.1
R4	Residential - Bank Farm Cottage	537964.2	305587.8
R5	Residential - Two Bridges	538072.5	305461.4
R6	Residential - Sidmouth House	538256.7	304908.8
R7	Residential - Flagg House	538243.4	304832.8
R8	Residential - Tower Farm	537474.2	303673.4
R9	Residential - Fort Farm	537164.4	304330.0
R10	Residential - Hope Cottage	536762.4	304276.4
R11	Residential - Gull Drove Cottage	536540.9	304315.1
R12	Residential - Ivy Farm	536457.3	304328.0
R13	Residential - Hope Farm	536361.7	304383.6
R14	Residential - The Cottage	536846.0	305060.8
R15	Residential - Redfern House	536862.6	305017.7
R16	Residential - White Lion Farm	537028.7	305035.7
R17	Residential - Cant's Drove Cottage	537131.2	305004.1
R18	Residential - Ivy Home	537158.6	305003.5
R19	Residential - Homefield	537202.7	305005.9

3.5.3 Reference should be made to Figure 2 for a map of the human receptor locations.

Ecological Receptors

3.5.4 Atmospheric emissions from the facility have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. The Conservation of Habitats and Species Regulations (2010) and subsequent amendments require competent authorities

to review applications and consents that have the potential to impact on ecological sites. A pre-application screening report from the EA indicated the following designations should be considered within the assessment:

- Nene Washes Special Protection Area (SPA) and Ramsar site;
- Nene Washes Special Area of Conservation (SAC); and,
- Coastal and Floodplain Grazing Marsh Protected Habitat.

3.5.5 For the purpose of the modelling assessment discrete receptors were placed at the closest points of each designation to the facility to ensure the maximum potential impact was predicted. These are summarised in Table 7.

Table 7 Ecological Receptor Locations

Receptor		NGR (m)	
		X	Y
E1	Nene Washes SAC, SPA and Ramsar	537531.1	301748.2
E2	Nene Washes SAC, SPA and Ramsar	535750.1	301051.3
E3	Nene Washes SAC, SPA and Ramsar	533672.3	300109.2
E4	Nene Washes SAC, SPA and Ramsar	531896.0	299208.9
E5	Nene Washes SAC, SPA and Ramsar	529211.6	299001.1
E6	Nene Washes SAC, SPA and Ramsar	539595.9	302970.8
E7	Nene Washes SAC, SPA and Ramsar	529211.6	299001.1
E8	Nene Washes SPA and Ramsar	539595.9	302970.8
E9	Nene Washes SPA and Ramsar	537371.7	302638.6
E10	Nene Washes SPA and Ramsar	535572.0	301690.3
E11	Nene Washes SPA and Ramsar	533406.3	301086.3
E12	Nene Washes SPA and Ramsar	531473.6	300516.8
E13	Nene Washes SPA and Ramsar	529049.1	299852.5
E14	Nene Washes SPA and Ramsar	536767.7	306545.0
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	536929.0	306585.5
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	537100.3	306625.4

Receptor		NGR (m)	
		X	Y
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	533406.3	301086.3

3.5.6 Reference should be made to Figure 3 for a map of the ecological receptor locations.

3.5.7 Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS[5] website was undertaken in order to identify the most suitable critical loads for each designation considered in the assessment.

3.5.8 The relevant critical loads for nitrogen deposition are presented in Table 8.

Table 8 Critical Loads for Nitrogen Deposition

Designation	Site Feature	Relevant Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
Nene Washes SPA and Ramsar	Anas acuta (North-western Europe)	Atlantic upper-mid % mid-low salt marshes	10	20
Nene Washes SAC	Cobitis taenia	-(a)	-(a)	-(a)
Coastal and Floodplain Grazing Marsh Protected Habitat	Coastal and floodplain grazing marsh	Low and medium altitude hay meadows	10	20

NOTE: (a) No comparable habitat with established critical load estimate available.

3.5.9 The relevant acid deposition critical loads are presented in Table 9.

5 http://www.apis.ac.uk/.

Table 9 Critical Loads for Acid Deposition

Designation	Site Feature	Relevant Acidity Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
Nene Washes SPA and Ramsar	Anas clypeata (North-western/Central Europe)	Calcareous grassland (using base cation)	0.856	4.000	4.856
Nene Washes SAC	Cobitis taenia	Freshwater	-(a)	-(a)	-(a)
Coastal and Floodplain Grazing Marsh Protected Habitat	Coastal and floodplain grazing marsh	-(a)	-(a)	-(a)	-(a)

NOTE: (a) No comparable habitat with established critical load estimate available.

3.5.10 Baseline pollutant concentrations and deposition rates at each ecological receptor were obtained from the APIS website[6] and are summarised in Table 10.

Table 10 Baseline Pollution Levels

Receptor		Annual Mean NO_x Conc. ($\mu g/m^3$)	Annual Mean SO_2 Conc. ($\mu g/m^3$)	Baseline Deposition Rate	
				Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
E1	Nene Washes SAC, SPA and Ramsar	9.05	1.38	15.33	1.13
E2	Nene Washes SAC, SPA and Ramsar	9.34	1.40	15.31	1.14
E3	Nene Washes SAC, SPA and Ramsar	9.28	2.02	15.31	1.14
E4	Nene Washes SAC, SPA and Ramsar	9.52	1.66	15.27	1.16
E5	Nene Washes SAC, SPA and Ramsar	10.35	2.83	15.17	1.18
E6	Nene Washes SAC, SPA and Ramsar	9.88	1.40	15.29	1.12
E7	Nene Washes SAC, SPA and Ramsar	10.35	2.83	15.17	1.18
E8	Nene Washes SPA and Ramsar	9.88	1.40	15.29	1.12
E9	Nene Washes SPA and Ramsar	9.29	1.37	15.34	1.13
E10	Nene Washes SPA and Ramsar	9.34	1.40	15.31	1.14

[6] http://www.apis.ac.uk/.

Receptor		Annual Mean NO_x Conc. ($\mu g/m^3$)	Annual Mean SO_2 Conc. ($\mu g/m^3$)	Baseline Deposition Rate	
				Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
E11	Nene Washes SPA and Ramsar	9.55	2.00	15.30	1.15
E12	Nene Washes SPA and Ramsar	9.99	2.09	15.26	1.16
E13	Nene Washes SPA and Ramsar	10.35	2.83	15.17	1.18
E14	Nene Washes SPA and Ramsar	8.78	1.40	15.73	1.15
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	8.78	1.40	15.73	1.15
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	8.90	1.47	15.74	1.15
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	9.55	2.00	15.30	1.15

4.0 METHODOLOGY

4.1 Introduction

4.1.1 Combustion emissions associated with the CHP units have the potential to cause increases in pollutant concentrations at sensitive locations in the vicinity of the site. These have been quantified through dispersion modelling in accordance with the methodology outlined in the following Sections.

4.2 Dispersion Model

4.2.1 Dispersion modelling was undertaken using ADMS-6 (v6.0.0.1), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-6 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

4.2.2 The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected long-term and short-term averages.

4.3 Modelling Scenarios

4.3.1 The scenarios considered in the modelling assessment for human receptors are summarised in Table 11.

Table 11 Human Receptor Assessment Scenarios

Parameter	Modelled As	
	Short Term	Long Term
NO_2	99.8th percentile (%ile) 1-hour mean	Annual mean
SO_2	99.9th %ile 15-minute mean	-

Parameter	Modelled As	
	Short Term	Long Term
	99.7th %ile 1-hour mean	
	99.2nd %ile 24-hour mean	
Total Volatile Organic Compounds (VOCs) as C_6H_6	100th %ile 24-hour mean	Annual mean
CO	100th %ile 8-hour rolling mean	-

4.3.2 Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the %iles shown in Table 11 were selected to represent the relationship between the permitted number of exceedences of short-period concentrations and the number of periods within a calendar year.

4.3.1 The scenarios considered for ecological receptors in the modelling assessment are summarised in Table 12.

Table 12 Ecological Receptor Assessment Scenarios

Parameter	Modelled As	
	Short Term	Long Term
NO_x	100th %ile 24-hour mean	Annual mean
SO_2	-	Annual mean
Nitrogen deposition	-	Annual deposition
Acid deposition	-	Annual deposition

4.3.2 Predicted pollutant concentrations were summarised in the following formats:

- Process contribution (PC) - Predicted pollutant level as a result of emissions from the CHP units only; and,
- Predicted environmental concentration (PEC) - Total predicted pollutant level as a result of emissions from the CHP units and existing baseline conditions.

4.3.3 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant AQOs, critical loads and critical levels. These criteria are collectively referred to as Environmental Quality Standards (EQSs).

4.4 Assessment Area

4.4.1 The assessment area was defined based on the facility location, anticipated pollutant dispersion patterns and the positioning of sensitive receptors. Ambient concentrations were predicted over NGR: 536289, 303628 to 538289, 305628. One Cartesian grid with a resolution of 10m was used within the model to produce data suitable for contour plotting using the Surfer software package.

4.4.2 Reference should be made to Figure 4 for a graphical representation of the assessment grid extents.

4.5 Process Conditions

4.5.1 A summary of the model inputs for the CHP units are summarised in Table 13. These were derived from stack emissions monitoring results, the relevant plant specifications and information provided by Murrow AD Plant Ltd.

Table 13 Process Conditions - CHP Units

Parameter	Unit	CHP Unit 1 and 2 (Value per Stack)	CHP Unit 3 and 4 (Value per Stack)
Stack height	m	6.50	5.70
Stack diameter	m	0.15	0.20
Exhaust gas temperature	°C	189	150
Exhaust gas oxygen (O_2) content	%	6.5	-(a)
Exhaust gas moisture content	%	12.50	-(a)
Exhaust gas flow rate	Nm^3/s	0.26	0.58
Exhaust gas flow rate	m^3/s	0.55	0.90
Exhaust gas efflux velocity	m/s	31.37	28.61

NOTE: (a) Information not available.

4.5.2 Reference should be made to Figure 4 for the emission source locations.

4.6 Emissions

4.6.1 The relevant Emission Limit Values (ELVs) for exhaust gas pollutant concentrations for the plant are shown in Table 14. It was assumed that all CHP units combust biogas. This provided a worst-case assessment as the ELVs for the fuel is higher than for natural gas.

Table 14 Pollutant Emission Concentrations

Pollutant	Pollutant Emission Concentration (mg/Nm^3)
NO_x	500
SO_2	107
VOCs	1,000
CO	1,400

4.6.2 The ELV for organic carbon is stated as total VOC. However, for the purposes of dispersion modelling it was considered that the entire VOC emission consisted of only C_6H_6. This allowed the maximum ground level impacts to be assessed with respect to the EQS. Actual plant emissions of VOC are unlikely to only consist of one species, resulting in a worst-case assessment.

4.6.3 The pollutant mass emission rates for use in the assessment were derived from the concentrations shown in Table 14 and the flow rates shown in Table 13. These are summarised in Table 15.

Table 15 Pollutant Mass Emission Rates

Pollutant	Pollutant Mass Emission Rate (g/s)			
	CHP Unit 1	CHP Unit 2	CHP Unit 3	CHP Unit 4
NO_x	0.1299	0.1299	0.2900	0.2900
SO_2	0.0278	0.0278	0.8120	0.8120
VOC	0.2597	0.2597	0.0621	0.0621
CO	0.3636	0.3636	0.5800	0.5800

4.6.4 Emissions from the CHP units were assumed to be constant, with the plant in operation for 24-hours per day, 365-days per year. This is considered to be a worst-case assessment scenario as plant shutdown or periods of reduced work load are not reflected in the modelled emissions.

4.7 NO_x to NO_2 Conversion

4.7.1 Emissions of total NO_x from combustion processes are predominantly in the form of nitric oxide (NO). Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO_2. Comparisons of ambient NO and NO_2 concentrations in the vicinity of point sources in recent years has indicated that it is unlikely that more than 30% of the NO_x is present at ground level as NO_2.

4.7.2 Ambient NO_x concentrations were predicted through dispersion modelling. Concentrations of NO_2 shown in the results section assume 70% conversion from NO_x to NO_2 for annual means and 35% conversion for 1-hour concentrations, based upon EA guidance[7].

4.8 Building Effects

4.8.1 The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures can interrupt the wind flows and cause significantly higher ground-level concentrations close to the source than would arise in the absence of the buildings.

4.8.2 Analysis of the site layout indicated that a number of structures should be included within the model in order to take account of effects on pollutant dispersion. Building input geometries are shown in Table 16.

Table 16 Building Geometries

Building	NGR (m)		Height (m)	Length / Diameter (m)	Width (m)	Angle (°)
	X	Y				
Biogas Engine Building	537229.1	304661.9	4.80	8.3	17.9	153.8

[7] https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports.

Building	NGR (m)		Height (m)	Length / Diameter (m)	Width (m)	Angle (°)
	X	Y				
CHP Unit 3 Container	537412.1	304612.3	2.60	2.5	6.8	98.1
CHP Unit 4 Container	537410.9	304602.7	2.60	2.5	6.8	97.3
Primary Digester	537238.9	304644.2	12.75	20.7	-	-
Secondary Digester	537251.1	304622.1	12.75	22.7	-	-
Digester 1	537298.8	304642.3	12.75	24.6	-	-
Digester 2	537306.5	304615.3	12.75	24.6	-	-
Digester 3	537326.1	304635.4	12.75	24.6	-	-
Digester 4	537277.5	304621.9	12.75	25.5	-	-

4.8.3 Reference should be made to Figure 4 for a map of the building locations.

4.8.4 It should be noted that the digesters specified in Table 16 are circular structures. Widths and angles for these structures have therefore not been defined.

4.9 Meteorological Data

4.9.1 Meteorological data used in the assessment was taken from Wittering meteorological station over the period 1st January 2017 to 31st December 2021 (inclusive). This observation station is located at NGR: 503490, 302412, which is approximately 32.9km west of the facility. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

4.9.2 All meteorological files used in the assessment were provided by Atmospheric Dispersion Modelling Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 for wind roses of the utilised meteorological records.

4.10 Roughness Length

4.10.1 A roughness length (z_0) of 0.3m was used within the model to describe the modelling extents and meteorological site. This is considered appropriate for the morphology of both areas and is suggested within ADMS-6 as being suitable for 'agricultural areas (max)'.

4.11 Monin-Obukhov Length

4.11.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 1m was used to describe the modelling extents. This value is considered appropriate for the nature of the area and is suggested within ADMS-6 as being suitable for 'rural areas'.

4.11.2 A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This value is considered appropriate for the nature of the area and is suggested within ADMS-6 as being suitable for 'small towns < 50,000'.

