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Air Quality Assessment

Rev 1



**Milk &
Ingredients**

meller

Air Quality Assessment

Müller Dairy, Dove Valley Park

Client: Müller

Reference: 21.150.4.R1

Issue Date: 13 December 2021



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EXECUTIVE SUMMARY

This Air Quality Assessment has been undertaken in support of the installation of energy plant at the existing Muller Milk and Ingredients facility off Park Avenue, Dove Valley Park, Derby.

It is proposed to install two gas fired Combined Heat and Power units at the Site. Combustion emissions from the plant 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 assess potential changes in pollution levels as a result of the development.

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

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the scheme.

TABLE OF CONTENTS

1	INTRODUCTION	5
2	POLICY & GUIDANCE	7
3	BASELINE	11
4	METHODOLOGY	12
5	ASSESSMENT	19
6	CONCLUSION	22
APPENDIX 1:	GLOSSARY	23
APPENDIX 2:	FIGURES	24

1 INTRODUCTION

1.1.1 Professional Consult have been commissioned by Meller, on behalf of Müller, ('the Applicant'), to prepare an Air Quality Assessment for the proposed redevelopment of the existing dairy plant at Park Avenue, Dove Valley Park in Foston, Derbyshire DE65 5BZ to be referred to hereafter as 'the Site'.

1.2 The Proposal

1.2.1 It is understood that proposals include for the alteration of the manufacturing processes at the Site and the redevelopment will include a new 38m high structure, an extension to the existing building, new silos, an extension to the existing canopy and a new Combined Heat and Power (CHP) Plant.

1.2.2 Combustion emissions from the plant 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 assess potential changes in pollution levels as a result of the development.

1.3 Site & Locality

1.3.1 The Muller Milk and Ingredients facility is located off Park Avenue, Dove Valley Park, Derby, at approximate National Grid Reference (NGR): 420405, 332405. Reference should be made to Figure 1 for a map of the Site and surrounding area.

1.3.2 The proposals comprise development of the following infrastructure:

- ② Six silos on the western section of the Site;
- ② Extensions to the northern and southern parts of the existing factory to provide additional floorspace for processing plant and maintenance of equipment, respectively;
- ② Two gas fired Combined Heat and Power (CHP) engines and associated stack on the southern section of the Site; and,
- ② Increase in existing Tanker Clean-In-Place (CIP) Canopy to cater for 4 Heavy Goods Vehicles (HGVs).

1.3.3 The proposed infrastructure is required to facilitate the production of powdered milk through drying processes at the Site.

1.3.4 Reference should be made to Figure 2 for a proposed Site layout plan.

1.4 Purpose of Assessment

1.4.1 It is proposed install two gas fired Combined Heat and Power (CHP) engines on the southern section of the Site. Emissions from the plant will be released to atmosphere via a single flue at a minimum height of 15m.

1.4.2 Combustion emissions from the plant have the potential to cause air quality impacts at sensitive locations during normal operation. These have been assessed within the following report.

1.4.3 All acronyms used within this report are defined in the Glossary presented in Appendix 1.

- 1.4.4 It should be noted that the proposals include provision of a dryer and associated gas burner. At the time of assessment the exact plant to be installed and dispersion arrangements for associated emissions had not been finalised. Releases from the equipment were therefore not considered within this report and they will be assessed as part of an Environmental Permit Variation application to the Environment Agency (EA) when full details of the plant are known.

1.5 Confidentiality

- 1.5.1 Professional Consult has prepared this report solely for the use of the Client. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Professional Consult; a charge may be levied against such approval.

2 POLICY & GUIDANCE

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:

- ② Nitrogen dioxide (NO₂);
- ② Sulphur dioxide;
- ② Lead;
- ② Particulate matter with an aerodynamic diameter of less than 10µm;
- ② Particulate matter with an aerodynamic diameter of less than 2.5µm;
- ② Benzene; and,
- ② Carbon monoxide.

2.1.2 Air quality target values have also been provided for several additional pollutants.

2.1.3 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out Air Quality Objectives (AQOs) that 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

2.1.5 Table 2 summarises the advice provided in DEFRA guidance² on where the AQOs for pollutants considered within this report apply.

