Air Quality Assessment

Westgate Street, Bury St Edmunds

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Executive Summary

Redmore Environmental Ltd was commissioned by EHS Projects Ltd to undertake an Air Quality Assessment in support of an Environmental Permit Variation Application for Greene King, Westgate Street, Bury St Edmunds.

Combustion emissions from existing and proposed boilers at the site have the potential to cause air quality impacts during normal operation. As such, an Air Quality Assessment was undertaken 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 facility. The results indicated that impacts on pollutant concentrations were not predicted to be significant at any human or ecological receptor location in the vicinity of the facility.

Impacts were also predicted at relevant ecological sites. The results indicated that emissions from the facility would not significantly affect existing conditions at any designation

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by EHS Projects Ltd to undertake an Air Quality Assessment in support of an Environmental Permit Variation Application for Greene King, Westgate Street, Bury St Edmunds.

1.1.2 Combustion emissions from existing and proposed boilers at the site have the potential to cause air quality impacts during normal operation. 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 The facility is located on land at Westgate Street, Bury St Edmunds, at National Grid Reference (NGR): 585580, 2638300. Reference should be made to Figure 1 for a map of the facility and surrounding area.

1.2.2 Activities at Greene King are undertaken in accordance with the conditions of an Environmental Permit (reference: EPR/BO1122IA/V005). An Environmental Permit Variation Application is currently being prepared in order to authorise the installation of four Fulton 1.465MWth natural gas fired boilers. These will complement the following existing boilers at the facility:

- Boiler 1 - 13.2MWth natural gas fired boiler;
- Boiler 2 - 13.2MWth natural gas fired boiler; and,
- Draught Beer Boiler 2 - 2.5MWth natural gas fired boiler.

1.2.3 It should be noted that Draught Beer Boiler 1, as included in the existing Environmental Permit, has been decommissioned.

1.2.4 Combustion emissions from Boiler 1 and 2, as well as the proposed Fulton boilers, will be discharged to atmosphere at a height of 47.2m via three dedicated stacks as per current arrangements. It should be noted that emissions from the proposed Fulton boilers will be grouped within one of these stacks. Emissions from Draught Beer Boiler 2 will be discharged via a 9m stack.

1.2.5 Atmospheric emissions from the existing and proposed boilers have the potential to cause air quality impacts at sensitive locations. These have therefore been quantified within the following report.

2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and include Air Quality Limit Values (AQLVs) for the following pollutants:

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

2.1.2 Air Quality Target Values (AQTV) 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/m^3)	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.

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
1-hour mean	All locations where the annual mean and 24-hour 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

2.2 Industrial Pollution Control Legislation

2.2.1 Atmospheric emissions from industry are controlled in England through the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. Activities at the site are included within the Regulations. As such the facility operates in accordance with an Environmental Permit issued by the Environment Agency (EA). This includes a number of conditions and monitoring requirements in order to restrict environmental impacts as result of atmospheric emissions associated with the authorised activities.

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

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 (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 Critical Loads and Levels

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

> "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."

2.4.2 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."

2.4.3 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).

2.4.4 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.

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

2.4.5 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.

2.4.6 Table 3 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

Table 3 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration (µg/m^3)	Averaging Period
Oxides of nitrogen (NO_x)	30	Annual mean
	75	24-hour mean

2.4.7 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,) West Suffolk Council (WSC) has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO_2 are above the AQO within the council's administrative extents. As such, one AQMA has been declared. This is described as follows:

> "An area incorporating Gatehouse Cottage and 1 to 8 The Street (A143) in the parish of Great Barton."

3.2.2 The site is approximately 4.7km south-west of the AQMA. It is considered unlikely the facility would cause air quality impacts over a distance of this magnitude. As such the AQMA has not been considered further in the context of the assessment.

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

3.3 Air Quality Monitoring

3.3.1 Monitoring of pollutant concentrations is undertaken by WSC throughout their area of jurisdiction. Recent NO_2 concentrations recorded in the vicinity of the site are shown in Table 4.

Table 4 Monitoring Results

Monitoring Site		Monitored NO_2 Concentration (µg/m³)		
		2022	2023	2024
BSE18	68/69 Southgate Street	22.6	19.9	17.6

3.3.2 As shown in Table 4, annual mean NO_2 concentrations were below the AQO of 40µg/m^3 at the BSE18 monitoring location in recent years. Reference should be made to Figure 2 for a map of the survey position.

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: 585500, 263500. 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 Prediction

Pollutant	Predicted 2025 Background Pollutant Concentration (µg/m^3)
NO_2	10.15

3.4.2 As shown in Table 5, the predicted annual mean NO_2 concentration is below the relevant AQO at 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 sensitive 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 - Bridgewell Lane	585564.5	263865.4
R2	Residential - Crown Street	585609.9	263884.3
R3	MHA the Martins - Residential and Dementia Care Home	585881.1	264247.7
R4	St James C of E School	586007.9	264097.4
R5	Priory School	586360.1	264457.2
R6	Residential - Crown Street	585613.9	263817.7
R7	St Edmunds Hospital	585730.7	263732.7
R8	Residential - Maynewater Lane	585684.2	263714.9
R9	Residential - Maynewater Lane	585710.8	263545.4
R10	Residential - Tannery Drive	585693.3	263496.0
R11	Residential - Tannery Drive	585676.1	263433.7
R12	Residential - Cullum Road	585788.1	263204.6
R13	Southgate School	585966.8	262932.5
R14	Residential - Abbots Gate	585622.7	263152.0
R15	Residential - Canterbury Green	585461.5	263063.6
R16	West Suffolk Hospital	585129.5	262790.5
R17	Residential - Boon Close	585207.0	263128.7
R18	Residential - Rembrandt Way	585161.0	263307.6
R19	St Edmunds Roman Catholic V.A. Primary School	585373.5	263699.1
R20	Residential - Greene Mews	585525.2	263643.8
R21	Residential - Westgate Street	585501.1	263778.9
R22	Guildhall Feoffment Community Primary School	585543.5	263821.7
R23	Residential - College Street	585430.9	264040.2

3.5.3 Reference should be made to Figure 3 for a map of the sensitive 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. A study was therefore undertaken to identify the following sites of ecological or nature conservation importance:

- Special Areas of Conservation, Special Protection Areas (SPA) or Ramsar sites within 10km of the facility; and,
- Sites of Special Scientific Interest (SSSI), National Nature Reserves, Local Nature Reserves (LNR), Local Wildlife Sites and Ancient Woodland within 2km of the facility.

3.5.5 The study was completed using the EA Nature and Heritage Conservation screening report[5] and the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service[6], which draws together information on key environmental schemes and designations. The identified sites of ecological or nature conservation importance are summarised in Table 7. It should be noted that 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.

Table 7 Ecological Receptor Locations

Receptor		NGR (m)	
		X	Y
E1	Breckland SPA	578626.7	266066.9
E2	Breckland SPA	578855.6	267059.5
E3	Breckland SPA	578430.4	269897.1
E4	Breckland SPA	579692.0	271277.2
E5	Breckland SPA	581350.9	270889.7
E6	Breckland SPA	582359.0	271915.8
E7	Breckland SPA	583898.7	272463.2

5 EPR/BO1122IA/P006, EA, 2025.

6 Multi-Agency Geographic Information for the Countryside, www.magic.gov.uk.

Receptor		NGR (m)	
		X	Y
E8	The Glen Chalk Caves SSSI	586428.3	264713.0
E9	The Glen Chalk Caves SSSI	586429.6	264588.3
E10	Moreton Hall Community Woods LNR	586370.0	264609.6
E11	Moreton Hall Community Woods LNR	586681.3	264554.0
E12	Moreton Hall Community Woods LNR	586745.2	264406.8
E13	Moreton Hall Community Woods LNR	586802.8	264156.1
E14	Moreton Hall Community Woods LNR	587037.7	264074.3
E15	Moreton Hall Community Woods LNR	586727.4	263965.8
E16	Moreton Hall Community Woods LNR	586616.7	263885.1
E17	Horringer Court Caves SSSI	583816.5	262800.9
E18	Horringer Court Caves SSSI	583712.3	262988.7

3.5.6 Reference should be made to Figure 4 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 information provided by the APIS[7] website and MAGIC web-based interactive mapping service[8] was undertaken in order to identify the most sensitive habitat and associated critical load for each designation considered within the assessment.