4.12 Terrain Data

4.12.1 Ordnance Survey OS Terrain 50 data was included in the model for the site and surrounding area in order to take account of the specific flow field produced by variations in ground height throughout the assessment extents. This was pre-processed using the method suggested by CERC[8].

4.13 Nitrogen Deposition

4.13.1 Nitrogen deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06'[9]. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used for the determination of nitrogen deposition are presented within Table 17.

[8] Note 105: Setting up Terrain Data for Input to CERC Models, CERC, 2016.

[9] Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06, EA, 2014.

Table 17 Conversion Factors to Determine Dry Deposition Flux for Nitrogen Deposition

Pollutant	Deposition Velocity (m/s)		Conversion Factor (µg/m²/s to kg/ha/yr of pollutant species)
	Grassland	Forest	
NO_2	0.0015	0.003	95.9

4.13.2 The relevant deposition velocity for each ecological receptor was selected from Table 17 based on the vegetation type present within the designation.

4.14 Acid Deposition

4.14.1 Acid deposition occurs as result of NO_2 and SO_2. Predicted ground level pollutant concentrations of both species were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors. The conversion to units of equivalents, a measure of the potential acidifying effect of a species, was undertaken using the standard conversion factors shown in Table 18.

Table 18 Conversion Factors to Determine Dry Deposition Flux for Acid Deposition

Pollutant	Deposition Velocity (m/s)		Conversion Factor (µg/m²/s to keq/ha/yr of pollutant species)
	Grassland	Forest	
NO_2	0.0015	0.003	6.84
SO_2	0.012	0.024	9.84

4.14.2 The following formula was used to calculate predicted PCs as a proportion of the critical load function where PECs were identified to be greater than the CLminN value.

PC as %CL function = ((PC of S+N deposition)/CLmaxN) x 100

4.14.3 The above formula was obtained from the APIS website[10].

[10] http://www.apis.ac.uk/.

4.14.4 It should be noted that CLminN is defined as the 'minimum critical load for nitrogen' on the APIS website[11].

4.15 Background Concentrations

4.15.1 Review of existing data in the vicinity of the site was undertaken in Section 3.0 in order to identify suitable background values for use in the assessment. This indicated the closest monitor is positioned a significant distance from the facility and therefore results are considered unlikely to be representative of the site location. As such, the background NO_2 concentration predicted by DEFRA was utilised to represent existing concentrations in the vicinity of the site.

4.15.2 FDC do not undertake monitoring of other pollutants within the vicinity of the site. As such, the background SO_2, C_6H_6 and CO concentrations predicted by DEFRA, as shown in Table 5, were utilised to represent baseline levels throughout the assessment extents.

4.15.3 Background levels at the ecological receptors were obtained from the APIS website, as summarised in Table 10.

4.15.4 It is not possible to add short-term peak baseline and process concentrations. This is because the conditions which give rise to peak ground-level concentrations of substances emitted from an elevated source at a particular location and time are likely to be different to the conditions which give rise to peak concentrations due to emissions from other sources. This point is addressed in in EA guidance 'Air emissions risk assessment for your environmental permit'[12], which advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum predicted short-term concentration due to emissions from the source to twice the annual mean baseline concentration. This approach was adopted throughout the assessment.

[11] http://www.apis.ac.uk/.

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

4.16 Assessment Criteria

Human Receptors

4.16.1 EA guidance 'Air emissions risk assessment for your environmental permit'[13] states that PCs can be screened as insignificant if they meet the following criteria:

- The short-term PC is less than 10% of the short-term environmental standard; and,
- The long-term PC is less than 1% of the long-term environmental standard.

4.16.2 If these criteria are exceeded the following guidance is provided on when whether PECs can be screened as insignificant:

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and,
- The long-term PEC is less than 70% of the long-term environmental standards.

4.16.3 Should these criteria be exceeded then additional consideration to potential impacts should be provided.

Ecological Receptors

4.16.4 EA guidance 'Air emissions risk assessment for your environmental permit'[14] states that PCs at SACs, SPAs and Ramsar sites can be screened as insignificant if they meet the following criteria:

- The short-term PC is less than 10% of the short-term environmental standard for protected conservation areas;
- The long-term PC is less than 1% of the long-term environmental standard for protected conservation areas; or,
- The long-term PC is greater than 1% and the long term PEC is less than 70% of the long term environmental standard.

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

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

4.16.5 PCs at protected habitats can be screened as insignificant if they meet the following criteria:

- The short-term PC is less than 100% of the short-term environmental standard for protected conservation areas; and,
- The long-term PC is less than 100% of the long-term environmental standard for protected conservation areas.

4.16.6 Predicted PCs have been compared to the relevant EQSs and the criteria stated above. Where the impact is within these parameters, the EA concludes that impacts associated with an installation are acceptable.

4.17 Modelling Uncertainty

4.17.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and,
- Variability - randomness of measurements used.

4.17.2 Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-5 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Meteorological data - Modelling was undertaken using five annual meteorological data sets from an observation station local to the site to account for inter-year variability. The assessment was based on the worst-case year to ensure maximum concentrations were considered;
- Surface characteristics - The z_0 and Monin-Obukhov length were determined for both the dispersion and meteorological sites based on the surrounding land uses

and guidance provided by CERC. Terrain data was included and processed using the method outlined by CERC;

- Plant operating conditions - Operational parameters were derived from stack emissions monitoring results, relevant plant specifications and information provided by Murrow AD Plant Ltd. As such, these are considered to be representative of normal operating conditions;
- Emission rates - Emission rates were derived from the relevant ELVs for the CHP units. As such, these are considered to be representative of maximum emissions; and,
- Background concentrations - Background pollutant levels were obtained from the DEFRA and APIS websites. These are considered representative of baseline air quality conditions at sensitive locations within the vicinity of the site;
- Receptor locations - A Cartesian Grid was included in the model in order to provide suitable data for contour plotting. Receptor points were also included at sensitive locations to provide additional consideration of these areas; and,
- Variability - All model inputs were as accurate as possible and worst-case conditions were considered as necessary in order to ensure a robust assessment of potential pollutant concentrations.

4.17.3 Results were considered in the context of the relevant EQSs and EA criteria. It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

5.0 RESULTS

5.1 Introduction

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 4.0. The results are outlined in the following Sections.

5.2 Maximum Pollutant Concentrations

5.2.1 The maximum predicted pollutant concentrations at any point within the modelling extents for any meteorological data set are summarised in Table 19.

Table 19 Maximum Predicted Pollutant Concentrations

Pollutant	Averaging Period	EQS (µg/m³)	PC (µg/m³)	PC Proportion of EQS (%)	PEC (µg/m³)	PEC Proportion of EQS (%)
NO_2	Annual	40	23.33	58.3	29.37	73.4
	99.8th %ile 1-hour	200	66.63	33.3	78.71	39.4
SO_2	99.2th %ile 24-hour	125	32.36	25.9	36.98	29.6
	99.73rd %ile 1-hour	350	40.47	11.6	45.09	12.9
	99.9th %ile 15-minute	266	43.26	16.3	47.88	18.0
C_6H_6	Annual	5	66.66	1333.2	66.82	1336.3
	100th %ile 24-hour	30	337.73	1125.8	338.05	1126.8
CO	8-hour rolling	10,000	524.38	5.2	998.38	10.0

5.2.2 As shown in Table 19, there were no predicted exceedences of any EQS at any location for any pollutant or averaging period of interest, with the exception of the annual mean and 24-hour mean EQSs for C_6H_6.

5.2.3 Although exceedences of the annual mean and 24-hour mean EQSs for C_6H_6 are shown in Table 19, this assumes the entire VOC emission consists of only one species. Emissions from the CHP units will comprise numerous VOC components, of which C_6H_6 is anticipated to be a very small proportion. Information obtained from stack emissions monitoring

undertaken at a similar AD plant[15] indicated a total VOC emission concentration within the exhaust gas stream of 648mg/m^3, whilst the total non-methane VOC emission (NMVOC) emission concentration was 0.16mg/m^3. Although C_6H_6 would be included in both results, the only difference between the monitored species is methane (CH_4). As such, this indicates the majority of the release is CH_4 and the maximum C_6H_6 emission from the plant is 0.16mg/m^3. This is still considered worst-case as it assumes the entire NMVOC emission is C_6H_6.

5.2.4 Based on the above, a factor was derived from the VOC monitoring results and applied to the predicted annual mean and 1-hour mean C_6H_6 concentrations to provide a more accurate representation of potential impacts in the vicinity of the site. This is shown in Table 20.

Table 20 Maximum Predicted Adjusted C_6H_6 Concentrations

Pollutant	Averaging Period	EQS (µg/m^3)	PC (µg/m^3)	PC Proportion of EQS (%)	PEC (µg/m^3)	PEC Proportion of EQS (%)
C_6H_6	Annual	5	0.02	0.4	0.17	3.5
	100th %ile 24-hour	30	0.09	0.3	0.40	1.3

5.2.5 As indicated in Table 20, predicted maximum annual mean and 1-hour C_6H_6 concentrations were below the relevant EQSs when considered in the context of actual monitoring results. As such, impacts are not considered to be significant.

5.2.6 Reference should be made to Figures 6 to 13 for graphical representations of predicted pollutant concentrations, inclusive of background pollutant levels, throughout the assessment extents. It should be noted that the values shown in the Figures are predictions from the meteorological data set which resulted in the maximum pollutant concentration for that species. For example, the maximum annual mean NO_2 concentration was predicted using the 2017 meteorological data set. As such, the contours shown in Figure 6 were produced from these outputs.

15 Stack Emissions Testing Report - Wallingford AD Plant, Catalyst Environment, 2013.

5.3 Human Receptors

5.3.1 Predicted concentrations of each pollutant at the human receptor locations identified in Table 6 are summarised in the following sections.

Nitrogen Dioxide

5.3.2 Predicted annual mean NO_2 PECs at the human receptor locations are summarised in Table 21.

Table 21 Predicted Annual Mean NO_2 Concentrations

Receptor		Predicted Annual Mean NO_2 PEC (µg/m³)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	7.07	7.08	7.14	7.02	7.00
R2	Residential - Poplar House	7.57	7.53	7.64	7.50	7.49
R3	Residential - Coronation Cottage	7.94	7.80	8.01	7.81	7.83
R4	Residential - Bank Farm Cottage	6.36	6.31	6.38	6.32	6.33
R5	Residential - Two Bridges	6.38	6.32	6.40	6.35	6.33
R6	Residential - Sidmouth House	6.59	6.43	6.47	6.51	6.45
R7	Residential - Flagg House	6.61	6.45	6.46	6.51	6.47
R8	Residential - Tower Farm	6.15	6.25	6.19	6.19	6.27
R9	Residential - Fort Farm	6.62	7.30	6.92	7.25	7.42
R10	Residential - Hope Cottage	6.25	6.41	6.34	6.36	6.44
R11	Residential - Gull Drove Cottage	6.16	6.27	6.22	6.20	6.25
R12	Residential - Ivy Farm	6.13	6.23	6.19	6.17	6.21
R13	Residential - Hope Farm	6.11	6.18	6.17	6.14	6.17
R14	Residential - The Cottage	6.35	6.40	6.38	6.27	6.25
R15	Residential - Redfern House	6.36	6.43	6.41	6.29	6.27
R16	Residential - White Lion Farm	6.52	6.56	6.54	6.40	6.38
R17	Residential - Cant's Drove Cottage	6.70	6.74	6.74	6.60	6.56

Receptor		Predicted Annual Mean NO_2 PEC (µg/m³)				
		2017	2018	2019	2020	2021
R18	Residential - Ivy Home	6.76	6.79	6.80	6.66	6.62
R19	Residential - Homefield	6.85	6.87	6.89	6.77	6.73

5.3.3 As indicated in Table 21, predicted NO_2 concentrations were below the annual mean EQS of 40µg/m³ at all human receptor locations for all meteorological data sets. Reference should be made to Figure 6 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.4 Maximum predicted annual mean NO_2 concentrations at the human receptor locations are summarised in Table 22.

Table 22 Maximum Predicted Annual Mean NO_2 Concentrations

Receptor		Predicted Annual Mean NO_2 Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Residential - Willow Lodge	1.10	7.14	2.74	17.84
R2	Residential - Poplar House	1.60	7.64	4.00	19.10
R3	Residential - Coronation Cottage	1.97	8.01	4.93	20.03
R4	Residential - Bank Farm Cottage	0.34	6.38	0.84	15.94
R5	Residential - Two Bridges	0.36	6.40	0.89	15.99
R6	Residential - Sidmouth House	0.55	6.59	1.37	16.47
R7	Residential - Flagg House	0.57	6.61	1.42	16.52
R8	Residential - Tower Farm	0.23	6.27	0.56	15.66
R9	Residential - Fort Farm	1.38	7.42	3.45	18.55
R10	Residential - Hope Cottage	0.40	6.44	1.00	16.10
R11	Residential - Gull Drove Cottage	0.23	6.27	0.56	15.66
R12	Residential - Ivy Farm	0.19	6.23	0.46	15.56
R13	Residential - Hope Farm	0.14	6.18	0.36	15.46

Receptor		Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R14	Residential - The Cottage	0.36	6.40	0.91	16.01
R15	Residential - Redfern House	0.39	6.43	0.98	16.08
R16	Residential - White Lion Farm	0.52	6.56	1.31	16.41
R17	Residential - Cant's Drove Cottage	0.70	6.74	1.76	16.86
R18	Residential - Ivy Home	0.76	6.80	1.90	17.00
R19	Residential - Homefield	0.85	6.89	2.13	17.23

5.3.5 As indicated in Table 22, PECs were below 70% of the EQS at all human receptor locations. As such, predicted effects on annual mean NO_2 concentrations are not considered to be significant, in accordance with the stated criteria.