¹ The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

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 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 Local Air Quality Management

2.2.1 Under Section 82 of the Environment Act (1995) (Part IV) 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.

2.3 Industrial Pollution Control

2.3.1 Atmospheric emissions from combustion plant are controlled in the UK through the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. Existing operations at the Site are regulated in accordance with an Environmental Permit issued by the EA (Number: EPR/TP3638RP). Prior to operation of the development there will be a requirement to vary the Environmental Permit in order to authorise the proposed changes. This process will require detailed consideration of potential atmospheric emissions and associated impacts at sensitive locations in the vicinity of the Site. In accordance with the Regulations, any Environmental Permit which is subsequently issued for the facility will include appropriate conditions to restrict environmental impacts beyond the boundary of the Site.

2.4 National Planning Policy

2.4.1 The revised National Planning Policy Framework³ (NPPF) was published in July 2021 and sets out the Government's planning policies for England and how these are expected to be applied.

2.4.2 The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives, including the following of relevance to air quality:

³ NPPF, Ministry of Housing, Communities and Local Government, 2021.

"c) an environmental objective - to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

- 2.4.3 Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

[...]

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality [...]."

- 2.4.4 The NPPF specifically recognises air quality as part of delivering sustainable development and states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

- 2.4.5 The implications of the NPPF have been considered throughout this assessment.

2.5 National Planning Practice Guidance

- 2.5.1 The National Planning Practice Guidance⁴ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 and updated on 1st November 2019 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. What air quality considerations does planning need to address?
2. What is the role of plan-making with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality considerations be relevant to the development management process?
6. What specific issues may need to be considered when assessing air quality impacts?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?

- 2.5.2 These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

⁴ <https://www.gov.uk/guidance/air-quality--3>.

2.6 Local Planning Policy

2.6.1 The Adopted Local Plan Part 1⁵ was adopted by South Derbyshire District Council (SDDC) in June 2016. It forms part of the Local Development Framework for the district and provides the overall spatial strategy from 2011 to 2028.

2.6.2 A review of the Adopted Local Plan Part 1 identified the following of relevance to this assessment:

"Policy SD1 Amenity and Environmental Quality

A. The Council will support development that does not lead to adverse impacts on the environment or amenity of existing and future occupiers within or around proposed developments.

B. The Council will take into consideration the following:

[...]

ii) The potential for development to affect designated Air Quality Management Areas (AQMAs).

[...]."

2.6.3 Consideration was made to the above policy throughout the assessment.

⁵ Adopted Local Plan Part 1, SDDC, 2016.

3 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), SDDC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that concentrations of all pollutants considered within the AQS are currently below the relevant AQOs. As such, no AQMAs have been designated within the district.

3.3 Air Quality Monitoring

3.3.1 Monitoring of pollutant concentrations is undertaken by SDDC throughout their area of jurisdiction. Recent results recorded in the vicinity of the development are shown in Table 3.

Table 3. Monitoring Results

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)		
		2018	2019	2020
SDDC4	Castle Hotel, Station Road	24.8	19.5	19.1

3.3.2 As shown in Table 3, annual mean NO₂ concentrations at the SDD4 - Castle Hotel, Station Road, monitor were below the relevant AQO during 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 LAs in their Review and Assessment of air quality. The Site is located in grid square NGR: 420500, 332500. Data for this location was downloaded from the DEFRA website⁶ for the purpose of the assessment and is summarised in Table 4.

Table 4. Background Pollutant Concentration Predictions

Pollutant	Predicted 2021 Background Pollutant Concentration (µg/m ³)
NO ₂	9.42

3.4.2 As shown in Table 4, the predicted background NO₂ concentration is below the relevant AQO at the Site.

⁶ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>.

4 METHODOLOGY

4.1 Introduction

4.1.1 Emissions associated with the combustion of natural gas within the proposed plant have the potential to cause increases in pollutant concentrations 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-5.2 (v5.2.4.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-5 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 are summarised in in Table 5.

Table 5. Modelling Scenarios

Parameter	Modelled As	
	Short Term	Long Term
NO ₂	99.8 th 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 5 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.

4.3.3 Predicted pollutant concentrations were summarised in the following formats:

- ② Process Contribution (PC) - Predicted pollutant concentration as a result of emissions from the proposed plant only; and,
- ② Predicted Environmental Concentration (PEC) - Total predicted pollutant concentration as a result of emissions from the proposed plant and existing baseline levels.