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

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

8 Multi-Agency Geographic Information for the Countryside, www.magic.gov.uk.

Table 8 Critical Loads for Nitrogen Deposition

Feature		APIS Habitat	Relevant Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
				Low	High
E1- E7	Breckland SPA	Caprimulgus europaeus	Temperate continental Pinus sylvestris forest	5	15
E8 & E9	The Glen Chalk Caves SSSI	Broadleaved Deciduous Forest	Broadleaved Deciduous Woodland	10	15
E10 - E16	Moreton Hall Community Woods LNR	Broadleaved Deciduous Forest	Broadleaved Deciduous Woodland	10	15
E17 & E18	Horringer Court Caves SSSI	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	15

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

Table 9 Critical Loads for Acid Deposition

Receptor		Feature	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
				CLMinN	CLMaxS	CLMaxN
E1 - E7	Breckland SPA	Caprimulgus europaeus	Unmanaged Broadleaved /Coniferous Woodland	0.142	0.251	0.536
E8 & E9	The Glen Chalk Caves SSSI	Unmanaged Woodland	-	0.142	10.833	10.975
E10 - E13	Moreton Hall Community Woods LNR	Unmanaged Woodland	-	0.142	10.833	10.975
E14	Moreton Hall Community Woods LNR	Unmanaged Woodland	-	0.142	8.393	8.535
E15 & E16	Moreton Hall Community Woods LNR	Unmanaged Woodland	-	0.142	10.834	10.976
E17 & E18	Horringer Court Caves SSSI	Unmanaged Woodland	-	0.142	8.388	8.530

3.5.10 Baseline pollutant concentrations and deposition rates at each ecological receptor were obtained from the APIS website[9] and are summarised in Table 10.

Table 10 Baseline Pollution Levels at Ecological Receptors

Receptor		Annual Mean NO_x Conc. ($\mu g/m^3$)	Baseline Deposition Rate	
			Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)
E1	Breckland SPA	9.16	32.27	2.37
E2	Breckland SPA	8.27	32.71	2.40
E3	Breckland SPA	7.90	32.41	2.38
E4	Breckland SPA	7.76	32.50	2.38
E5	Breckland SPA	8.24	33.63	2.48
E6	Breckland SPA	8.21	33.65	2.47
E7	Breckland SPA	8.04	33.24	2.44
E8 & E9	The Glen Chalk Caves SSSI	17.83	34.12	2.52
E10 - E13	Moreton Hall Community Woods LNR	17.83	34.12	2.52
E14	Moreton Hall Community Woods LNR	13.31	34.11	2.51
E15 & E16	Moreton Hall Community Woods LNR	14.92	33.75	2.48
E17 & E18	Horringer Court Caves SSSI	9.30	33.38	2.45

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

4.0 METHODOLOGY

4.1 Introduction

4.1.1 Combustion emissions from the existing and proposed boilers have the potential to cause air quality impacts during normal operation. 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 (v6.0.2.5), 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 for human receptors in the modelling assessment are summarised in Table 11.

Table 11 Assessment Scenarios: Human Receptors

Parameter	Modelled As	
	Short Term	Long Term
NO_2	99.8th percentile (%ile) 1-hour mean	Annual 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 %ile shown in Table 11 was 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 Assessment Scenarios: Ecological Receptors

Parameter	Modelled As	
	Short Term	Long Term
NO_x	24-hour mean	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 facility only; and,
- Predicted environmental concentration (PEC) - Total predicted pollutant level as a result of emissions from the facility 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: 584610, 262630 to 586610, 264630. 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 5 for a graphical representation of the assessment grid extents.

4.5 Process Conditions

4.5.1 A summary of the source parameters used in the assessment is provided in Table 13.

Table 13 Source Parameters

Parameter	Unit	Boiler 1	Boiler 2	Draught Beer Boiler 2	Fulton Boilers
Stack position	NGR	585578.3, 263828.8	585575.7, 263828.8	585641.7, 263470.6	585576.9, 263830.9
Stack height	m	47.2	47.2	9.0	47.2
Stack diameter	m	0.83	0.84	0.54	0.70
Exhaust gas temperature	°C	192	78	244	275
Stack oxygen (O_2) content	%	7.40	10.91	5.77	-
Stack moisture content	%	7.57	6.73	6.42	-
Exhaust gas flow rate	m^3/s	5.20	5.20	6.13	1.25
Normalised exhaust gas flow rate[(a)]	Nm^3/s	1.03	0.57	0.49	1.09
Exhaust gas efflux velocity	m/s	4.62	2.54	5.07	5.70

Note: (a) 273K, 3% O_2, dry.

4.5.2 Reference should be made to Figure 5 for a map of the source locations.

4.6 Emissions

4.6.1 Pollutant emission concentrations were based on the Emission Limits Values (ELVs) for new and existing gas-fired boilers[10]. These are shown in Table 14.

10 https://www.gov.uk/guidance/medium-combustion-plant-mcp-comply-with-emission-limit-values.

Table 14 Pollutant Emission Concentrations

Pollutant	Pollutant Emission Concentration (mg/Nm³)[a]			
	Boiler 1	Boiler 2	Draught Beer Boiler 2	Fulton Boilers
NO_x	200	200	250	100

Note: (a) 273K, 3% O_2, dry.

4.6.2 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)			
	Boiler 1	Boiler 2	Draught Beer Boiler 2	Fulton Boilers
NO_x	0.2050	0.1144	0.1215	0.1093

4.6.3 Emissions were assumed to be constant, with all 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 O_2 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[11].

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

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 (m)	Width (m)	Angle (°)
	X	Y				
Building 1	585661.2	263831.6	16.4	47.7	50.8	159.7
Building 2	585583.6	263817.6	15.5	38.6	19.2	179.9
Building 3	585598.1	263797.6	13.0	44.5	8.6	179.3
Building 4	585565.4	263826.4	13.3	56.2	14.2	176.9
Building 5	585615.3	263638.1	11.1	105.9	54.1	179.6
Building 6	585660.3	263615.1	5.6	59.7	35.9	179.8
Building 7	585625.8	263460.0	8.3	85.1	38.9	200.8

4.8.3 Reference should be made to Figure 5 for a map of the building locations.

4.9 Meteorological Data

4.9.1 Meteorological data used in the assessment was taken from RAF Mildenhall Meteorological Station over the period 1st January 2020 to 31st December 2024 (inclusive). This observation station is located at NGR: 568952, 276984, which is approximately 21.2km north-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 6 for wind roses of the utilised meteorological records.

4.10 Roughness Length

4.10.1 The roughness length (z_0) is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 1m was used to describe the modelling extents. This value is considered appropriate for the morphology of the area and is suggested within ADMS-6 as being suitable for 'cities, woodland'.

4.10.2 A z_0 of 0.5 was used to describe the meteorological site. This value is considered appropriate for the morphology of the area and is suggested within ADMS-6 as being suitable for 'parkland, open suburbia'.

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 30m 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 'cities and large towns'.

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[12].

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

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'[13]. 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.

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 Predicted ground level NO_2 concentrations 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

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

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 N deposition)/CLmaxN) x 100

4.14.3 The above formula was obtained from the APIS website[14].

4.15 Background Concentrations

4.15.1 Review of the data summarised in Section 3.0 was undertaken in order to identify suitable baseline values for use in the assessment. This indicated that the BSE18 monitor is positioned at a roadside location 350m from the closest sensitive receptor. The annual mean NO_2 concentration recorded at the monitor during 2024 of 17.6µg/m^3 was therefore utilised to represent baseline conditions in the vicinity of the facility as a worst-case.

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

4.15.3 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'[15], 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.

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

[15] 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'[16] 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.

Ecological Receptors

4.16.3 EA guidance 'Air emissions risk assessment for your environmental permit'[17] states that PCs at SPAs and SSSIs 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; and,
- The long-term PC is greater than 1% and the long term PEC is less than 70% of the long term environmental standard.

4.16.4 PCs at LNRs 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,

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

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

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

4.16.5 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-6 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 provided by the Applicant. As such, input parameters are considered to be representative of normal operating conditions;

- Emission rates - Emission rates for the boilers were derived from the relevant ELVs. These were assumed to be constant throughout the modelling period, which does not allow for plant shutdown. This assumption is likely to overestimate actual emissions and therefore result in a worst-case assessment;
- Background concentrations - Background pollutant levels were obtained from local monitoring results and the APIS website. These are considered to provide a reasonable representation of existing conditions at receptors in 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 significance 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.

5.1.2 Reference should be made to Figure 7 to Figure 8 for graphical representations of predicted pollutant concentrations, inclusive of background 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 2023 meteorological data set. As such, the contours shown in Figure 7 were produced from the 2023 model outputs.

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	14.57	36.43	32.17	80.43
	99.8th %ile 1-hour	200	34.04	17.02	69.24	34.62

5.2.2 As indicated in Table 19, there were no predicted exceedences of the EQS at any location within the vicinity of the facility.

5.3 Human Receptors

5.3.1 Predicted annual mean NO_2 PECs at the human receptor locations, inclusive of background levels, are summarised in Table 20.