5.3.6 Predicted 99.8th %ile 1-hour mean NO_2 PECs at the sensitive human receptors are summarised in Table 23.

Table 23 Predicted 99.8th %ile 1-hour Mean NO_2 Concentrations

Receptor		Predicted 99.8th %ile 1-hour Mean NO_2 PEC ($\mu g/m^3$)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	20.67	20.64	20.81	20.82	21.44
R2	Residential - Poplar House	22.99	21.59	22.68	22.19	22.27
R3	Residential - Coronation Cottage	23.10	22.70	23.86	22.77	22.75
R4	Residential - Bank Farm Cottage	16.11	16.30	17.19	16.01	16.17
R5	Residential - Two Bridges	16.40	16.21	16.49	15.86	16.36
R6	Residential - Sidmouth House	16.86	16.33	17.61	17.40	16.69
R7	Residential - Flagg House	17.09	16.67	17.30	17.46	17.24
R8	Residential - Tower Farm	14.64	16.07	15.87	15.40	16.46
R9	Residential - Fort Farm	20.65	21.74	20.77	20.55	21.48
R10	Residential - Hope Cottage	16.97	18.32	18.37	17.68	18.06

Receptor		Predicted 99.8th %ile 1-hour Mean NO_2 PEC (µg/m³)				
		2017	2018	2019	2020	2021
R11	Residential - Gull Drove Cottage	16.02	16.67	16.58	15.98	16.91
R12	Residential - Ivy Farm	15.63	15.91	15.59	15.49	15.99
R13	Residential - Hope Farm	15.11	15.47	15.55	15.43	15.38
R14	Residential - The Cottage	19.27	19.94	20.38	19.70	18.15
R15	Residential - Redfern House	20.14	20.59	20.56	20.47	18.27
R16	Residential - White Lion Farm	20.53	20.97	20.54	19.60	19.13
R17	Residential - Cant's Drove Cottage	20.35	20.35	20.67	19.11	19.37
R18	Residential - Ivy Home	20.62	20.20	20.29	19.21	19.35
R19	Residential - Homefield	20.44	20.15	20.12	19.80	19.92

5.3.7 As indicated in Table 23, predicted 99.8th %ile 1-hour mean NO_2 concentrations were below the EQS of 200µg/m³ at all human receptor locations. Reference should be made to Figure 7 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.8 Maximum predicted 99.8th %ile 1-hour mean NO_2 concentrations at the human receptor locations are summarised in Table 24.

Table 24 Maximum Predicted 99.8th %ile 1-hour Mean NO_2 Concentrations

Receptor		Maximum Predicted 99.8th %ile 1-hour Mean NO_2 Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) [a]
		PC	PEC		
R1	Residential - Willow Lodge	9.36	21.44	4.68	4.98
R2	Residential - Poplar House	10.91	22.99	5.46	5.81
R3	Residential - Coronation Cottage	11.78	23.86	5.89	6.27
R4	Residential - Bank Farm Cottage	5.11	17.19	2.55	2.72
R5	Residential - Two Bridges	4.41	16.49	2.20	2.34
R6	Residential - Sidmouth House	5.53	17.61	2.76	2.94

Receptor		Maximum Predicted 99.8th %ile 1-hour Mean NO_2 Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) [a]
		PC	PEC		
R7	Residential - Flagg House	5.38	17.46	2.69	2.86
R8	Residential - Tower Farm	4.38	16.46	2.19	2.33
R9	Residential - Fort Farm	9.66	21.74	4.83	5.14
R10	Residential - Hope Cottage	6.29	18.37	3.14	3.35
R11	Residential - Gull Drove Cottage	4.83	16.91	2.42	2.57
R12	Residential - Ivy Farm	3.91	15.99	1.95	2.08
R13	Residential - Hope Farm	3.47	15.55	1.73	1.84
R14	Residential - The Cottage	8.30	20.38	4.15	4.42
R15	Residential - Redfern House	8.51	20.59	4.25	4.53
R16	Residential - White Lion Farm	8.89	20.97	4.44	4.73
R17	Residential - Cant's Drove Cottage	8.59	20.67	4.29	4.57
R18	Residential - Ivy Home	8.54	20.62	4.27	4.55
R19	Residential - Homefield	8.36	20.44	4.18	4.45

NOTE (a) PC proportion of EQS minus twice the long-term background concentration.

5.3.9 As indicated in Table 24, PCs were below 10% of the EQS at all human receptor locations. As such, predicted effects on 1-hour mean NO_2 concentrations are not considered to be significant, in accordance with the stated criteria.

Sulphur Dioxide

5.3.10 Predicted 99.2nd %ile 24-hour mean SO_2 PECs at the human receptor locations are summarised in Table 25.

Table 25 Predicted 99.2nd %ile 24-hour Mean SO_2 Concentrations

Receptor		Predicted 99.2nd %ile 24-hour Mean SO_2 PEC (µg/m³)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	6.53	6.50	6.66	6.50	6.42
R2	Residential - Poplar House	6.82	7.05	7.01	6.96	6.83
R3	Residential - Coronation Cottage	7.30	7.50	7.36	7.24	7.37
R4	Residential - Bank Farm Cottage	5.18	5.16	5.34	5.12	5.14
R5	Residential - Two Bridges	5.15	5.12	5.25	5.21	5.10
R6	Residential - Sidmouth House	5.44	5.28	5.26	5.53	5.41
R7	Residential - Flagg House	5.48	5.30	5.26	5.47	5.44
R8	Residential - Tower Farm	5.05	5.26	5.12	5.24	5.34
R9	Residential - Fort Farm	6.72	7.04	6.89	6.85	6.91
R10	Residential - Hope Cottage	5.65	5.60	5.57	5.57	5.84
R11	Residential - Gull Drove Cottage	5.29	5.36	5.28	5.37	5.44
R12	Residential - Ivy Farm	5.12	5.27	5.23	5.27	5.34
R13	Residential - Hope Farm	5.02	5.19	5.09	5.16	5.15
R14	Residential - The Cottage	5.75	6.05	5.75	5.98	5.42
R15	Residential - Redfern House	5.84	6.19	5.89	6.10	5.46
R16	Residential - White Lion Farm	6.27	6.22	6.04	6.26	5.66
R17	Residential - Cant's Drove Cottage	6.39	6.27	6.42	6.28	5.89
R18	Residential - Ivy Home	6.43	6.31	6.42	6.25	5.96
R19	Residential - Homefield	6.30	6.18	6.48	6.34	6.19

5.3.11 As indicated in Table 25, predicted 99.2nd %ile 24-hour mean SO_2 PECs were below the EQS of 125µg/m³ at all human receptor locations. Reference should be made to Figure 8 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.12 Maximum predicted 99.2nd %ile 24-hour mean SO_2 concentrations at the receptor locations are summarised in Table 26.

Table 26 Maximum Predicted 99.2nd %ile 24-hour Mean SO_2 Concentrations

Receptor		Maximum Predicted 99.2nd %ile 24-hour Mean SO_2 Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) (a)
		PC	PEC		
R1	Residential - Willow Lodge	2.04	6.66	1.63	1.69
R2	Residential - Poplar House	2.43	7.05	1.94	2.02
R3	Residential - Coronation Cottage	2.88	7.50	2.30	2.39
R4	Residential - Bank Farm Cottage	0.72	5.34	0.58	0.60
R5	Residential - Two Bridges	0.63	5.25	0.51	0.53
R6	Residential - Sidmouth House	0.91	5.53	0.73	0.76
R7	Residential - Flagg House	0.86	5.48	0.69	0.71
R8	Residential - Tower Farm	0.72	5.34	0.58	0.60
R9	Residential - Fort Farm	2.42	7.04	1.94	2.01
R10	Residential - Hope Cottage	1.22	5.84	0.98	1.01
R11	Residential - Gull Drove Cottage	0.82	5.44	0.65	0.68
R12	Residential - Ivy Farm	0.72	5.34	0.58	0.60
R13	Residential - Hope Farm	0.57	5.19	0.45	0.47
R14	Residential - The Cottage	1.43	6.05	1.15	1.19
R15	Residential - Redfern House	1.57	6.19	1.25	1.30
R16	Residential - White Lion Farm	1.65	6.27	1.32	1.37
R17	Residential - Cant's Drove Cottage	1.80	6.42	1.44	1.50
R18	Residential - Ivy Home	1.81	6.43	1.45	1.50
R19	Residential - Homefield	1.86	6.48	1.49	1.55

NOTE: (a) PC proportion of EQS minus twice the long-term background concentration.

5.3.13 As indicated in Table 26, PCs were below 10% of the EQS at all human receptor locations. As such, predicted effects on 24-hour mean SO_2 concentrations are not considered to be significant, in accordance with the stated criteria.

5.3.14 Predicted 99.7th %ile 1-hour mean SO_2 PECs at the human receptor locations are summarised in Table 27.

Table 27 Predicted 99.7th %ile 1-hour Mean SO_2 Concentrations

Receptor		Predicted 99.7th %ile 1-hour Mean SO_2 PEC (µg/m³)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	9.62	9.63	9.77	9.58	9.77
R2	Residential - Poplar House	10.90	9.98	10.65	10.42	10.49
R3	Residential - Coronation Cottage	10.68	10.69	11.12	10.67	10.83
R4	Residential - Bank Farm Cottage	6.95	6.79	7.01	6.67	6.85
R5	Residential - Two Bridges	7.00	7.04	7.01	6.69	6.93
R6	Residential - Sidmouth House	7.26	6.97	7.78	7.48	7.15
R7	Residential - Flagg House	7.34	7.17	7.37	7.66	7.55
R8	Residential - Tower Farm	5.99	6.68	6.45	6.41	7.03
R9	Residential - Fort Farm	9.59	9.95	9.42	9.54	10.15
R10	Residential - Hope Cottage	7.27	7.76	7.74	7.52	8.12
R11	Residential - Gull Drove Cottage	6.41	6.87	6.85	6.61	7.17
R12	Residential - Ivy Farm	6.33	6.76	6.54	6.41	6.68
R13	Residential - Hope Farm	6.05	6.33	6.36	6.36	6.37
R14	Residential - The Cottage	8.79	8.40	8.87	8.69	7.87
R15	Residential - Redfern House	9.13	9.09	9.28	8.98	8.08
R16	Residential - White Lion Farm	9.25	9.42	9.71	8.71	8.54
R17	Residential - Cant's Drove Cottage	9.32	9.32	9.49	8.73	8.74
R18	Residential - Ivy Home	9.31	8.98	9.37	8.72	8.74
R19	Residential - Homefield	9.21	9.23	9.15	8.81	8.81

5.3.15 As indicated in Table 27, predicted 99.7th %ile 1-hour mean SO_2 PECs were below the EQS of 350µg/m³ at all human receptor locations. Reference should be made to Figure 9 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.16 Maximum predicted 99.7th %ile 1-hour mean SO_2 concentrations at the human receptor locations are summarised in Table 28.

Table 28 Maximum Predicted 99.7th %ile 1-hour Mean SO_2 Concentrations

Receptor		Maximum Predicted 99.7th %ile 1-hour Mean SO_2 Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) (a)
		PC	PEC		
R1	Residential - Willow Lodge	5.15	9.77	1.47	1.49
R2	Residential - Poplar House	6.28	10.90	1.79	1.82
R3	Residential - Coronation Cottage	6.50	11.12	1.86	1.88
R4	Residential - Bank Farm Cottage	2.39	7.01	0.68	0.69
R5	Residential - Two Bridges	2.42	7.04	0.69	0.70
R6	Residential - Sidmouth House	3.16	7.78	0.90	0.92
R7	Residential - Flagg House	3.04	7.66	0.87	0.88
R8	Residential - Tower Farm	2.41	7.03	0.69	0.70
R9	Residential - Fort Farm	5.53	10.15	1.58	1.60
R10	Residential - Hope Cottage	3.50	8.12	1.00	1.01
R11	Residential - Gull Drove Cottage	2.55	7.17	0.73	0.74
R12	Residential - Ivy Farm	2.14	6.76	0.61	0.62
R13	Residential - Hope Farm	1.75	6.37	0.50	0.51
R14	Residential - The Cottage	4.25	8.87	1.21	1.23
R15	Residential - Redfern House	4.66	9.28	1.33	1.35
R16	Residential - White Lion Farm	5.09	9.71	1.46	1.48
R17	Residential - Cant's Drove Cottage	4.87	9.49	1.39	1.41
R18	Residential - Ivy Home	4.75	9.37	1.36	1.38
R19	Residential - Homefield	4.61	9.23	1.32	1.33

NOTE: (a) PC proportion of EQS minus twice the long-term background concentration.

5.3.17 As indicated in Table 28, PCs were below 10% of the EQS at all human receptor locations. As such, predicted effects on 1-hour mean SO_2 concentrations are not considered to be significant, in accordance with the stated criteria.

5.3.18 Predicted 99.9th %ile 15-min mean SO_2 PECs at the sensitive human receptors are summarised in Table 29.

Table 29 Predicted 99.9th %ile 15-min Mean SO_2 Concentrations

Receptor		Predicted 99.9th %ile 15-min Mean SO_2 PEC (µg/m³)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	13.06	12.51	13.10	13.04	12.92
R2	Residential - Poplar House	14.97	13.60	14.51	14.99	13.45
R3	Residential - Coronation Cottage	13.26	13.28	14.83	12.95	13.45
R4	Residential - Bank Farm Cottage	8.04	8.64	8.98	8.12	8.69
R5	Residential - Two Bridges	8.59	9.20	9.75	8.34	8.47
R6	Residential - Sidmouth House	9.32	9.10	10.10	9.36	8.84
R7	Residential - Flagg House	9.94	8.76	9.51	9.40	9.29
R8	Residential - Tower Farm	7.51	7.99	8.54	7.58	8.42
R9	Residential - Fort Farm	11.95	12.57	12.42	11.41	12.64
R10	Residential - Hope Cottage	8.68	9.44	9.50	9.33	9.67
R11	Residential - Gull Drove Cottage	8.54	8.42	8.88	8.27	8.69
R12	Residential - Ivy Farm	7.97	7.74	8.64	8.07	8.33
R13	Residential - Hope Farm	7.78	8.57	8.16	7.78	7.79
R14	Residential - The Cottage	11.40	11.36	12.68	12.00	10.17
R15	Residential - Redfern House	11.70	12.21	13.35	12.65	10.10
R16	Residential - White Lion Farm	11.17	11.45	11.33	11.18	10.44
R17	Residential - Cant's Drove Cottage	12.20	12.54	12.48	10.32	10.61
R18	Residential - Ivy Home	12.96	12.99	12.66	10.32	11.12
R19	Residential - Homefield	12.31	12.00	12.60	11.44	12.02

5.3.19 As indicated in Table 29, predicted 99.9th %ile 15-min mean SO_2 PECs were below the EQS of 266µg/m³ at all human receptor locations. Reference should be made to Figure 10 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.20 Maximum predicted 99.9th %ile 15-min mean SO_2 concentrations at the receptor locations are summarised in Table 30.