4.3.4 Predicted ground level pollutant concentrations were compared with the relevant AQOs.

4.4 Assessment Area

4.4.1 The assessment area was defined based on the Site location, anticipated pollutant dispersion patterns and the positioning of sensitive receptors. Ambient concentrations were predicted over NGR: 419560, 331505 to 421190,

333135. One Cartesian grid 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 3 for a graphical representation of the assessment grid extents.

4.5 Sensitive Receptors

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

Table 6. Sensitive Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - Miry Lane	421156.1	332083.6
R2	Residential - The Bungalow	420801.9	332400.6
R3	Residential - Dark Lane	420899.1	332693.5
R4	Residential - Heath Top Farm	420247.0	332780.6
R5	Residential - Woodyard Lane	419954.4	332534.6
R6	Residential - Park View	420145.2	332467.2
R7	Residential - Woodyard Lane	419870.3	332203.4
R8	Residential - Woodyard Lane	419822.3	332092.9

4.5.2 Reference should be made to Figure 4 for a graphical representation of the sensitive receptors.

4.6 Process Conditions and Emissions

4.6.1 A summary of the inputs used in the assessment is provided in Table 7. These were based on the CHP specifications provided by Meller Ltd.

Table 7. Process Conditions and Emissions

Parameter	Unit	CHP Stack
Stack position	NGR	420332.6, 332316.1
Stack height	m	15.0
Stack diameter	m	0.6
Exhaust gas temperature	°C	120
Exhaust gas moisture content	%	10.5
Exhaust gas oxygen (O ₂) content	%	5.6
Exhaust gas volumetric flow rate	Nm ³ /hr ^(a)	6,299
Exhaust gas volumetric flow rate	m ³ /hr	10,526
Exhaust gas efflux velocity	m/s	10.34

Parameter	Unit	CHP Stack
Oxides of nitrogen (NO _x) emission concentration	mg/Nm ³	250
NO _x emission rate	g/s ^(a)	0.4374

^(a) Dry, 0°C, 5% O₂.

4.6.2 Reference should be made to Figure 3 for a map of the stack location.

4.7 NO_x to NO₂ 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 NO₂. Comparisons of ambient NO and NO₂ 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 NO₂.

4.7.2 Ambient NO_x concentrations were predicted through dispersion modelling. Concentrations of NO₂ shown in the results section assume 70% conversion from NO_x to NO₂ for annual means and 35% conversion for 1-hour concentrations, based upon EA guidance⁷.

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 several structures should be included within the model in order to take account of effects on pollutant dispersion. Input geometries are shown in Table 8.

Table 8. Building Geometries

Parameter	NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
	X	Y				
Building 1	420401.1	332411.3	38.0	30.2	63.5	192.0
Building 2	420405.8	332386.6	15.5	71.3	80.9	192.0
Building 3	420350.5	332374.1	12.0	48.4	42.7	190.9
Building 4	420353.8	332413.7	13.0	27.3	22.9	192.0
Building 5	420388.9	332317.1	11.0	55.0	51.2	192.0

4.8.1 Reference should be made to Figure 3 for a map of the building locations.

4.9 Meteorological Data

4.9.1 Meteorological data used in the assessment was taken from East Midlands meteorological station over the period 1st January 2015 to 31st December 2019 (inclusive). This observation station is located at NGR: 445745, 326055,

⁷ Environmental permitting: air dispersion modelling reports, EA, 2018.

which is approximately 26.6km east of the Site. 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 utilised meteorological records.

4.10 Roughness Length

- 4.10.1 Roughness length (z_0) is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.3m was used within the model to describe the modelling extents. This value is considered appropriate for the morphology of the area and is suggested within ADMS-5 as being suitable for 'agricultural areas (max)'.

- 4.10.2 A z_0 of 0.2m was used within the model to describe the meteorological site. This value is considered appropriate for the morphology of the area and is suggested within ADMS-5 as being suitable for 'agricultural areas (min)'.

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-5 as being suitable for 'mixed urban/industrial'.

- 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-5 as being suitable for 'small towns <10,000'.

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 CERC⁸.