Table 20 Predicted Annual Mean NO_2 Concentrations

Receptor		Predicted Annual Mean NO_2 PEC (µg/m³)				
		2020	2021	2022	2023	2024
R1	Residential - Bridgewell Lane	17.73	17.72	17.75	17.72	17.72
R2	Residential - Crown Street	17.75	17.73	17.77	17.73	17.74
R3	MHA the Martins - Residential and Dementia Care Home	17.86	17.83	17.85	17.86	17.87
R4	St James C of E School	17.89	17.86	17.86	17.92	17.89
R5	Priory School	17.73	17.72	17.72	17.75	17.74
R6	Residential - Crown Street	17.79	17.77	17.81	17.76	17.78
R7	St Edmunds Hospital	18.02	17.99	18.02	17.97	18.02
R8	Residential - Maynewater Lane	18.02	17.97	18.03	17.94	18.00
R9	Residential - Maynewater Lane	20.12	19.93	19.93	20.32	20.24
R10	Residential - Tannery Drive	23.40	22.47	22.50	23.75	23.17
R11	Residential - Tannery Drive	20.00	20.68	20.27	20.17	20.38
R12	Residential - Cullum Road	17.78	17.85	17.80	17.79	17.81
R13	Southgate School	17.67	17.70	17.68	17.68	17.69
R14	Residential - Abbots Gate	17.74	17.82	17.74	17.75	17.76
R15	Residential - Cantebury Green	17.71	17.77	17.71	17.72	17.71
R16	West Suffolk Hospital	17.65	17.68	17.65	17.66	17.65
R17	Residential - Boon Close	17.70	17.73	17.69	17.70	17.68
R18	Residential - Rembrandt Way	17.72	17.74	17.71	17.72	17.69
R19	St Edmunds Roman Catholic V.A. Primary School	17.78	17.79	17.82	17.80	17.77
R20	Residential - Greene Mews	17.90	17.95	18.02	17.94	17.93
R21	Residential - Westgate Street	17.74	17.74	17.78	17.75	17.74
R22	Guildhall Feoffment Community Primary School	17.74	17.73	17.77	17.74	17.73
R23	Residential - College Street	17.72	17.72	17.75	17.72	17.73

5.3.2 As indicated in Table 20, predicted NO_2 concentrations were below the annual mean EQS of 40µg/m^3 at all human receptors for all meteorological data sets.

5.3.3 Maximum predicted annual mean NO_2 concentrations at the human receptor locations are summarised in Table 21. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 21 Maximum Predicted Annual Mean NO_2 Concentrations

Receptor		Maximum Predicted Annual Mean NO_2 Concentration (µg/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Residential - Bridgewell Lane	0.15	17.75	0.39	44.39
R2	Residential - Crown Street	0.17	17.77	0.43	44.43
R3	MHA the Martins - Residential and Dementia Care Home	0.27	17.87	0.68	44.68
R4	St James C of E School	0.32	17.92	0.79	44.79
R5	Priory School	0.15	17.75	0.38	44.38
R6	Residential - Crown Street	0.21	17.81	0.54	44.54
R7	St Edmunds Hospital	0.42	18.02	1.05	45.05
R8	Residential - Maynewater Lane	0.43	18.03	1.08	45.08
R9	Residential - Maynewater Lane	2.72	20.32	6.80	50.80
R10	Residential - Tannery Drive	6.15	23.75	15.39	59.39
R11	Residential - Tannery Drive	3.08	20.68	7.69	51.69
R12	Residential - Cullum Road	0.25	17.85	0.62	44.62
R13	Southgate School	0.10	17.70	0.26	44.26
R14	Residential - Abbots Gate	0.22	17.82	0.55	44.55
R15	Residential - Cantebury Green	0.17	17.77	0.43	44.43
R16	West Suffolk Hospital	0.08	17.68	0.20	44.20
R17	Residential - Boon Close	0.13	17.73	0.33	44.33
R18	Residential - Rembrandt Way	0.14	17.74	0.34	44.34

Receptor		Maximum Predicted Annual Mean NO_2 Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R19	St Edmunds Roman Catholic V.A. Primary School	0.22	17.82	0.56	44.56
R20	Residential - Greene Mews	0.42	18.02	1.04	45.04
R21	Residential - Westgate Street	0.18	17.78	0.46	44.46
R22	Guildhall Feoffment Community Primary School	0.17	17.77	0.43	44.43
R23	Residential - College Street	0.15	17.75	0.38	44.38

5.3.4 As indicated in Table 21, PECs were below 70% of the EQS at all human receptors. As such, predicted effects on annual mean NO_2 concentrations are not considered to be significant, in accordance with the stated criteria.

5.3.5 Predicted 99.8th %ile 1-hour mean NO_2 PECs at the human receptor locations, inclusive of background levels, are summarised in Table 22.

Table 22 Predicted 99.8th %ile 1-hour Mean NO_2 Concentrations

Receptor		Predicted 99.8th %ile 1-hour Mean NO_2 PEC (µg/m³)				
		2020	2021	2022	2023	2024
R1	Residential - Bridgewell Lane	36.61	36.67	36.78	36.72	36.53
R2	Residential - Crown Street	37.86	37.24	38.13	37.24	38.17
R3	MHA the Martins - Residential and Dementia Care Home	36.22	36.23	36.25	36.31	36.26
R4	St James C of E School	36.26	36.26	36.30	36.26	36.25
R5	Priory School	35.79	35.78	35.78	35.78	35.79
R6	Residential - Crown Street	37.86	37.48	38.12	37.47	38.18
R7	St Edmunds Hospital	37.45	37.44	37.53	37.49	37.52
R8	Residential - Maynewater Lane	37.31	37.27	37.37	37.30	37.36
R9	Residential - Maynewater Lane	42.44	42.32	42.37	42.46	42.41

Receptor		Predicted 99.8th %ile 1-hour Mean NO_2 PEC (µg/m³)				
		2020	2021	2022	2023	2024
R10	Residential - Tannery Drive	50.99	51.12	51.29	51.04	51.04
R11	Residential - Tannery Drive	59.76	61.11	60.52	60.78	60.59
R12	Residential - Cullum Road	37.14	37.16	37.34	37.20	37.25
R13	Southgate School	36.41	36.36	36.39	36.29	36.45
R14	Residential - Abbots Gate	36.78	36.76	36.73	36.84	36.78
R15	Residential - Cantebury Green	36.58	36.59	36.73	36.59	36.58
R16	West Suffolk Hospital	35.98	36.03	36.05	36.03	35.97
R17	Residential - Boon Close	36.24	36.37	36.30	36.22	36.24
R18	Residential - Rembrandt Way	36.60	36.32	36.43	36.32	36.20
R19	St Edmunds Roman Catholic V.A. Primary School	37.30	37.22	37.27	37.28	37.21
R20	Residential - Greene Mews	37.94	38.16	38.22	38.14	37.93
R21	Residential - Westgate Street	37.04	37.13	37.24	36.98	37.19
R22	Guildhall Feoffment Community Primary School	36.69	36.78	36.87	36.87	36.69
R23	Residential - College Street	37.10	37.08	36.91	36.64	37.10

5.3.6 As indicated in Table 22, predicted 99.8th %ile 1-hour mean NO_2 concentrations were below the EQS of 200µg/m³ at all human receptors for all meteorological data sets.

5.3.7 Maximum predicted 99.8th %ile 1-hour mean NO_2 concentrations at the receptor locations are summarised in Table 23.

Table 23 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 - Bridgewell Lane	1.58	36.78	0.79	0.96

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		
R2	Residential - Crown Street	2.97	38.17	1.48	1.80
R3	MHA the Martins - Residential and Dementia Care Home	1.11	36.31	0.56	0.67
R4	St James C of E School	1.10	36.30	0.55	0.67
R5	Priory School	0.59	35.79	0.30	0.36
R6	Residential - Crown Street	2.98	38.18	1.49	1.81
R7	St Edmunds Hospital	2.33	37.53	1.17	1.41
R8	Residential - Maynewater Lane	2.17	37.37	1.08	1.32
R9	Residential - Maynewater Lane	7.26	42.46	3.63	4.41
R10	Residential - Tannery Drive	16.09	51.29	8.04	9.76
R11	Residential - Tannery Drive	25.91	61.11	12.95	15.72
R12	Residential - Cullum Road	2.14	37.34	1.07	1.30
R13	Southgate School	1.25	36.45	0.62	0.76
R14	Residential - Abbots Gate	1.64	36.84	0.82	1.00
R15	Residential - Cantebury Green	1.53	36.73	0.77	0.93
R16	West Suffolk Hospital	0.85	36.05	0.43	0.52
R17	Residential - Boon Close	1.17	36.37	0.59	0.71
R18	Residential - Rembrandt Way	1.40	36.60	0.70	0.85
R19	St Edmunds Roman Catholic V.A. Primary School	2.10	37.30	1.05	1.28
R20	Residential - Greene Mews	3.02	38.22	1.51	1.83
R21	Residential - Westgate Street	2.04	37.24	1.02	1.24
R22	Guildhall Feoffment Community Primary School	1.67	36.87	0.83	1.01
R23	Residential - College Street	1.90	37.10	0.95	1.15

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

5.3.8 As indicated in Table 23, the PC proportion of the EQS headroom was below 20% al all 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.