Table 30 Maximum Predicted 99.9th %ile 15-min Mean SO_2 Concentrations

Receptor		Maximum Predicted 99.9th %ile 15-min Mean SO_2 Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) [a]
		PC	PEC		
R1	Residential - Willow Lodge	8.48	13.10	3.19	3.24
R2	Residential - Poplar House	10.37	14.99	3.90	3.97
R3	Residential - Coronation Cottage	10.21	14.83	3.84	3.91
R4	Residential - Bank Farm Cottage	4.36	8.98	1.64	1.67
R5	Residential - Two Bridges	5.13	9.75	1.93	1.96
R6	Residential - Sidmouth House	5.48	10.10	2.06	2.10
R7	Residential - Flagg House	5.32	9.94	2.00	2.04
R8	Residential - Tower Farm	3.92	8.54	1.47	1.50
R9	Residential - Fort Farm	8.02	12.64	3.01	3.07
R10	Residential - Hope Cottage	5.05	9.67	1.90	1.93
R11	Residential - Gull Drove Cottage	4.26	8.88	1.60	1.63
R12	Residential - Ivy Farm	4.02	8.64	1.51	1.54
R13	Residential - Hope Farm	3.95	8.57	1.48	1.51
R14	Residential - The Cottage	8.06	12.68	3.03	3.08
R15	Residential - Redfern House	8.73	13.35	3.28	3.34
R16	Residential - White Lion Farm	6.83	11.45	2.57	2.61
R17	Residential - Cant's Drove Cottage	7.92	12.54	2.98	3.03
R18	Residential - Ivy Home	8.37	12.99	3.15	3.20

Receptor		Maximum Predicted 99.9th %ile 15-min Mean SO_2 Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) [a]
		PC	PEC		
R19	Residential - Homefield	7.98	12.60	3.00	3.05

NOTE: (a) PC proportion of EQS minus twice the long-term background concentration.

5.3.21 As indicated in Table 30, PCs were below 10% of the EQS at all human receptor locations. As such, predicted effects on 15-min mean SO_2 concentrations are not considered to be significant, in accordance with the stated criteria.

Volatile Organic Compounds

5.3.22 Predicted annual mean VOC (as C_6H_6) PECs at the sensitive human receptors are summarised in Table 31. It should be noted that the presented results have taken monitoring data into consideration when determining the potential C_6H_6 content of the total VOC emission, as detailed previously.

Table 31 Predicted Annual Mean VOC (as C_6H_6) Concentrations

Receptor		Predicted Annual Mean VOC (as C_6H_6) PEC (µg/m³)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	0.1568	0.1568	0.1568	0.1567	0.1567
R2	Residential - Poplar House	0.1572	0.1571	0.1572	0.1571	0.1571
R3	Residential - Coronation Cottage	0.1575	0.1573	0.1575	0.1574	0.1574
R4	Residential - Bank Farm Cottage	0.1562	0.1562	0.1563	0.1562	0.1562
R5	Residential - Two Bridges	0.1563	0.1562	0.1563	0.1562	0.1562
R6	Residential - Sidmouth House	0.1564	0.1563	0.1563	0.1564	0.1563
R7	Residential - Flagg House	0.1564	0.1563	0.1563	0.1564	0.1563
R8	Residential - Tower Farm	0.1561	0.1562	0.1561	0.1561	0.1562
R9	Residential - Fort Farm	0.1564	0.1570	0.1567	0.1569	0.1571
R10	Residential - Hope Cottage	0.1562	0.1563	0.1562	0.1562	0.1563
R11	Residential - Gull Drove Cottage	0.1561	0.1562	0.1561	0.1561	0.1562

Receptor		Predicted Annual Mean VOC (as C_6H_6) PEC (µg/m³)				
		2017	2018	2019	2020	2021
R12	Residential - Ivy Farm	0.1561	0.1561	0.1561	0.1561	0.1561
R13	Residential - Hope Farm	0.1561	0.1561	0.1561	0.1561	0.1561
R14	Residential - The Cottage	0.1562	0.1563	0.1563	0.1562	0.1562
R15	Residential - Redfern House	0.1562	0.1563	0.1563	0.1562	0.1562
R16	Residential - White Lion Farm	0.1564	0.1564	0.1564	0.1563	0.1563
R17	Residential - Cant's Drove Cottage	0.1565	0.1565	0.1565	0.1564	0.1564
R18	Residential - Ivy Home	0.1565	0.1566	0.1566	0.1565	0.1564
R19	Residential - Homefield	0.1566	0.1566	0.1567	0.1566	0.1565

5.3.23 As indicated in Table 31, predicted annual mean VOC (as C_6H_6) concentrations were below the EQS of 5µg/m³ at all human receptor locations. Reference should be made to Figure 11 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.24 Maximum predicted annual mean VOC (as C_6H_6) concentrations at the receptor locations are summarised in Table 32.

Table 32 Maximum Predicted Annual Mean VOC (as C_6H_6) Concentrations

Receptor		Maximum Predicted Annual Mean VOC (as C_6H_6) Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Residential - Willow Lodge	0.0008	0.1568	0.017	3.137
R2	Residential - Poplar House	0.0012	0.1572	0.024	3.144
R3	Residential - Coronation Cottage	0.0015	0.1575	0.030	3.150
R4	Residential - Bank Farm Cottage	0.0003	0.1563	0.005	3.125
R5	Residential - Two Bridges	0.0003	0.1563	0.005	3.125
R6	Residential - Sidmouth House	0.0004	0.1564	0.008	3.128
R7	Residential - Flagg House	0.0004	0.1564	0.009	3.129

Receptor		Maximum Predicted Annual Mean VOC (as C_6H_6) Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R8	Residential - Tower Farm	0.0002	0.1562	0.003	3.123
R9	Residential - Fort Farm	0.0011	0.1571	0.021	3.141
R10	Residential - Hope Cottage	0.0003	0.1563	0.006	3.126
R11	Residential - Gull Drove Cottage	0.0002	0.1562	0.003	3.123
R12	Residential - Ivy Farm	0.0001	0.1561	0.003	3.123
R13	Residential - Hope Farm	0.0001	0.1561	0.002	3.122
R14	Residential - The Cottage	0.0003	0.1563	0.006	3.126
R15	Residential - Redfern House	0.0003	0.1563	0.006	3.126
R16	Residential - White Lion Farm	0.0004	0.1564	0.008	3.128
R17	Residential - Cant's Drove Cottage	0.0005	0.1565	0.011	3.131
R18	Residential - Ivy Home	0.0006	0.1566	0.012	3.132
R19	Residential - Homefield	0.0007	0.1567	0.013	3.133

5.3.25 As indicated in Table 32, PCs were below 1% of the EQS at all human receptor locations. As such, predicted effects on annual mean VOC (as C_6H_6) concentrations are not considered to be significant, in accordance with the stated criteria.

5.3.26 Predicted 100th %ile 24-hour mean C_6H_6 PECs at the human receptor locations are summarised in Table 33.

Table 33 Predicted 100th %ile 24-hour Mean VOC (as C_6H_6) Concentrations

Receptor		Predicted 100th %ile 24-hour Mean VOC (as C_6H_6) PEC (µg/m³)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	0.319	0.318	0.318	0.317	0.317
R2	Residential - Poplar House	0.320	0.319	0.318	0.318	0.319
R3	Residential - Coronation Cottage	0.319	0.320	0.320	0.320	0.320

Receptor		Predicted 100th %ile 24-hour Mean VOC (as C_6H_6) PEC (µg/m³)				
		2017	2018	2019	2020	2021
R4	Residential - Bank Farm Cottage	0.314	0.314	0.314	0.313	0.314
R5	Residential - Two Bridges	0.313	0.314	0.314	0.314	0.313
R6	Residential - Sidmouth House	0.314	0.314	0.314	0.315	0.314
R7	Residential - Flagg House	0.315	0.314	0.314	0.315	0.314
R8	Residential - Tower Farm	0.313	0.314	0.314	0.314	0.314
R9	Residential - Fort Farm	0.318	0.319	0.318	0.318	0.318
R10	Residential - Hope Cottage	0.315	0.316	0.315	0.315	0.316
R11	Residential - Gull Drove Cottage	0.314	0.315	0.314	0.315	0.315
R12	Residential - Ivy Farm	0.314	0.314	0.314	0.314	0.314
R13	Residential - Hope Farm	0.313	0.314	0.314	0.314	0.314
R14	Residential - The Cottage	0.316	0.316	0.315	0.316	0.315
R15	Residential - Redfern House	0.317	0.317	0.316	0.316	0.315
R16	Residential - White Lion Farm	0.318	0.317	0.316	0.317	0.315
R17	Residential - Cant's Drove Cottage	0.318	0.317	0.318	0.317	0.317
R18	Residential - Ivy Home	0.317	0.317	0.318	0.317	0.317
R19	Residential - Homefield	0.318	0.317	0.318	0.317	0.317

5.3.27 As indicated in Table 33, predicted 100th %ile 24-hour mean VOC (as C_6H_6) concentrations were below the EQS of 30µg/m³ at all human receptor locations. Reference should be made to Figure 12 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.28 Maximum predicted 100th %ile 24-hour mean VOC (as C_6H_6) concentrations at the human receptor locations are summarised in Table 34.

Table 34 Maximum Predicted 100th %ile 24-hour Mean VOC (as C_6H_6) Concentrations

Receptor		Maximum Predicted 100th %ile 24-hour Mean VOC (as C_6H_6) Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) (a)
		PC	PEC		
R1	Residential - Willow Lodge	0.007	0.319	0.02	0.02
R2	Residential - Poplar House	0.008	0.320	0.03	0.03
R3	Residential - Coronation Cottage	0.008	0.320	0.03	0.03
R4	Residential - Bank Farm Cottage	0.002	0.314	0.01	0.01
R5	Residential - Two Bridges	0.002	0.314	0.01	0.01
R6	Residential - Sidmouth House	0.003	0.315	0.01	0.01
R7	Residential - Flagg House	0.003	0.315	0.01	0.01
R8	Residential - Tower Farm	0.002	0.314	0.01	0.01
R9	Residential - Fort Farm	0.007	0.319	0.02	0.02
R10	Residential - Hope Cottage	0.004	0.316	0.01	0.01
R11	Residential - Gull Drove Cottage	0.003	0.315	0.01	0.01
R12	Residential - Ivy Farm	0.002	0.314	0.01	0.01
R13	Residential - Hope Farm	0.002	0.314	0.01	0.01
R14	Residential - The Cottage	0.004	0.316	0.01	0.02
R15	Residential - Redfern House	0.005	0.317	0.02	0.02
R16	Residential - White Lion Farm	0.006	0.318	0.02	0.02
R17	Residential - Cant's Drove Cottage	0.006	0.318	0.02	0.02
R18	Residential - Ivy Home	0.006	0.318	0.02	0.02
R19	Residential - Homefield	0.006	0.318	0.02	0.02

NOTE (a) PC proportion of EQS minus twice the long-term background concentration.

5.3.29 As indicated in Table 34, PCs were below 10% of the EQS at all human receptor locations. As such, predicted effects on 100th %ile 24-hour mean VOC (as C_6H_6) concentrations are not considered to be significant, in accordance with the stated criteria.

Carbon Monoxide

5.3.30 Predicted 8-hour rolling mean CO PECs at the human receptor locations are summarised in Table 35.

Table 35 Predicted 8-hour Rolling Mean CO Concentrations

Receptor		Predicted 8-hour Rolling Mean CO PEC (µg/m³)				
		2017	2018	2019	2020	2021
R1	Residential - Willow Lodge	519.61	521.83	519.38	522.24	520.42
R2	Residential - Poplar House	533.58	532.28	530.06	534.12	536.17
R3	Residential - Coronation Cottage	534.13	543.58	541.11	530.43	537.50
R4	Residential - Bank Farm Cottage	502.25	497.81	501.49	493.00	494.69
R5	Residential - Two Bridges	491.99	495.05	494.78	495.76	501.11
R6	Residential - Sidmouth House	508.62	495.46	498.92	498.49	497.54
R7	Residential - Flagg House	503.45	499.09	495.16	498.38	503.92
R8	Residential - Tower Farm	490.76	491.87	496.29	492.69	507.16
R9	Residential - Fort Farm	522.94	522.86	524.24	519.93	526.87
R10	Residential - Hope Cottage	504.56	508.11	509.46	507.57	502.00
R11	Residential - Gull Drove Cottage	493.35	495.05	495.07	504.91	501.62
R12	Residential - Ivy Farm	490.53	494.04	493.27	502.29	500.33
R13	Residential - Hope Farm	494.80	493.65	490.48	496.37	496.83
R14	Residential - The Cottage	521.14	513.70	510.12	520.38	512.27
R15	Residential - Redfern House	525.01	519.22	512.01	524.64	516.62
R16	Residential - White Lion Farm	518.00	530.22	517.18	518.20	507.11
R17	Residential - Cant's Drove Cottage	518.42	521.00	516.18	521.55	511.46
R18	Residential - Ivy Home	518.95	521.28	519.57	519.37	514.11
R19	Residential - Homefield	517.98	517.96	520.51	519.01	514.52

5.3.31 As indicated in Table 35, predicted CO concentrations were below the 8-hour rolling mean EQS of 10,000µg/m³ at all human receptor locations. Reference should be made to

Figure 13 for a graphical representation of predicted concentrations throughout the assessment extents.

5.3.32 Maximum predicted 100th %ile 8-hour rolling mean CO concentrations at the human receptor locations are summarised in Table 36.

Table 36 Maximum Predicted 100th %ile 8-hour Rolling Mean CO Concentrations

Receptor		Maximum Predicted 100th %ile 8-hour Rolling Mean CO Concentration (µg/m³)		PC Proportion of EQS (%)	PC Proportion of EQS Headroom (%) [a]
		PC	PEC		
R1	Residential - Willow Lodge	48.24	522.24	0.48	0.51
R2	Residential - Poplar House	62.17	536.17	0.62	0.65
R3	Residential - Coronation Cottage	69.58	543.58	0.70	0.73
R4	Residential - Bank Farm Cottage	28.25	502.25	0.28	0.30
R5	Residential - Two Bridges	27.11	501.11	0.27	0.28
R6	Residential - Sidmouth House	34.62	508.62	0.35	0.36
R7	Residential - Flagg House	29.92	503.92	0.30	0.31
R8	Residential - Tower Farm	33.16	507.16	0.33	0.35
R9	Residential - Fort Farm	52.87	526.87	0.53	0.56
R10	Residential - Hope Cottage	35.46	509.46	0.35	0.37
R11	Residential - Gull Drove Cottage	30.91	504.91	0.31	0.32
R12	Residential - Ivy Farm	28.29	502.29	0.28	0.30
R13	Residential - Hope Farm	22.83	496.83	0.23	0.24
R14	Residential - The Cottage	47.14	521.14	0.47	0.49
R15	Residential - Redfern House	51.01	525.01	0.51	0.54
R16	Residential - White Lion Farm	56.22	530.22	0.56	0.59
R17	Residential - Cant's Drove Cottage	47.55	521.55	0.48	0.50
R18	Residential - Ivy Home	47.28	521.28	0.47	0.50
R19	Residential - Homefield	46.51	520.51	0.47	0.49

5.3.33 As indicated in Table 36, PCs were below 10% of the EQS at all human receptor locations. As such, predicted effects on 100th %ile 8-hour rolling mean CO concentrations are not considered to be significant, in accordance with the stated criteria.