4.13 Background Concentrations

- 4.13.1 Review of existing data was undertaken Section 3.0 in order to identify a suitable background value for use in the assessment. This indicated that the SDD4 - Castle Hotel, Station Road, monitor is positioned adjacent to the A511 and 2.9km from the Site. As such, the result is not considered to be representative of conditions at the CHP plant location or identified human receptors as these are set back from major road sources. The background NO₂ concentration predicted by DEFRA, as shown in Table 4, was therefore utilised to represent baseline levels in the vicinity of the Site.

- 4.13.2 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'⁹, which advises that an estimate of the maximum combined pollutant concentration can

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

⁹ Environmental permitting: air dispersion modelling reports, EA, 2018.

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.

4.14 Assessment Criteria

4.14.1 The significance of predicted air quality impacts was determined in accordance with the guidance provided within the Institute of Air Quality Management (IAQM) document 'Land-Use Planning & Development Control: Planning for Air Quality'¹⁰. Using this methodology impacts are defined based on the interaction between the predicted pollutant concentration with the development in place (PEC) and the magnitude of change (PC), as outlined in Table 9.

Table 9. Significance of Impact - Long-Term Concentrations

Concentration at Receptor in Assessment Year (PEC)	Predicted Concentration Change as Proportion of AQO (PC) (%)			
	1	2 - 5	6 - 10	> 10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

4.14.2 The matrix shown in Table 9 is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell the impact falls within. It should be noted that changes of 0%, i.e. less than 0.5%, are described as **negligible**.

4.14.3 The significance of impacts on short-term pollutant concentrations was determined in accordance with the criteria outlined in the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'¹¹, as summarised in Table 10.

Table 10. Significance of Impact - Short-Term Concentrations

Predicted Concentration Change as Proportion of AQO (PC) (%)	Significance of Impact
Less than 10	Negligible
11 - 20	Slight
21 - 50	Moderate
Greater than 51	Substantial

4.14.4 Following the prediction of impacts at discrete receptor locations, the IAQM document¹² provides guidance on determining the overall air quality impact significance of the operation of a development and states that an assessment must reach a conclusion on the likely significance of the predicted impact. Where the overall effect is **moderate** or **substantial**, the effect is likely to be considered **significant**, whilst if the impact is **slight** or **negligible**,

¹⁰ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹¹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹² Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

the impact is likely to be considered **not significant**. It should be noted that this is a binary judgement of either it is **significant** or it is **not significant**.

4.14.5 The determination of significance relies on professional judgement and reasoning has been provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

4.15 Modelling Uncertainty

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

- ② Model uncertainty - due to model limitations;
- ② Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and,
- ② Variability - randomness of measurements used.

4.15.2 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:

- ② 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;
- ② Meteorological data - Modelling was undertaken using five annual meteorological data sets from the closest observation station to the Site. The analysis was based on the worst-case year for each averaging period to ensure maximum concentrations were considered;
- ② 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;
- ② Plant operating conditions - Operational parameters were derived from the relevant CHP plant specification. As such, these are considered to be representative of normal operating conditions;
- ② Emission rates - The emission rates were derived from the relevant CHP plant specification. As such, these are considered to be representative of anticipated releases. In addition, emissions were assumed to be constant throughout the entire year, which does not allow for plant shut down or reduced operating periods. These assumptions are likely to overestimate impacts and provide a worst-case assessment;
- ② Background concentrations - The background NO₂ concentration was obtained from the DEFRA website¹³. This value is considered representative of baseline air quality conditions at sensitive locations within the vicinity of the Site;
- ② 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;
- ② 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.

¹³ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>.

- 4.15.3 Results were considered in the context of the relevant AQOs and IAQM 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 ASSESSMENT

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 Maximum predicted pollutant concentrations at any point within the modelling extents for any meteorological data set are summarised in Table 11.

Table 11. Maximum Predicted Pollutant Concentrations

Pollutant	Averaging Period	AQO ($\mu\text{g}/\text{m}^3$)	PC ($\mu\text{g}/\text{m}^3$)	PC Proportion of AQO (%)	PEC ($\mu\text{g}/\text{m}^3$)	PC Proportion of AQO (%)
NO ₂	Annual	40	5.55	13.88	14.97	37.43
	99.8 th %ile 1-hour	200	30.33	15.17	49.17	24.58

5.2.2 As shown in Table 11, there were no predicted exceedences of any AQO at any location for any pollutant or averaging period of interest.