5.4 Ecological Receptors

5.4.1 Predicted concentrations and deposition rates of each pollutant at the sensitive 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, inclusive of background levels, are summarised in Table 24.

Table 24 Predicted Annual Mean NO_x Concentrations

Receptor		Predicted Annual Mean NO_x PEC (µg/m³)				
		2020	2021	2022	2023	2024
E1	Breckland SPA	9.16	9.16	9.17	9.16	9.16
E2	Breckland SPA	8.27	8.27	8.28	8.27	8.28
E3	Breckland SPA	7.90	7.90	7.91	7.90	7.90
E4	Breckland SPA	7.76	7.76	7.77	7.77	7.76
E5	Breckland SPA	8.24	8.25	8.25	8.25	8.25
E6	Breckland SPA	8.22	8.22	8.22	8.22	8.22
E7	Breckland SPA	8.05	8.04	8.05	8.05	8.05
E8	The Glen Chalk Caves SSSI	17.97	17.96	17.96	17.99	17.98
E9	The Glen Chalk Caves SSSI	17.99	17.98	17.98	18.01	18.00
E10	Moreton Hall Community Woods LNR	17.99	17.98	17.98	18.02	18.00
E11	Moreton Hall Community Woods LNR	17.96	17.95	17.96	17.98	17.97
E12	Moreton Hall Community Woods LNR	17.96	17.95	17.95	17.97	17.96

Receptor		Predicted Annual Mean NO_x PEC (µg/m³)				
		2020	2021	2022	2023	2024
E13	Moreton Hall Community Woods LNR	17.95	17.94	17.94	17.95	17.95
E14	Moreton Hall Community Woods LNR	13.40	13.39	13.39	13.40	13.40
E15	Moreton Hall Community Woods LNR	15.05	15.04	15.04	15.05	15.05
E16	Moreton Hall Community Woods LNR	15.06	15.05	15.05	15.06	15.06
E17	Horringer Court Caves SSSI	9.33	9.33	9.32	9.32	9.32
E18	Horringer Court Caves SSSI	9.33	9.32	9.32	9.32	9.32

5.4.3 As indicated in Table 24, predicted NO_x concentrations were below the annual mean EQS of 30µg/m³ at all ecological receptors.

5.4.4 Maximum predicted annual mean NO_x concentrations at the ecological receptor locations are summarised in Table 25.

Table 25 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	Breckland SPA	0.01	9.17	0.02	30.55
E2	Breckland SPA	0.01	8.28	0.02	27.59
E3	Breckland SPA	0.01	7.91	0.02	26.35
E4	Breckland SPA	0.01	7.77	0.02	25.89
E5	Breckland SPA	0.01	8.25	0.02	27.49
E6	Breckland SPA	0.01	8.22	0.02	27.39
E7	Breckland SPA	0.01	8.05	0.02	26.82
E8	The Glen Chalk Caves SSSI	0.16	17.99	0.54	59.97
E9	The Glen Chalk Caves SSSI	0.18	18.01	0.61	60.04

Receptor		Maximum Predicted Annual Mean NO_x Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E10	Moreton Hall Community Woods LNR	0.19	18.02	0.62	60.06
E11	Moreton Hall Community Woods LNR	0.15	17.98	0.49	59.92
E12	Moreton Hall Community Woods LNR	0.14	17.97	0.47	59.90
E13	Moreton Hall Community Woods LNR	0.12	17.95	0.42	59.85
E14	Moreton Hall Community Woods LNR	0.09	13.40	0.30	44.67
E15	Moreton Hall Community Woods LNR	0.13	15.05	0.42	50.16
E16	Moreton Hall Community Woods LNR	0.14	15.06	0.48	50.21
E17	Horringer Court Caves SSSI	0.03	9.33	0.10	31.10
E18	Horringer Court Caves SSSI	0.03	9.33	0.10	31.10

5.4.5 As indicated in Table 25, PCs were below the relevant criteria at all ecological receptors. As such, predicted effects on annual mean NO_x concentrations are not considered to be significant.

5.4.6 Predicted 24-hour mean NO_x PECs at the ecological receptor locations, inclusive of background levels, are summarised in Table 26.

Table 26 Predicted 24-hour Mean NO_x Concentrations

Receptor		Predicted 24-hour Mean NO_x PEC (µg/m³)				
		2020	2021	2022	2023	2024
E1	Breckland SPA	18.40	18.43	18.39	18.39	18.39
E2	Breckland SPA	16.63	16.62	16.62	16.63	16.62
E3	Breckland SPA	15.85	15.87	15.87	15.89	15.87
E4	Breckland SPA	15.57	15.60	15.60	15.58	15.56

Receptor		Predicted 24-hour Mean NO_x PEC (µg/m³)				
		2020	2021	2022	2023	2024
E5	Breckland SPA	16.55	16.60	16.59	16.56	16.54
E6	Breckland SPA	16.50	16.51	16.49	16.48	16.47
E7	Breckland SPA	16.14	16.14	16.16	16.13	16.14
E8	The Glen Chalk Caves SSSI	36.33	36.33	36.41	36.39	36.44
E9	The Glen Chalk Caves SSSI	36.41	36.39	36.45	36.43	36.45
E10	Moreton Hall Community Woods LNR	36.40	36.42	36.45	36.48	36.50
E11	Moreton Hall Community Woods LNR	36.29	36.30	36.38	36.26	36.24
E12	Moreton Hall Community Woods LNR	36.25	36.39	36.52	36.31	36.27
E13	Moreton Hall Community Woods LNR	36.38	36.39	36.47	36.28	36.32
E14	Moreton Hall Community Woods LNR	27.27	27.23	27.36	27.13	27.15
E15	Moreton Hall Community Woods LNR	30.67	30.53	30.73	30.51	30.45
E16	Moreton Hall Community Woods LNR	30.72	30.55	30.76	30.55	30.51
E17	Horringer Court Caves SSSI	18.93	18.92	18.90	18.88	18.96
E18	Horringer Court Caves SSSI	18.92	18.88	18.89	18.97	18.92

5.4.7 As indicated in Table 26, predicted NO_x concentrations were below the 24-hour mean EQS of 75µg/m³ at all ecological receptors.

5.4.8 Maximum predicted 24-hour mean NO_x concentrations at the ecological receptor locations are summarised in Table 27.

Table 27 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	Breckland SPA	0.11	18.43	0.14	24.57
E2	Breckland SPA	0.09	16.63	0.11	22.17
E3	Breckland SPA	0.09	15.89	0.12	21.19
E4	Breckland SPA	0.08	15.60	0.11	20.80
E5	Breckland SPA	0.12	16.60	0.16	22.13
E6	Breckland SPA	0.09	16.51	0.12	22.01
E7	Breckland SPA	0.08	16.16	0.11	21.55
E8	The Glen Chalk Caves SSSI	0.78	36.44	1.05	48.59
E9	The Glen Chalk Caves SSSI	0.79	36.45	1.06	48.60
E10	Moreton Hall Community Woods LNR	0.84	36.50	1.12	48.67
E11	Moreton Hall Community Woods LNR	0.72	36.38	0.96	48.50
E12	Moreton Hall Community Woods LNR	0.86	36.52	1.15	48.70
E13	Moreton Hall Community Woods LNR	0.81	36.47	1.08	48.63
E14	Moreton Hall Community Woods LNR	0.74	27.36	0.99	36.49
E15	Moreton Hall Community Woods LNR	0.89	30.73	1.19	40.97
E16	Moreton Hall Community Woods LNR	0.92	30.76	1.23	41.01
E17	Horringer Court Caves SSSI	0.36	18.96	0.48	25.28
E18	Horringer Court Caves SSSI	0.37	18.97	0.49	25.29

5.4.9 As indicated in Table 27, PCs were below the relevant criteria at all ecological receptors. As such, predicted effects on 24-hour mean NO_x concentrations are not considered to be significant.