5.4 Ecological Receptors

5.4.1 Predicted concentrations and deposition rates of each pollutant at the ecological receptor locations identified in Table 7 are summarised in the following Sections.

Nitrogen Oxides

5.4.2 Predicted annual mean NO_x PECs at the ecological receptor locations are summarised in Table 37.

Table 37 Predicted Annual Mean NO_x Concentrations

Receptor		Predicted Annual Mean NO_x PEC (µg/m³)				
		2017	2018	2019	2020	2021
E1	Nene Washes SAC, SPA and Ramsar	9.13	9.11	9.12	9.11	9.11
E2	Nene Washes SAC, SPA and Ramsar	9.40	9.40	9.40	9.39	9.40
E3	Nene Washes SAC, SPA and Ramsar	9.31	9.34	9.33	9.32	9.35
E4	Nene Washes SAC, SPA and Ramsar	9.54	9.57	9.56	9.57	9.58
E5	Nene Washes SAC, SPA and Ramsar	10.36	10.37	10.37	10.37	10.38
E6	Nene Washes SAC, SPA and Ramsar	9.89	9.89	9.89	9.90	9.90
E7	Nene Washes SAC, SPA and Ramsar	10.36	10.36	10.36	10.36	10.36
E8	Nene Washes SPA and Ramsar	9.96	9.94	9.95	9.94	9.95
E9	Nene Washes SPA and Ramsar	9.37	9.36	9.36	9.35	9.37
E10	Nene Washes SPA and Ramsar	9.37	9.42	9.41	9.40	9.43
E11	Nene Washes SPA and Ramsar	9.57	9.60	9.60	9.61	9.63
E12	Nene Washes SPA and Ramsar	10.01	10.01	10.01	10.02	10.02
E13	Nene Washes SPA and Ramsar	10.36	10.37	10.37	10.37	10.37
E14	Nene Washes SPA and Ramsar	8.79	8.79	8.79	8.79	8.79

Receptor		Predicted Annual Mean NO_x PEC (µg/m³)				
		2017	2018	2019	2020	2021
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	8.90	8.90	8.91	8.89	8.90
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	9.01	9.02	9.03	9.02	9.03
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	9.66	9.67	9.69	9.67	9.68

5.4.3 As indicated in Table 37, predicted NO_x concentrations were below the annual mean EQS of 30µg/m³ at all ecological receptor locations.

5.4.4 Maximum predicted annual mean NO_x concentrations at the ecological receptor locations are summarised in Table 38.

Table 38 Maximum Predicted Annual Mean NO_x Concentrations

Receptor		Maximum Predicted Annual Mean NO_x Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E1	Nene Washes SAC, SPA and Ramsar	0.08	9.13	0.25	30.42
E2	Nene Washes SAC, SPA and Ramsar	0.06	9.40	0.21	31.35
E3	Nene Washes SAC, SPA and Ramsar	0.07	9.35	0.23	31.16
E4	Nene Washes SAC, SPA and Ramsar	0.06	9.58	0.21	31.94
E5	Nene Washes SAC, SPA and Ramsar	0.03	10.38	0.11	34.61
E6	Nene Washes SAC, SPA and Ramsar	0.02	9.90	0.07	33.00
E7	Nene Washes SAC, SPA and Ramsar	0.01	10.36	0.04	34.54
E8	Nene Washes SPA and Ramsar	0.08	9.96	0.27	33.21
E9	Nene Washes SPA and Ramsar	0.08	9.37	0.26	31.23
E10	Nene Washes SPA and Ramsar	0.09	9.43	0.30	31.43
E11	Nene Washes SPA and Ramsar	0.08	9.63	0.25	32.09
E12	Nene Washes SPA and Ramsar	0.03	10.02	0.11	33.41

Receptor		Maximum Predicted Annual Mean NO_x Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E13	Nene Washes SPA and Ramsar	0.02	10.37	0.06	34.56
E14	Nene Washes SPA and Ramsar	0.01	8.79	0.04	29.31
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	0.13	8.91	0.42	29.69
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	0.13	9.03	0.44	30.11
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	0.14	9.69	0.47	32.30

5.4.5 As shown in Table 38, PECs were below 1% of the EQS at Nene Washes SAC, SPA and Ramsar site. Additionally, PCs were below 100% of the EQS at the Coastal and Floodplain Grazing Marsh Protected Habitat. As such, predicted impacts on annual mean NO_x concentrations are not considered to be significant, in accordance with the stated criteria.

5.4.6 Predicted 24-hour mean NO_x PECs at the ecological receptor locations are summarised in Table 39.

Table 39 Predicted 24-hour Mean NO_x Concentrations

Receptor		Predicted 24-hour Mean NO_x PEC (µg/m³)				
		2017	2018	2019	2020	2021
E1	Nene Washes SAC, SPA and Ramsar	18.98	19.20	19.29	20.12	18.83
E2	Nene Washes SAC, SPA and Ramsar	19.42	19.87	19.96	19.54	19.70
E3	Nene Washes SAC, SPA and Ramsar	19.02	19.72	20.21	19.38	19.85
E4	Nene Washes SAC, SPA and Ramsar	19.45	19.95	20.14	19.78	20.32
E5	Nene Washes SAC, SPA and Ramsar	21.24	20.94	21.12	21.13	21.05
E6	Nene Washes SAC, SPA and Ramsar	20.06	19.98	20.09	20.10	19.99
E7	Nene Washes SAC, SPA and Ramsar	20.90	21.06	20.94	20.95	20.88

Receptor		Predicted 24-hour Mean NO_x PEC (µg/m³)				
		2017	2018	2019	2020	2021
E8	Nene Washes SPA and Ramsar	20.67	20.92	21.05	21.91	20.53
E9	Nene Washes SPA and Ramsar	19.53	19.95	19.99	19.56	19.84
E10	Nene Washes SPA and Ramsar	19.29	20.21	20.49	19.66	20.28
E11	Nene Washes SPA and Ramsar	19.81	19.84	20.38	20.10	20.19
E12	Nene Washes SPA and Ramsar	20.48	20.39	20.53	20.58	20.40
E13	Nene Washes SPA and Ramsar	20.97	21.21	21.04	21.06	20.97
E14	Nene Washes SPA and Ramsar	17.84	18.00	17.83	17.80	17.86
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	18.82	20.21	19.10	19.12	19.83
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	18.96	20.50	19.15	19.15	20.05
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	20.17	22.16	20.68	20.30	20.88

5.4.7 As indicated in Table 39, predicted NO_x concentrations were below the 24-hour mean EQS of 75µg/m³ at all ecological receptor locations.

5.4.8 Maximum predicted 24-hour mean NO_x concentrations at the ecological receptor locations are summarised in Table 40.

Table 40 Maximum Predicted 24-hour Mean NO_x Concentrations

Receptor		Maximum Predicted 24-hour Mean NO_x Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E1	Nene Washes SAC, SPA and Ramsar	2.02	20.12	2.70	26.83
E2	Nene Washes SAC, SPA and Ramsar	1.28	19.96	1.71	26.61
E3	Nene Washes SAC, SPA and Ramsar	1.65	20.21	2.20	26.94
E4	Nene Washes SAC, SPA and Ramsar	1.28	20.32	1.70	27.09
E5	Nene Washes SAC, SPA and Ramsar	0.54	21.24	0.72	28.32

Receptor		Maximum Predicted 24-hour Mean NO_x Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E6	Nene Washes SAC, SPA and Ramsar	0.34	20.10	0.46	26.80
E7	Nene Washes SAC, SPA and Ramsar	0.36	21.06	0.48	28.08
E8	Nene Washes SPA and Ramsar	2.15	21.91	2.86	29.21
E9	Nene Washes SPA and Ramsar	1.41	19.99	1.87	26.65
E10	Nene Washes SPA and Ramsar	1.81	20.49	2.41	27.31
E11	Nene Washes SPA and Ramsar	1.28	20.38	1.71	27.17
E12	Nene Washes SPA and Ramsar	0.60	20.58	0.81	27.45
E13	Nene Washes SPA and Ramsar	0.51	21.21	0.68	28.28
E14	Nene Washes SPA and Ramsar	0.44	18.00	0.58	24.00
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	2.65	20.21	3.53	26.94
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	2.70	20.50	3.60	27.33
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	3.06	22.16	4.08	29.55

5.4.9 As shown in Table 40, PCs were below 10% of the EQS at Nene Washes SAC, SPA and Ramsar. Additionally, PCs were below 100% of the EQS at the Coastal and Floodplain Grazing Marsh Protected Habitat. As such, predicted impacts on 24-hour mean NO_x concentrations are not considered to be significant, in accordance with the stated criteria.

Sulphur Dioxide

5.4.10 Predicted annual mean SO_2 PECs at the ecological receptor locations are summarised in Table 41.

Table 41 Predicted Annual Mean SO_2 Concentrations

Receptor		Predicted Annual Mean SO_2 PEC (µg/m³)				
		2017	2018	2019	2020	2021
E1	Nene Washes SAC, SPA and Ramsar	1.396	1.392	1.394	1.392	1.393
E2	Nene Washes SAC, SPA and Ramsar	1.413	1.413	1.412	1.411	1.414
E3	Nene Washes SAC, SPA and Ramsar	2.025	2.032	2.031	2.029	2.035
E4	Nene Washes SAC, SPA and Ramsar	1.664	1.671	1.669	1.671	1.673
E5	Nene Washes SAC, SPA and Ramsar	2.833	2.834	2.834	2.835	2.837
E6	Nene Washes SAC, SPA and Ramsar	1.402	1.402	1.403	1.404	1.404
E7	Nene Washes SAC, SPA and Ramsar	2.831	2.832	2.832	2.832	2.833
E8	Nene Washes SPA and Ramsar	1.418	1.413	1.415	1.413	1.414
E9	Nene Washes SPA and Ramsar	1.387	1.386	1.386	1.383	1.387
E10	Nene Washes SPA and Ramsar	1.407	1.417	1.414	1.412	1.419
E11	Nene Washes SPA and Ramsar	2.005	2.011	2.010	2.013	2.016
E12	Nene Washes SPA and Ramsar	2.094	2.095	2.095	2.096	2.097
E13	Nene Washes SPA and Ramsar	2.832	2.833	2.833	2.834	2.834
E14	Nene Washes SPA and Ramsar	1.401	1.402	1.402	1.402	1.403
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	1.425	1.426	1.427	1.424	1.426
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	1.494	1.496	1.498	1.495	1.497
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	2.024	2.027	2.030	2.026	2.028

5.4.11 As indicated in Table 41, predicted annual mean SO_2 concentrations were below the annual mean EQS of 10µg/m³ at all ecological receptor locations.

5.4.12 Maximum predicted annual mean SO_2 concentrations at the ecological receptor locations are summarised in Table 42.

Table 42 Maximum Predicted Annual Mean SO_2 Concentrations

Receptor		Maximum Predicted Annual Mean SO_2 Concentration ($\mu g/m^3$)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E1	Nene Washes SAC, SPA and Ramsar	0.016	1.396	0.16	13.96
E2	Nene Washes SAC, SPA and Ramsar	0.014	1.414	0.14	14.14
E3	Nene Washes SAC, SPA and Ramsar	0.015	2.035	0.15	20.35
E4	Nene Washes SAC, SPA and Ramsar	0.013	1.673	0.13	16.73
E5	Nene Washes SAC, SPA and Ramsar	0.007	2.837	0.07	28.37
E6	Nene Washes SAC, SPA and Ramsar	0.004	1.404	0.04	14.04
E7	Nene Washes SAC, SPA and Ramsar	0.003	2.833	0.03	28.33
E8	Nene Washes SPA and Ramsar	0.018	1.418	0.18	14.18
E9	Nene Washes SPA and Ramsar	0.017	1.387	0.17	13.87
E10	Nene Washes SPA and Ramsar	0.019	1.419	0.19	14.19
E11	Nene Washes SPA and Ramsar	0.016	2.016	0.16	20.16
E12	Nene Washes SPA and Ramsar	0.007	2.097	0.07	20.97
E13	Nene Washes SPA and Ramsar	0.004	2.834	0.04	28.34
E14	Nene Washes SPA and Ramsar	0.003	1.403	0.03	14.03
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	0.027	1.427	0.27	14.27
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	0.028	1.498	0.28	14.98
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	0.030	2.030	0.30	20.30

5.4.13 As shown in Table 42, PCs were below 1% of the EQS at Nene Washes SAC, SPA and Ramsar site. Additionally, PCs were below 100% of the EQS at the Coastal and Floodplain Grazing Marsh Protected Habitat. As such, predicted effects on annual mean SO_2 concentrations are not considered to be significant, in accordance with the stated criteria.

Nitrogen Deposition

5.4.14 Predicted annual nitrogen PC deposition rates at the receptor locations are summarised in Table 43.

Table 43 Predicted Annual Nitrogen Deposition Rates

Receptor		Predicted Annual Nitrogen Deposition Rate (kgN/ha/yr)				
		2017	2018	2019	2020	2021
E1	Nene Washes SAC, SPA and Ramsar	0.008	0.006	0.007	0.006	0.006
E2	Nene Washes SAC, SPA and Ramsar	0.006	0.006	0.006	0.005	0.006
E3	Nene Washes SAC, SPA and Ramsar	0.003	0.006	0.005	0.004	0.007
E4	Nene Washes SAC, SPA and Ramsar	0.002	0.005	0.004	0.005	0.006
E5	Nene Washes SAC, SPA and Ramsar	0.001	0.002	0.002	0.003	0.003
E6	Nene Washes SAC, SPA and Ramsar	0.001	0.001	0.001	0.002	0.002
E7	Nene Washes SAC, SPA and Ramsar	0.001	0.001	0.001	0.001	0.001
E8	Nene Washes SPA and Ramsar	0.008	0.006	0.007	0.006	0.007
E9	Nene Washes SPA and Ramsar	0.008	0.007	0.007	0.006	0.008
E10	Nene Washes SPA and Ramsar	0.003	0.008	0.007	0.006	0.009
E11	Nene Washes SPA and Ramsar	0.002	0.005	0.005	0.006	0.008
E12	Nene Washes SPA and Ramsar	0.002	0.002	0.002	0.003	0.003
E13	Nene Washes SPA and Ramsar	0.001	0.002	0.002	0.002	0.002
E14	Nene Washes SPA and Ramsar	0.001	0.001	0.001	0.001	0.001
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	0.012	0.012	0.013	0.011	0.012
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	0.011	0.012	0.013	0.012	0.013
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	0.011	0.013	0.014	0.012	0.013

5.4.15 Maximum predicted annual nitrogen deposition rates at the ecological receptor locations are summarised in Table 44.

Table 44 Maximum Predicted Annual Nitrogen Deposition Rates

Receptor		Maximum Predicted Annual Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of Low EQS (%)	
		PC	PEC	PC	PEC
E1	Nene Washes SAC, SPA and Ramsar	0.008	15.338	0.08	153.38
E2	Nene Washes SAC, SPA and Ramsar	0.006	15.316	0.06	153.16
E3	Nene Washes SAC, SPA and Ramsar	0.007	15.317	0.07	153.17
E4	Nene Washes SAC, SPA and Ramsar	0.006	15.276	0.06	152.76
E5	Nene Washes SAC, SPA and Ramsar	0.003	15.173	0.03	151.73
E6	Nene Washes SAC, SPA and Ramsar	0.002	15.292	0.02	152.92
E7	Nene Washes SAC, SPA and Ramsar	0.001	15.171	0.01	151.71
E8	Nene Washes SPA and Ramsar	0.008	15.298	0.08	152.98
E9	Nene Washes SPA and Ramsar	0.008	15.348	0.08	153.48
E10	Nene Washes SPA and Ramsar	0.009	15.319	0.09	153.19
E11	Nene Washes SPA and Ramsar	0.008	15.308	0.08	153.08
E12	Nene Washes SPA and Ramsar	0.003	15.263	0.03	152.63
E13	Nene Washes SPA and Ramsar	0.002	15.172	0.02	151.72
E14	Nene Washes SPA and Ramsar	0.001	15.731	0.01	157.31
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	0.013	15.743	0.13	157.43
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	0.013	15.753	0.13	157.53
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	0.014	15.314	0.14	153.14

5.4.16 As shown in Table 44, PCs were below 1% of the EQS at Nene Washes SAC, SPA and Ramsar site. Additionally, PCs were below 100% of the EQS at the Coastal and Floodplain Grazing Marsh Protected Habitat. As such, predicted effects on nitrogen deposition are not considered to be significant, in accordance with the stated criteria.

5.4.17 It should be noted that PECs are predicted to exceed the relevant EQSs at a number of the receptor locations as a base condition.

Acid Deposition

5.4.18 Maximum predicted annual acid deposition rates at the ecological receptor locations are summarised in Table 45.

Table 45 Predicted Annual Acid Deposition Rates

Receptor		Maximum Predicted Annual Acid PC Deposition Rate (keq/ha/yr)		PC Proportion of EQS (%)
		Nitrogen	Sulphur	
E1	Nene Washes SAC, SPA and Ramsar	0.0019	0.0005	0.1
E2	Nene Washes SAC, SPA and Ramsar	0.0016	0.0005	0.0
E3	Nene Washes SAC, SPA and Ramsar	0.0017	0.0005	0.0
E4	Nene Washes SAC, SPA and Ramsar	0.0016	0.0004	0.0
E5	Nene Washes SAC, SPA and Ramsar	0.0009	0.0002	0.0
E6	Nene Washes SAC, SPA and Ramsar	0.0005	0.0001	0.0
E7	Nene Washes SAC, SPA and Ramsar	0.0003	0.0001	0.0
E8	Nene Washes SPA and Ramsar	0.0021	0.0006	0.1
E9	Nene Washes SPA and Ramsar	0.0020	0.0006	0.1
E10	Nene Washes SPA and Ramsar	0.0023	0.0006	0.1
E11	Nene Washes SPA and Ramsar	0.0019	0.0005	0.1
E12	Nene Washes SPA and Ramsar	0.0008	0.0002	0.0
E13	Nene Washes SPA and Ramsar	0.0005	0.0001	0.0
E14	Nene Washes SPA and Ramsar	0.0003	0.0001	0.0
E15	Coastal and Floodplain Grazing Marsh Protected Habitat	0.0032	0.0009	-
E16	Coastal and Floodplain Grazing Marsh Protected Habitat	0.0033	0.0009	-

Receptor		Maximum Predicted Annual Acid PC Deposition Rate (keq/ha/yr)		PC Proportion of EQS (%)
		Nitrogen	Sulphur	
E17	Coastal and Floodplain Grazing Marsh Protected Habitat	0.0036	0.0010	-

5.4.19 As shown in Table 45, PCs were below 1% of the EQS at Nene Washes SAC, SPA and Ramsar site. As such, predicted effects on annual acid deposition are not considered to be significant, in accordance with the stated criteria.

6.0 CONCLUSION

6.1.1 Redmore Environmental Ltd was commissioned by Murrow AD Plant Ltd to undertake an Air Quality Assessment in support of an Environmental Permit Variation for the Murrow AD facility at Somerset Farm, Murrow.

6.1.2 The facility has the potential to cause air quality impacts as a result of atmospheric emissions from combustion processes on site. As such, an Air Quality Assessment was required in order to determine baseline conditions and quantify potential effects.

6.1.3 Dispersion modelling of using NO_x, SO_2, VOC (as C_6H_6) and CO emissions, as well as nitrogen and acid deposition, from the CHP units was undertaken using ADMS-5. Impacts at sensitive receptors were quantified and the results compared with the relevant EQSs and significance criteria.

6.1.4 Predicted concentrations of all pollutants were below the relevant EQSs at all locations of human exposure for all meteorological data sets modelled. Resultant impacts were not considered to be significant in accordance with the EA criteria.

6.1.5 Impacts were also predicted at sensitive ecological habitats. The results indicated that emissions from the plant are not predicted to significantly affect existing conditions at any designation in accordance with the relevant criteria.

6.1.6 Impacts were predicted based on a worst-case assessment scenario of the plant constantly emitting the maximum anticipated concentration of each pollutant throughout an entire year. As such, predicted pollutant concentrations are likely to overestimate actual impacts.

7.0 ABBREVIATIONS

APIS	Air Pollution Information System
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
C_6H_6	Benzene
CERC	Cambridge Environmental Research Consultants
CH_4	Methane
CHP	Combined Heat and Power
CO	Carbon Monoxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EAL	Environmental Assessment Levels
ELV	Emission Limit Value
EQS	Environmental Quality Standard
FDC	Fenland District Council
LAQM	Local Air Quality Management
NGR	National Grid Reference
NMVOC	Non-methane VOC emission
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
SAC	Special Area of Conservation
SPA	Special Protection Area
VOC	Volatile Organic Compounds
z_0	Roughness length
%ile	Percentile

Figures

Legend

Site Boundary

Title
Figure 1 - Site Location Plan

Project
Air Quality Assessment
Somerset Farm, Murrow

Project Reference
5500

Client
Murrow AD Plant Ltd

Redmore environmental
www.red-env.co.uk | 0161 7060075

Legend

Site Boundary

Receptor

Title
Figure 2 - Sensitive Human Receptors

Project
Air Quality Assessment
Somerset Farm, Murrow

Project Reference
5500

Client
Murrow AD Plant Ltd

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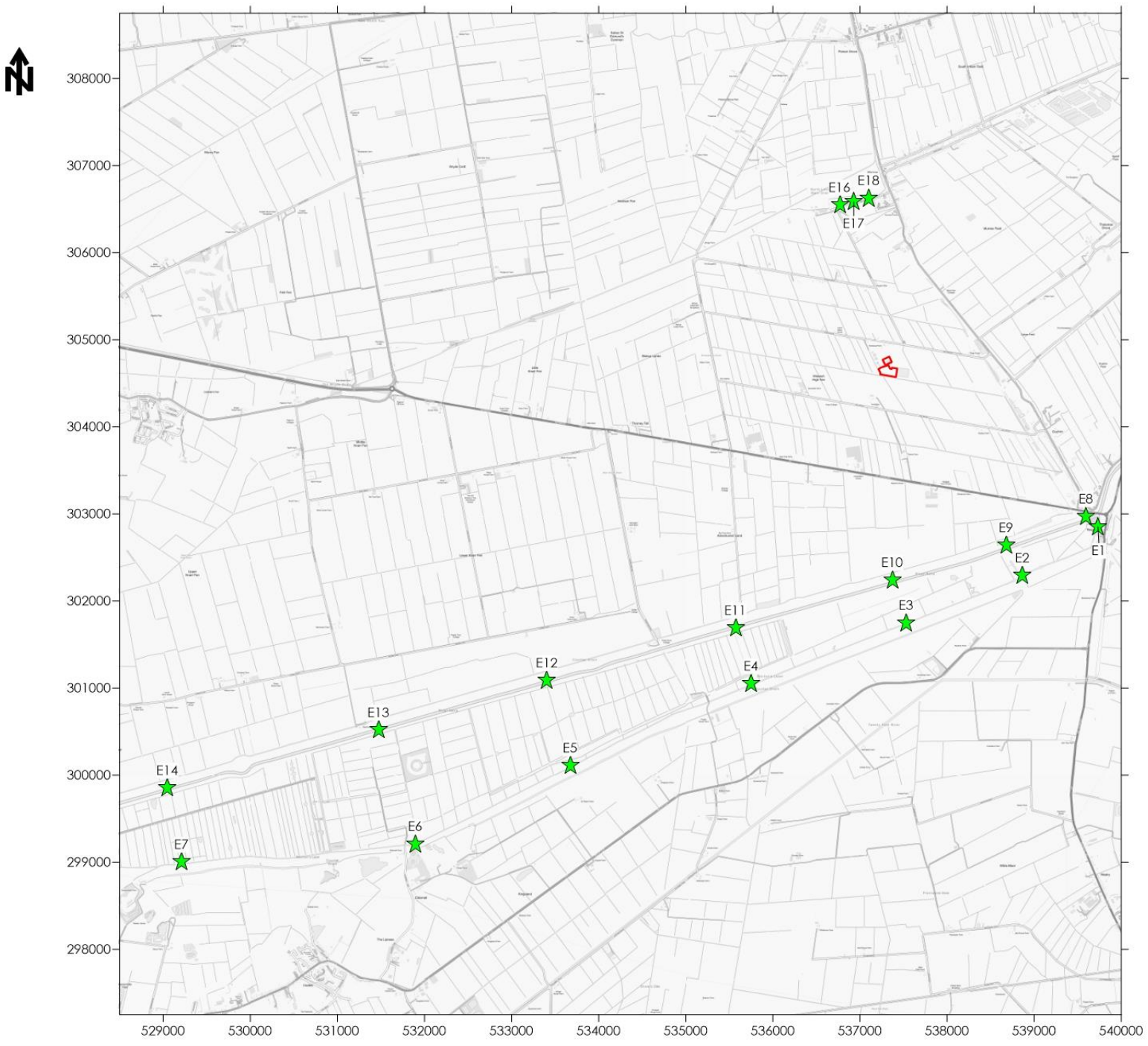

Legend

Site Boundary

Ecological Receptor

Title
Figure 3 - Ecological Receptor Locations

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Legend

Site Boundary

Source

Output Grid

Building

Title
Figure 4 - ADMS-6 Inputs

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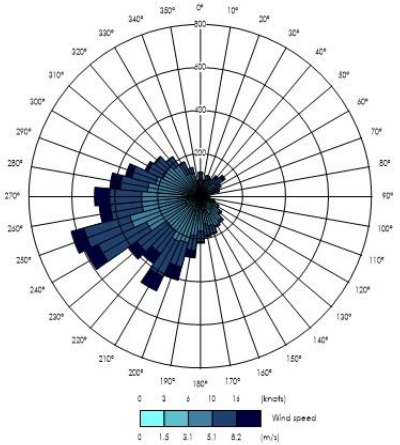
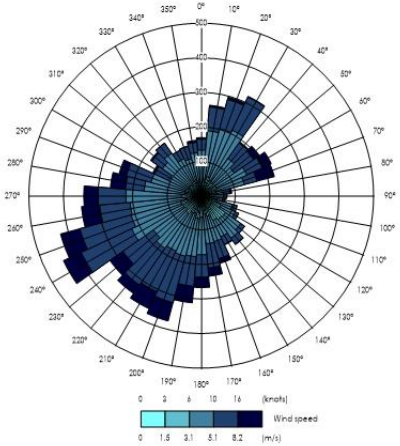
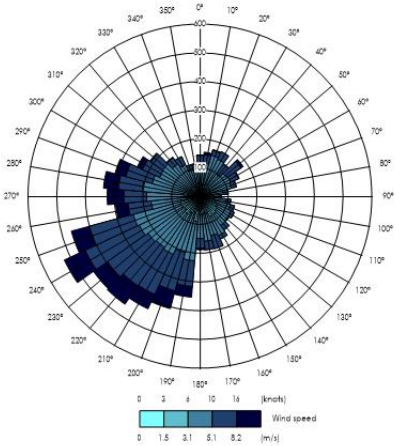


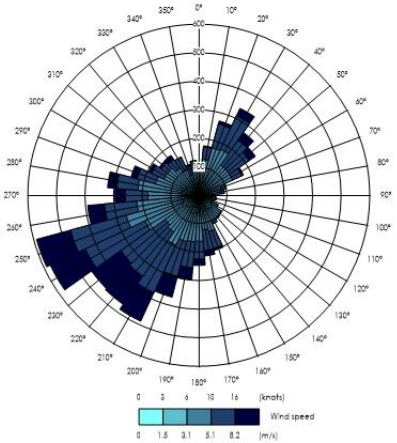
2017 Meteorological Data



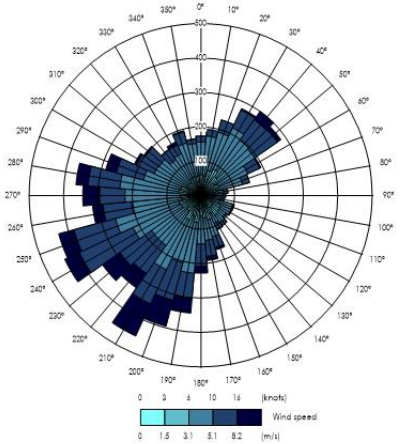
2018 Meteorological Data



2019 Meteorological Data



2020 Meteorological Data



2021 Meteorological Data

Legend

Title
Figure 5 - Wind Roses of 2017 to 2021 Wittering Meteorological Station Data