Nitrogen Deposition

5.4.10 Predicted annual nitrogen PC deposition rates are summarised in Table 28.

Table 28 Predicted Annual Nitrogen Deposition Rates

Receptor		Predicted Annual PC Nitrogen Deposition Rate (kgN/ha/yr)				
		2020	2021	2022	2023	2024
E1	Breckland SPA	0.001	0.001	0.001	0.001	0.001
E2	Breckland SPA	0.001	0.001	0.001	0.001	0.001
E3	Breckland SPA	0.001	0.001	0.001	0.001	0.001
E4	Breckland SPA	0.001	0.001	0.001	0.001	0.001
E5	Breckland SPA	0.001	0.001	0.002	0.001	0.001
E6	Breckland SPA	0.001	0.001	0.001	0.001	0.001
E7	Breckland SPA	0.001	0.001	0.001	0.001	0.001
E8	The Glen Chalk Caves SSSI	0.029	0.027	0.027	0.033	0.031
E9	The Glen Chalk Caves SSSI	0.032	0.030	0.030	0.037	0.034
E10	Moreton Hall Community Woods LNR	0.033	0.031	0.031	0.038	0.035
E11	Moreton Hall Community Woods LNR	0.026	0.025	0.026	0.030	0.027
E12	Moreton Hall Community Woods LNR	0.025	0.024	0.025	0.028	0.026
E13	Moreton Hall Community Woods LNR	0.024	0.022	0.022	0.025	0.024
E14	Moreton Hall Community Woods LNR	0.018	0.017	0.017	0.018	0.018
E15	Moreton Hall Community Woods LNR	0.025	0.023	0.023	0.025	0.026
E16	Moreton Hall Community Woods LNR	0.029	0.026	0.027	0.028	0.029
E17	Horringer Court Caves SSSI	0.006	0.005	0.004	0.005	0.004
E18	Horringer Court Caves SSSI	0.006	0.005	0.004	0.005	0.004

5.4.11 Maximum predicted annual nitrogen deposition rates at the receptor locations are summarised in Table 29.

Table 29 Maximum Predicted Annual Nitrogen Deposition Rates

Receptor		Maximum Predicted Annual PC Nitrogen Deposition Rate (kgN/ha/yr)	Proportion of EQS (%)	
			Low EQS	High EQS
E1	Breckland SPA	0.001	0.02	0.01
E2	Breckland SPA	0.001	0.02	0.01
E3	Breckland SPA	0.001	0.02	0.01
E4	Breckland SPA	0.001	0.02	0.01
E5	Breckland SPA	0.002	0.03	0.01
E6	Breckland SPA	0.001	0.03	0.01
E7	Breckland SPA	0.001	0.03	0.01
E8	The Glen Chalk Caves SSSI	0.033	0.33	0.22
E9	The Glen Chalk Caves SSSI	0.037	0.37	0.25
E10	Moreton Hall Community Woods LNR	0.038	0.38	0.25
E11	Moreton Hall Community Woods LNR	0.030	0.30	0.20
E12	Moreton Hall Community Woods LNR	0.028	0.28	0.19
E13	Moreton Hall Community Woods LNR	0.025	0.25	0.17
E14	Moreton Hall Community Woods LNR	0.018	0.18	0.12
E15	Moreton Hall Community Woods LNR	0.026	0.26	0.17
E16	Moreton Hall Community Woods LNR	0.029	0.29	0.19
E17	Horringer Court Caves SSSI	0.006	0.06	0.04
E18	Horringer Court Caves SSSI	0.006	0.06	0.04

5.4.12 As indicated in Table 29, PCs were below the relevant criteria at all receptors. As such, predicted effects on nitrogen deposition are not considered to be significant.

Acid Deposition

5.4.13 Predicted annual acid PC deposition rates are summarised in Table 30.

Table 30 Predicted Annual PC Acid Deposition Rates

Receptor		Predicted Annual PC Acid Deposition Rate (keq/ha/yr)				
		2020	2021	2022	2023	2024
E1	Breckland SPA	0.0001	0.0001	0.0001	0.0001	0.0001
E2	Breckland SPA	0.0001	0.0001	0.0001	0.0001	0.0001
E3	Breckland SPA	0.0001	0.0001	0.0001	0.0001	0.0001
E4	Breckland SPA	0.0001	0.0001	0.0001	0.0001	0.0001
E5	Breckland SPA	0.0001	0.0001	0.0001	0.0001	0.0001
E6	Breckland SPA	0.0001	0.0001	0.0001	0.0001	0.0001
E7	Breckland SPA	0.0001	0.0001	0.0001	0.0001	0.0001
E8	The Glen Chalk Caves SSSI	0.0021	0.0019	0.0019	0.0023	0.0022
E9	The Glen Chalk Caves SSSI	0.0023	0.0021	0.0021	0.0026	0.0024
E10	Moreton Hall Community Woods LNR	0.0024	0.0022	0.0022	0.0027	0.0025
E11	Moreton Hall Community Woods LNR	0.0018	0.0018	0.0018	0.0021	0.0019
E12	Moreton Hall Community Woods LNR	0.0018	0.0017	0.0018	0.0020	0.0019
E13	Moreton Hall Community Woods LNR	0.0017	0.0016	0.0016	0.0018	0.0017
E14	Moreton Hall Community Woods LNR	0.0013	0.0012	0.0012	0.0013	0.0013
E15	Moreton Hall Community Woods LNR	0.0018	0.0017	0.0017	0.0018	0.0018
E16	Moreton Hall Community Woods LNR	0.0020	0.0019	0.0019	0.0020	0.0021
E17	Horringer Court Caves SSSI	0.0004	0.0004	0.0003	0.0003	0.0003
E18	Horringer Court Caves SSSI	0.0004	0.0003	0.0003	0.0003	0.0003

5.4.14 Maximum predicted annual acid deposition rates at the receptor locations are summarised in Table 31.

Table 31 Predicted Annual Acid Deposition Rates

Receptor		Maximum Predicted Annual Acid PC Deposition Rate (keq/ha/yr)	Proportion of EQS (%)
E1	Breckland SPA	0.0001	0.01
E2	Breckland SPA	0.0001	0.02
E3	Breckland SPA	0.0001	0.02
E4	Breckland SPA	0.0001	0.02
E5	Breckland SPA	0.0001	0.02
E6	Breckland SPA	0.0001	0.02
E7	Breckland SPA	0.0001	0.02
E8	The Glen Chalk Caves SSSI	0.0023	0.02
E9	The Glen Chalk Caves SSSI	0.0026	0.02
E10	Moreton Hall Community Woods LNR	0.0027	0.02
E11	Moreton Hall Community Woods LNR	0.0021	0.02
E12	Moreton Hall Community Woods LNR	0.0020	0.02
E13	Moreton Hall Community Woods LNR	0.0018	0.02
E14	Moreton Hall Community Woods LNR	0.0013	0.02
E15	Moreton Hall Community Woods LNR	0.0018	0.02
E16	Moreton Hall Community Woods LNR	0.0021	0.02
E17	Horringer Court Caves SSSI	0.0004	0.01
E18	Horringer Court Caves SSSI	0.0004	0.00

5.4.15 As indicated in Table 31, PCs were below the relevant criteria at all receptors. As such, predicted effects on acid deposition are not considered to be significant.

5.5 Sensitivity Analysis

5.5.1 Dispersion model outputs can be affected by a number of variables, including:

- Meteorological data;
- Emission parameters;
- Receptor grid resolution;
- Treatment of terrain and buildings; and,
- Special model treatments.

5.5.2 As shown previously, maximum NO_2 concentrations at all points on the grid were well below the relevant EQSs. There is also a considerable difference between the predictions and the values required to result in a significant impact at the discrete receptors. As such, there is sufficient headroom to account for model uncertainty without any affecting the assessment conclusions. Further Sensitivity Analysis of specific variables is therefore not warranted for the project.

6.0 CONCLUSION

6.1.1 Redmore Environmental Ltd was commissioned by EHS Projects Ltd to undertake an Air Quality Assessment in support of an Environmental Permit Variation Application for Greene King, Westgate Street, Bury St Edmunds.

6.1.2 Atmospheric emissions of combustion products from the existing and proposed boilers have the potential to cause air quality impacts during normal operation. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and quantify potential effects.

6.1.3 Dispersion modelling was undertaken using ADMS-6 in order to predict NO_2 and NO_x concentrations, as well as nitrogen and acid deposition, at sensitive locations as a result of emissions from the facility.

6.1.4 The results of the assessment indicated that the operation of the facility is not predicted to result in exceedences of the relevant EQSs at any sensitive human receptor within the vicinity of the installation. Impacts were classified as not significant in accordance with the relevant methodology.

6.1.5 Impacts were also predicted at relevant ecological sites. The results indicated that emissions from the proposed plant would not significantly affect existing conditions at any designation.