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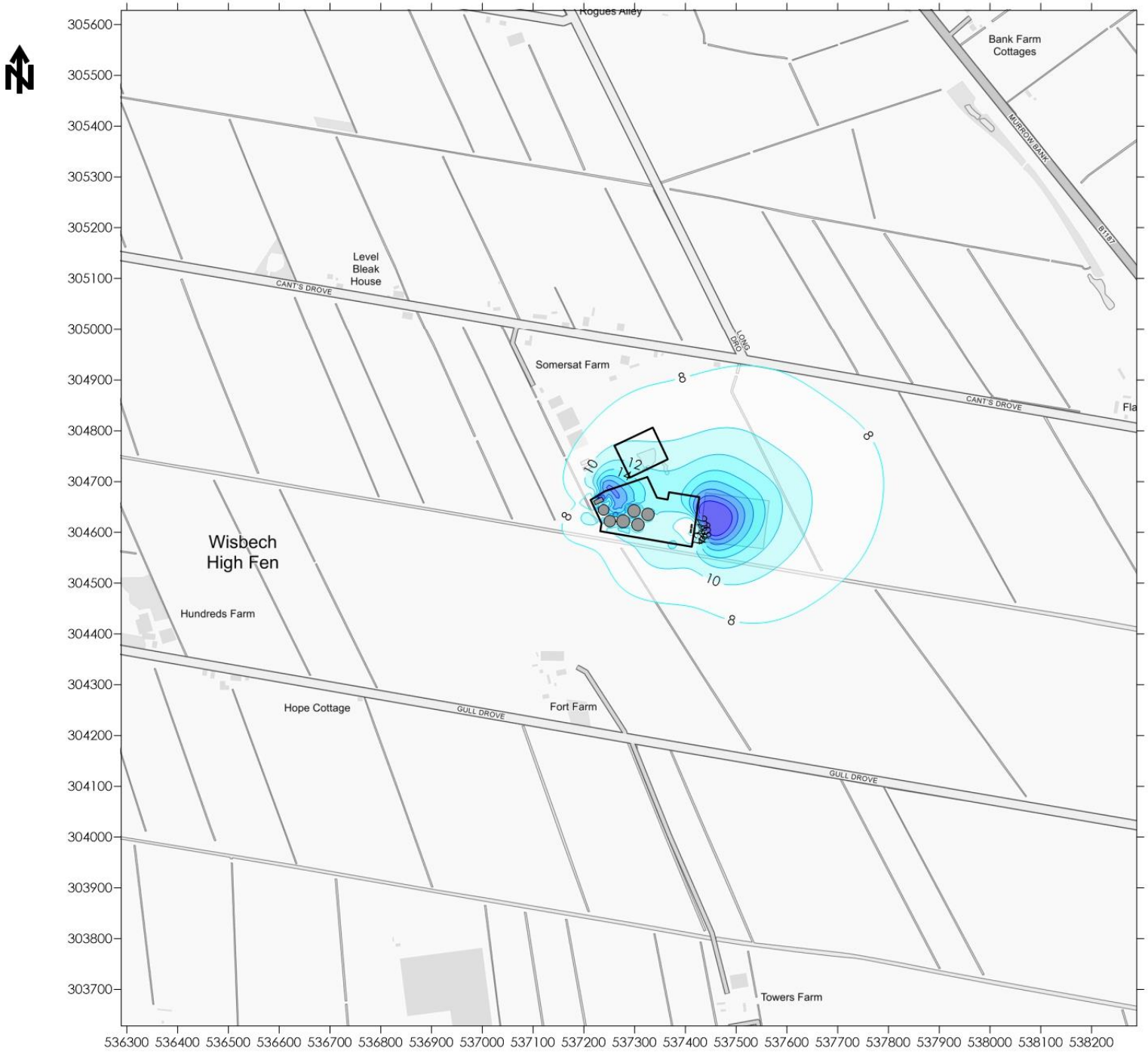

Legend

Site Boundary

Building

Annual Mean NO_2 Concentration ($\mu g/m^3$)

22
20
18
16
14
12
10
8

Title

Figure 6 - Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$)
2017 Meteorological Data

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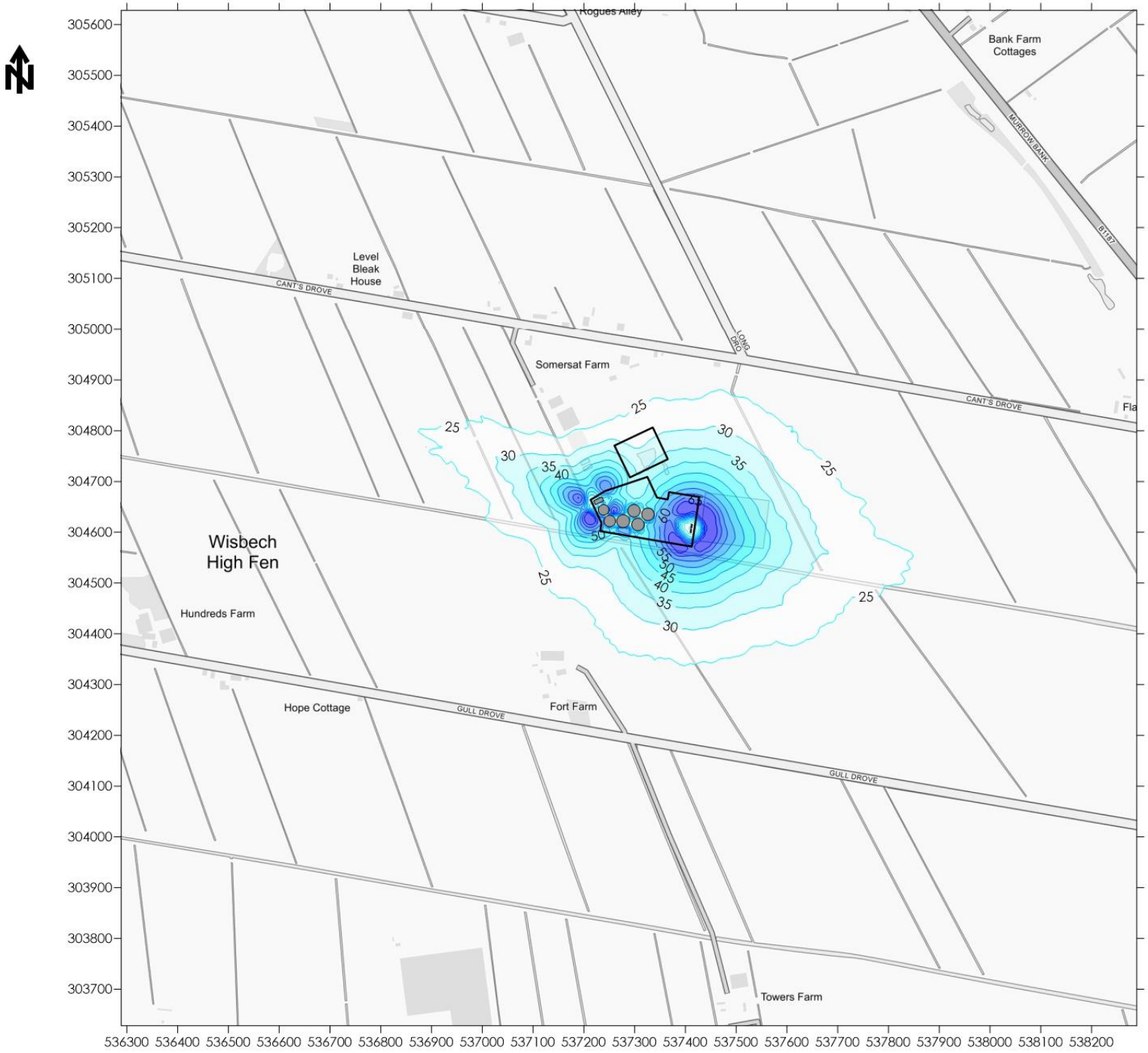

Legend

Site Boundary

Building

99.8th %ile 1-hour Mean NO_2 Concentration ($\mu g/m^3$)

70 65 60 55 50 45 40 35 30 25

Title

Figure 7 - Predicted 99.8th %ile 1-hour Mean NO_2 Concentrations ($\mu g/m^3$) 2021 Meteorological Data

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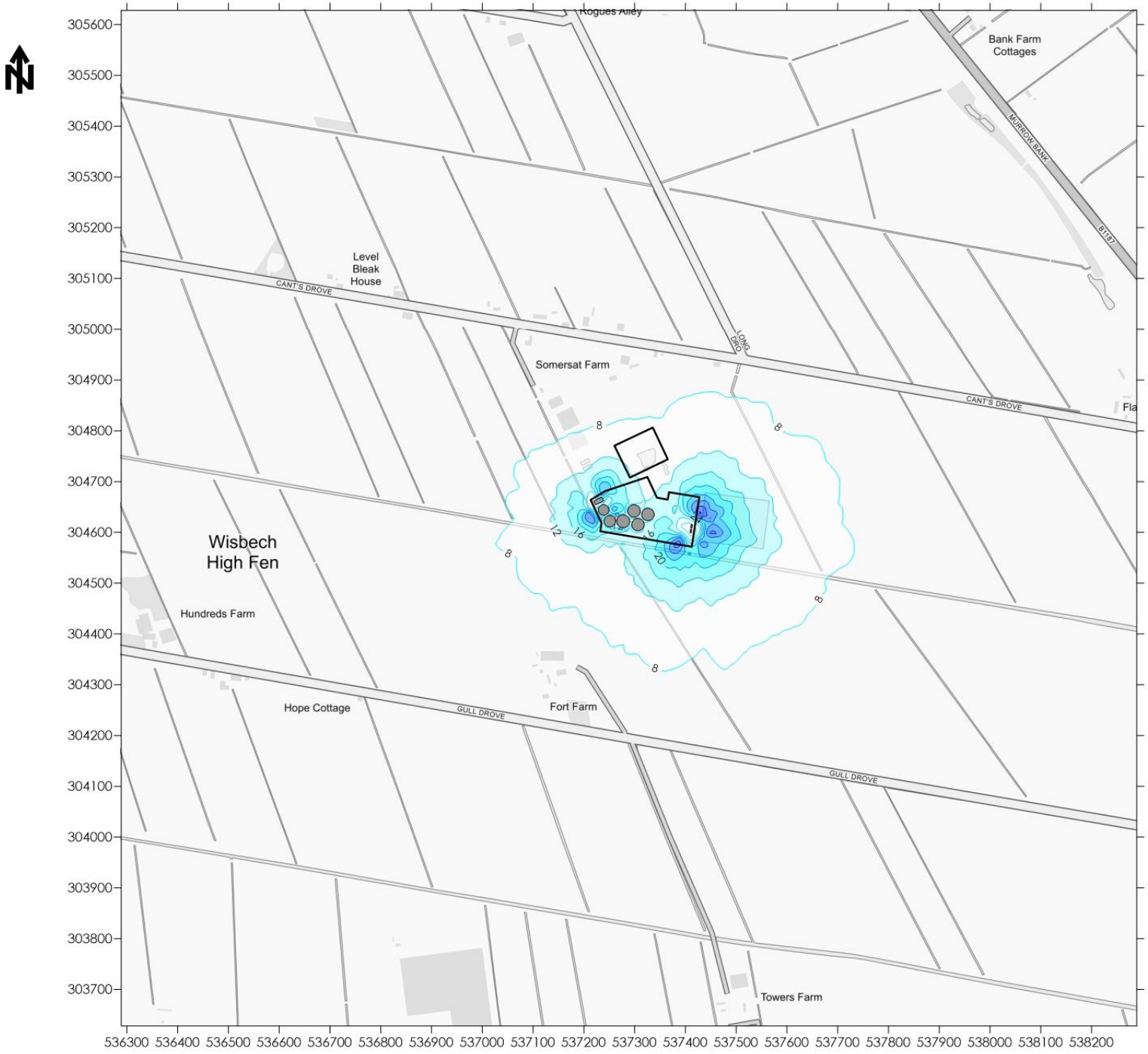

Legend

Site Boundary

Building

36
32
28
24
20
16
12
8

99.2nd %ile 24-hour Mean SO_2 Concentration (µg/m³)

Title

Figure 8 - Predicted 99.2nd %ile 24-hour Mean SO_2 Concentrations (µg/m³) 2021 Meteorological Data

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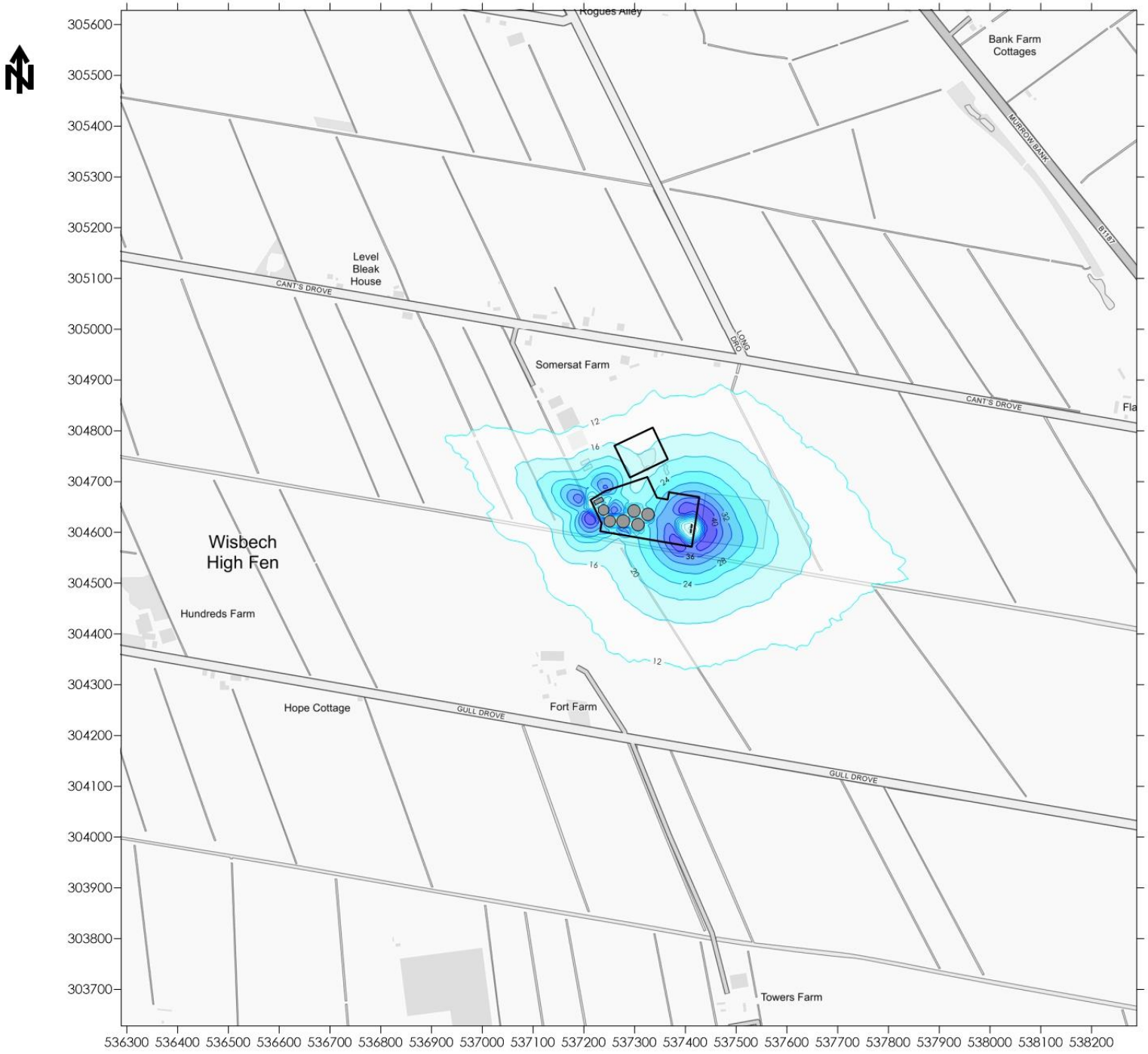