7.0 ABBREVIATIONS

APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQTV	Air Quality Target Values
AQO	Air Quality Objective
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ELV	Emission Limit Value
LA	Local Authority
EQS	Environmental Quality Standard
LAQM	Local Air Quality Management
LNR	Local Nature Reserves
MAGIC	Multi-Agency Geographic Information for the Countryside
NGR	National Grid Reference
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
O_2	Oxygen
PC	Process Contribution
PEC	Predicted Environmental Concentration
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
WSC	West Suffolk Council
z_0	Roughness length
%ile	Percentile

Figures

Legend

Site Boundary

Title
Figure 1 - Site Location Plan

Project
Air Quality Assessment
Westgate Street, Bury St Edmunds

Project Reference
10146

Client
EHS Projects Ltd

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

Legend

Site Boundary

Monitor

Title
Figure 2 - Monitor Location

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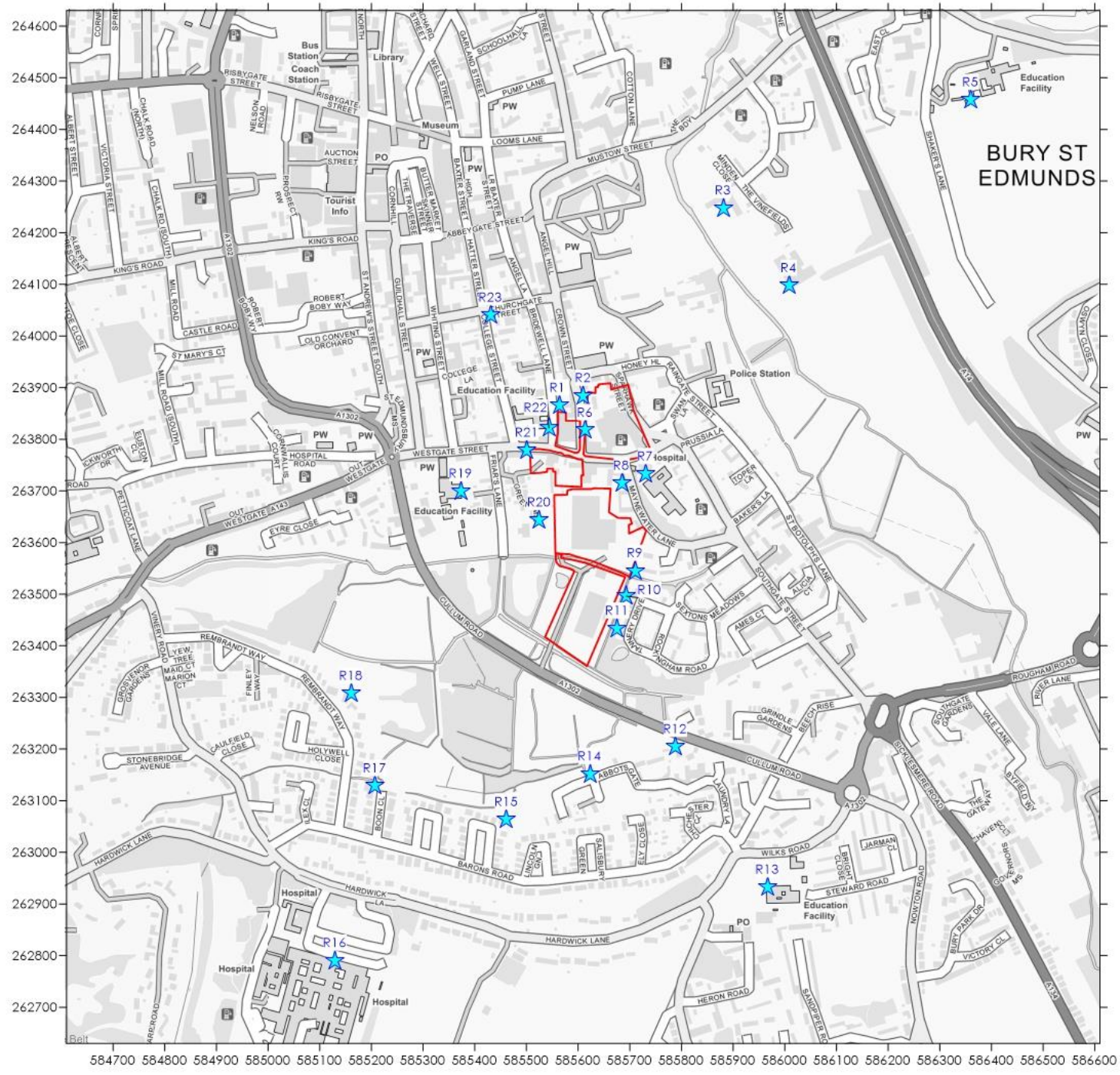

Legend

Site Boundary

Human Receptor

Title
Figure 3 - Human Receptor Locations

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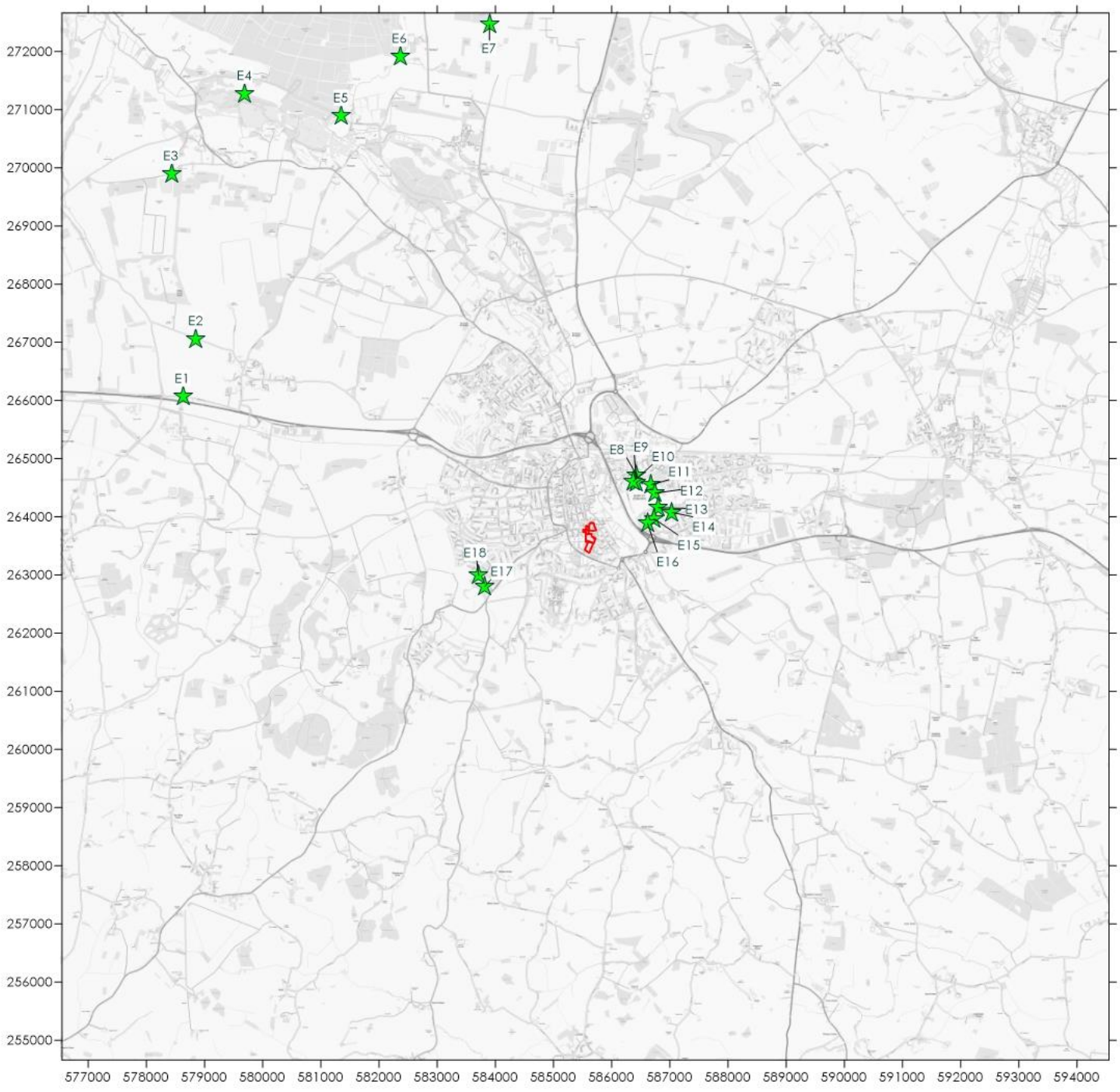