Legend

Site Boundary

Building

40
36
32
28
24
20
16
12

99.73rd %ile 1-hour Mean SO_2 Concentration (µg/m³)

Title

Figure 9 - Predicted 99.73rd %ile 1-hour Mean SO_2 Concentrations (µg/m³) 2021 Meteorological Data

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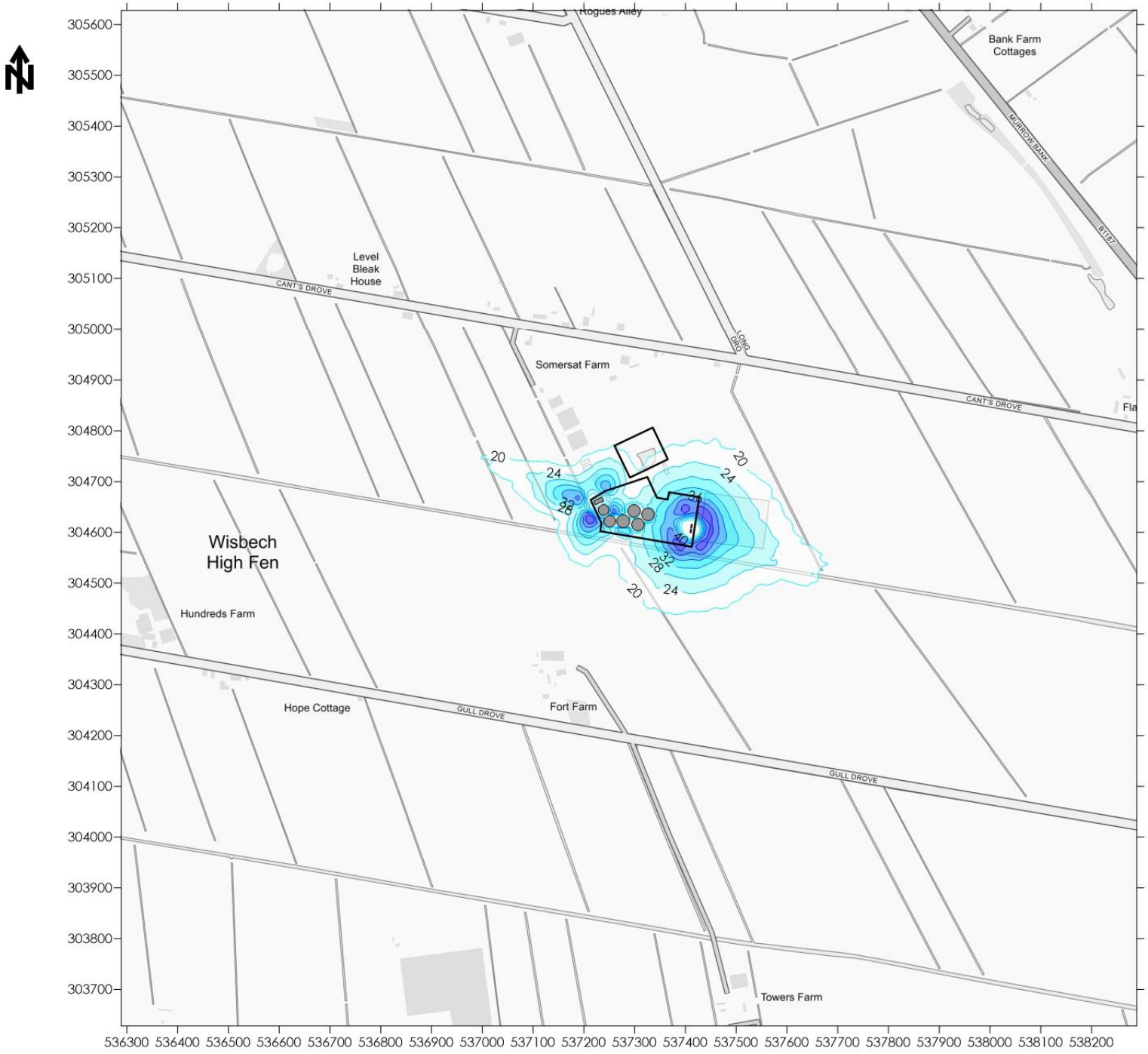

Legend

Site Boundary

Building

99.9%th %ile 15-Minute Mean SO_2 Concentration (µg/m³)

44
40
36
32
28
24
20

Title

Figure 10 - Predicted 99.9%th %ile 15-Minute Mean SO_2 Concentrations (µg/m³) 2020 Meteorological Data

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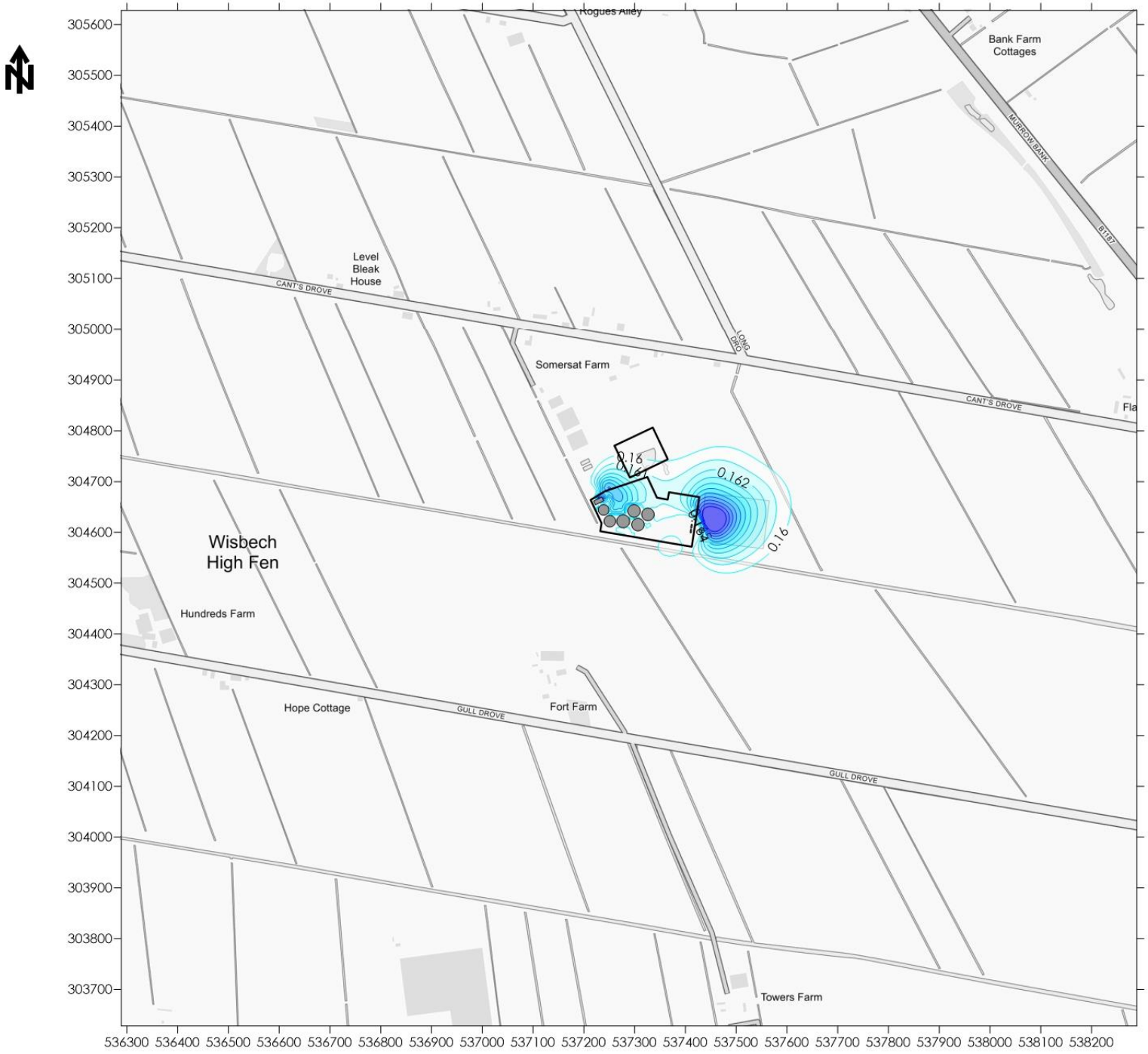

Legend

Site Boundary

Building

Annual Mean C_6H_6 Concentration ($\mu g/m^3$)

0.17
0.169
0.168
0.167
0.166
0.165
0.164
0.163
0.162
0.161
0.16

Title

Figure 11 - Predicted Annual Mean C_6H_6 Concentrations ($\mu g/m^3$)
2017 Meteorological Data

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Site Boundary

Building

0.4
0.395
0.39
0.385
0.38
0.375
0.37
0.365
0.36
0.355
0.35

100th %ile 24-hour Mean C_6H_6 Concentration (µg/m³)

Title

Figure 12 - Predicted 100th %ile 24-hour Mean C_6H_6 Concentrations (µg/m³) 2021 Meteorological Data

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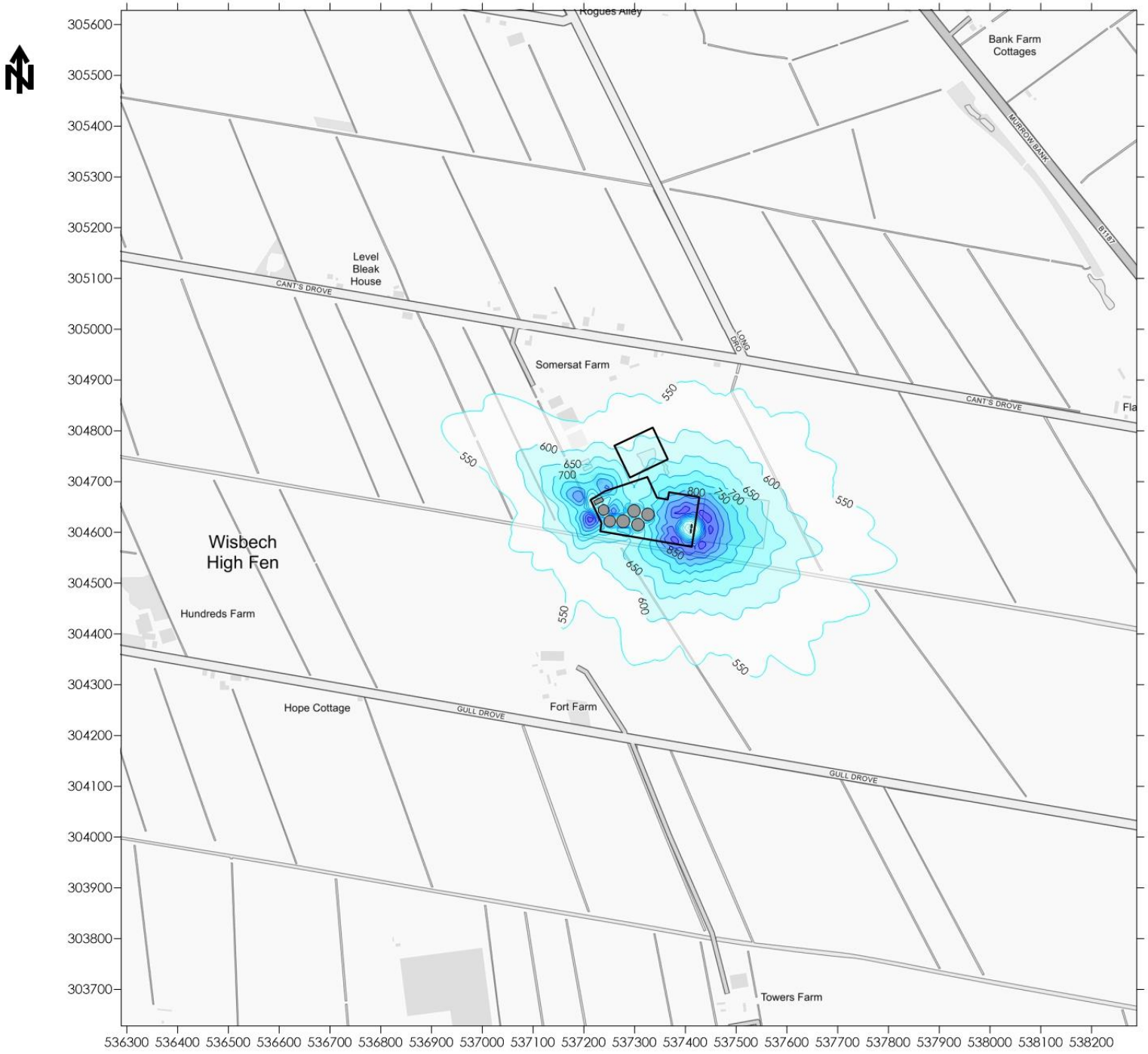

Legend

Site Boundary

Building

950
900
850
800
750
700
650
600
550

100th %ile 8-hour Rolling Mean CO Concentration (µg/m³)

Title

Figure 13 - Predicted 100th %ile 8-hour Rolling Mean CO Concentrations (µg/m³) 2017 Meteorological Data

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