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Site Boundary

Ecological Receptor

Title
Figure 4 - Ecological Receptor Locations

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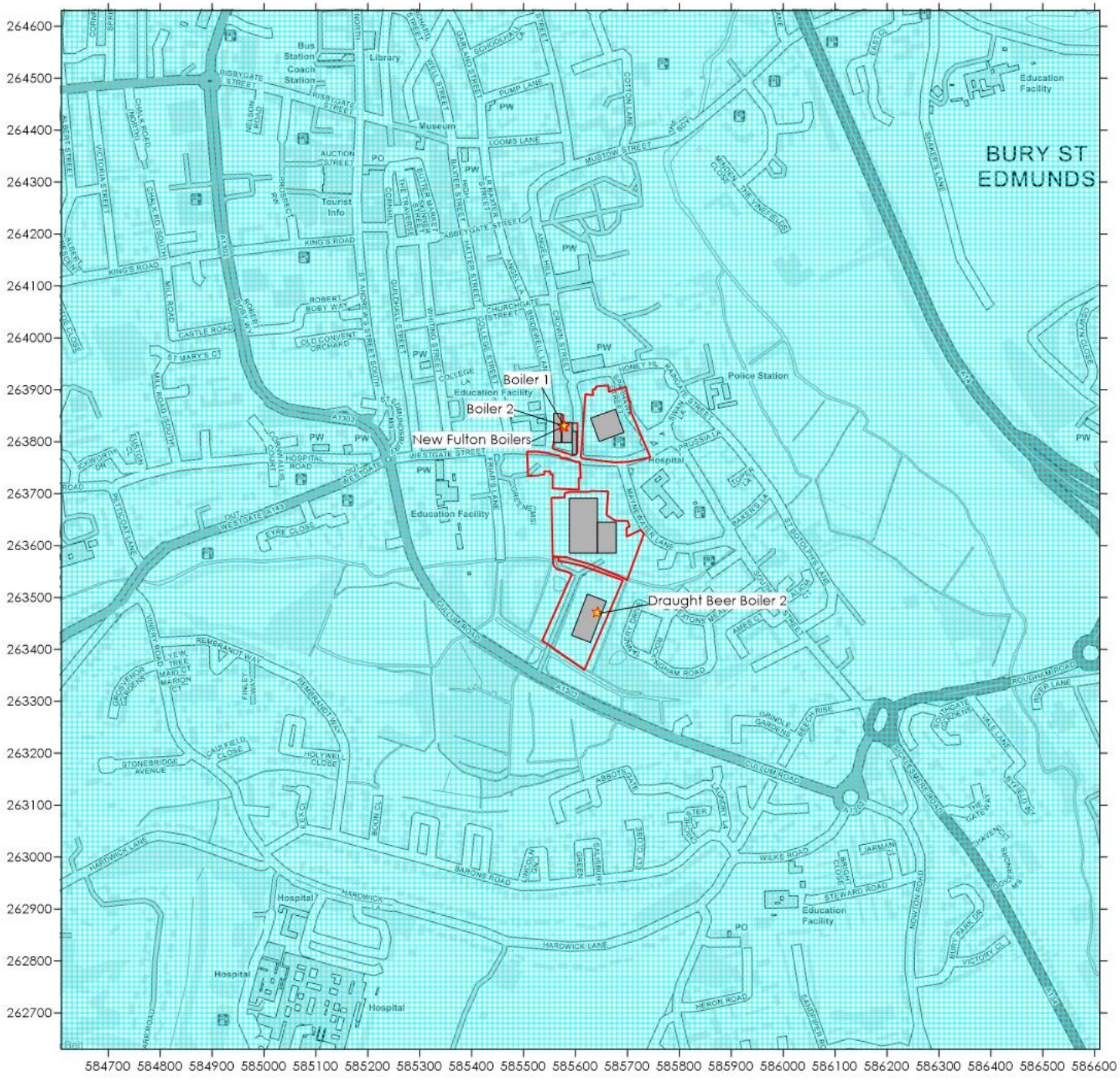

Legend

- Site Boundary
- Point Source
- Output Grid
- Building

Title
Figure 5 - ADMS-6 Inputs

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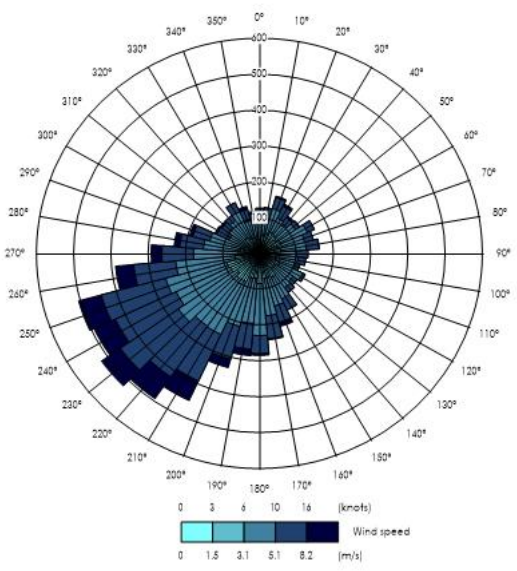
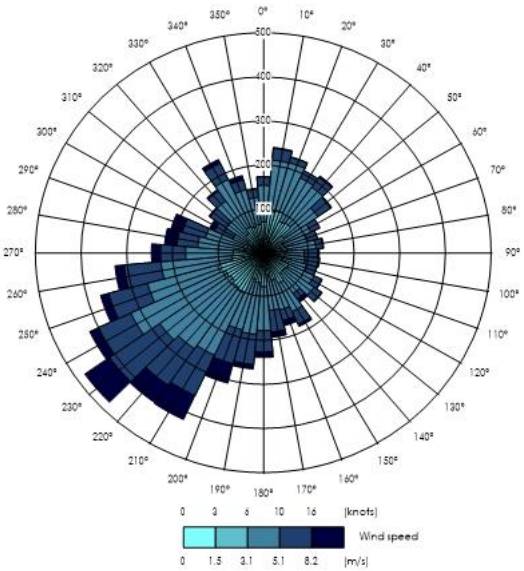
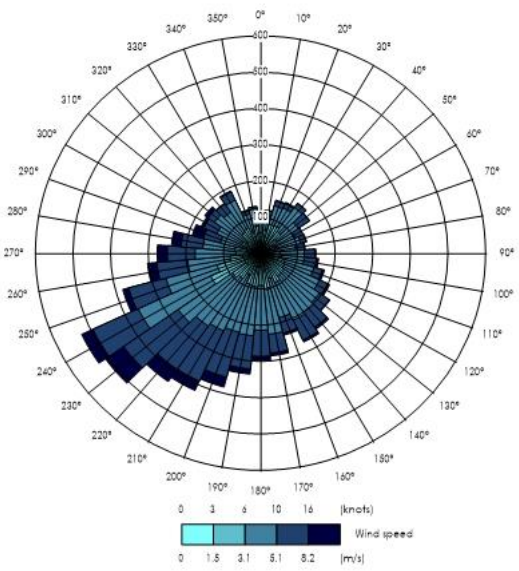


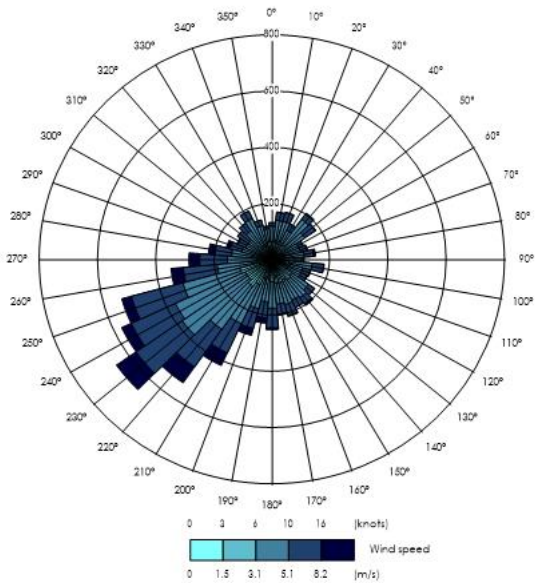
2020 Meteorological Data



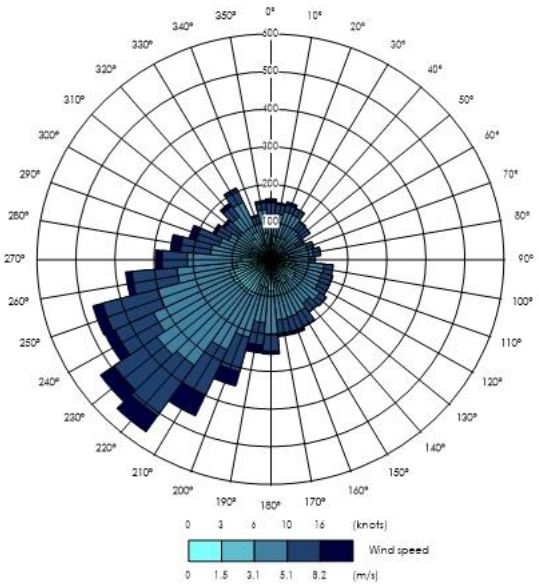
2021 Meteorological Data



2022 Meteorological Data



2023 Meteorological Data



2024 Meteorological Data

Legend

Title
Figure 6 - Wind Roses of 2020 to 2024 RAF Mildenhall Meteorological Station Data

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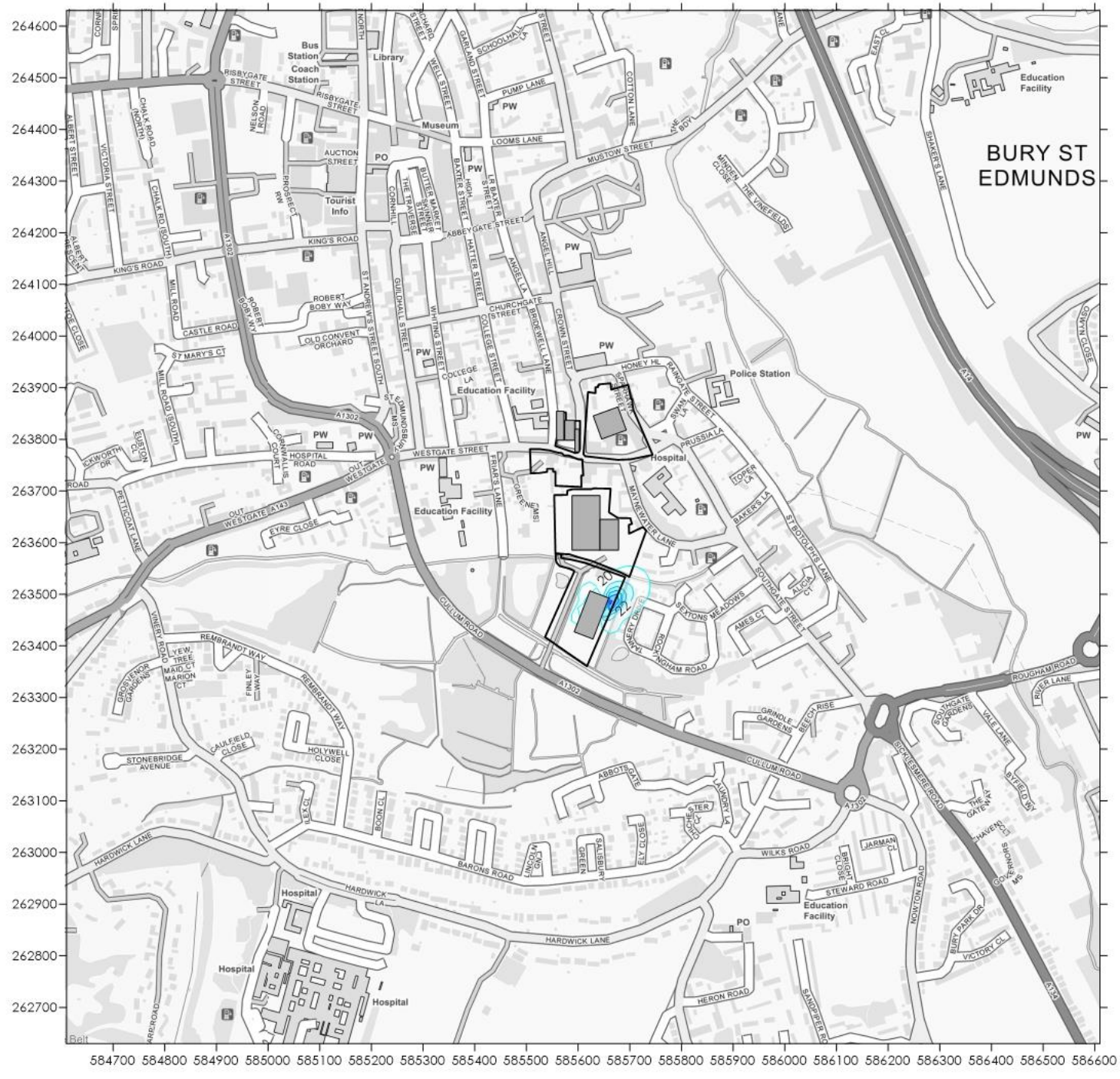

Legend

Site Boundary

Annual Mean NO_2 Concentration (µg/m3)

32
30
28
26
24
22
20

Title

Figure 7 - Predicted Annual Mean NO_2 Concentrations (µg/m³) 2023 Meteorological Data

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Air Quality Assessment
Westgate Street, Bury St Edmunds

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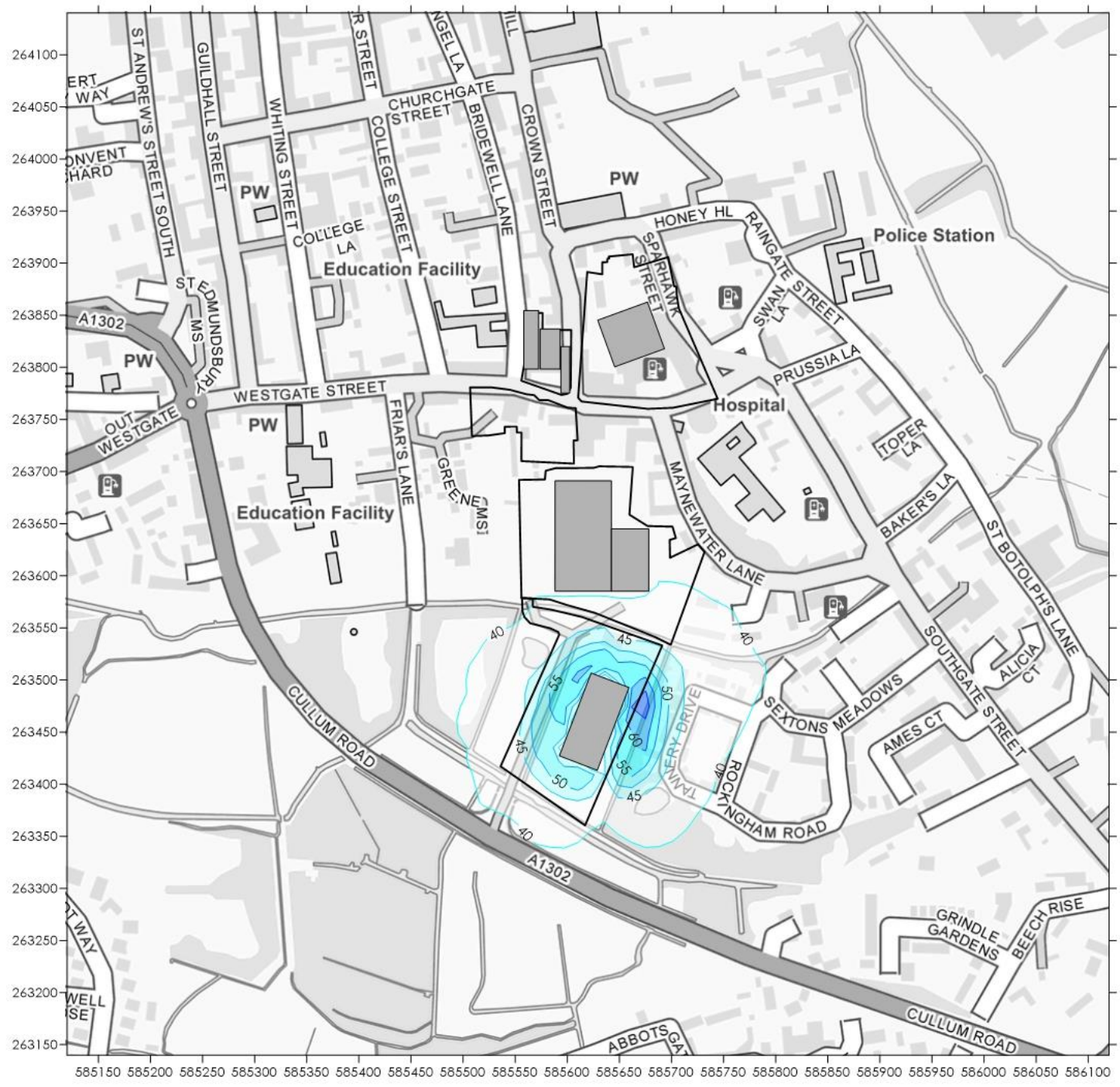

Legend

Site Boundary

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

70
65
60
55
50
45
40

Title

Figure 8 - Predicted 99.8th %ile 1-hour Mean NO_2 Concentrations ($\mu g/m^3$) 2020 Meteorological Data

Project

Air Quality Assessment
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