5.2.3 Reference should be made to Figure 6 and Figure 7 for graphical representations of predicted pollutant concentrations, inclusive of background levels, throughout the assessment extents.

5.2.4 It should be noted that the data 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 NO₂ concentration was predicted using the 2017 meteorological data set. As such, the contours shown in Figure 6 were produced from the 2017 model outputs.

5.3 Sensitive Receptors

5.3.1 Predicted annual mean NO₂ PECs at the sensitive receptor locations, inclusive of background levels, are summarised in Table 12.

Table 12. Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Annual Mean NO ₂ PEC ($\mu\text{g}/\text{m}^3$)				
		2015	2016	2017	2018	2019
R1	Residential - Miry Lane	9.58	9.62	9.62	9.57	9.59
R2	Residential - The Bungalow	9.91	9.88	10.00	9.86	9.90
R3	Residential - Dark Lane	9.72	9.76	9.76	9.68	9.72
R4	Residential - Heath Top Farm	9.62	9.58	9.62	9.62	9.63
R5	Residential - Woodyard Lane	9.57	9.58	9.56	9.64	9.63
R6	Residential - Park View	9.78	9.77	9.77	9.94	9.91
R7	Residential - Woodyard Lane	9.60	9.69	9.57	9.65	9.60
R8	Residential - Woodyard Lane	9.58	9.67	9.54	9.65	9.58

- 5.3.2 As indicated in Table 12, annual mean NO₂ PECs were below the AQO of 40µg/m³ at all sensitive receptor locations for all meteorological data sets.
- 5.3.3 Reference should be made to Figure 6 for a graphical representation of predicted annual mean NO₂ concentrations throughout the assessment extents.
- 5.3.4 The significance of predicted impacts on annual mean NO₂ concentrations at the sensitive receptors are summarised in Table 13. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 13. Predicted Impacts on Annual Mean NO₂ Concentrations

Receptor		Predicted Concentration (PEC)	Predicted Concentration Change as Proportion of AQO (PC) (%)	Impact Significance
R1	Residential - Miry Lane	Below 75% of EQS	0	Negligible
R2	Residential - The Bungalow	Below 75% of EQS	1	Negligible
R3	Residential - Dark Lane	Below 75% of EQS	1	Negligible
R4	Residential - Heath Top Farm	Below 75% of EQS	1	Negligible
R5	Residential - Woodyard Lane	Below 75% of EQS	1	Negligible
R6	Residential - Park View	Below 75% of EQS	1	Negligible
R7	Residential - Woodyard Lane	Below 75% of EQS	1	Negligible
R8	Residential - Woodyard Lane	Below 75% of EQS	1	Negligible

- 5.3.5 As indicated in Table 13, impacts on annual mean NO₂ concentrations as a result of the proposed plant were predicted to be **negligible** at all sensitive receptors.
- 5.3.6 The IAQM guidance¹⁴ states that only if the impact is **moderate** or **substantial**, the effect is considered **significant**. As such, overall impacts on annual mean NO₂ concentrations are considered to be **not significant**, in accordance with the stated guidance.
- 5.3.7 Predicted 99.8th %ile 1-hour mean NO₂ PECs at the sensitive receptor locations, inclusive of background levels, are summarised in Table 14.

Table 14. Predicted 99.8th %ile 1-hour Mean NO₂ Concentrations

Receptor		Predicted 99.8 th %ile 1-hour Mean NO ₂ PEC (µg/m ³)				
		2015	2016	2017	2018	2019
R1	Residential - Miry Lane	20.93	20.96	20.92	20.96	21.14
R2	Residential - The Bungalow	22.71	23.07	22.53	23.02	23.04
R3	Residential - Dark Lane	22.12	22.40	22.14	22.02	22.39
R4	Residential - Heath Top Farm	21.66	21.92	21.85	21.49	21.89
R5	Residential - Woodyard Lane	22.18	22.25	22.23	22.29	22.41

¹⁴ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

Receptor		Predicted 99.8 th %ile 1-hour Mean NO ₂ PEC (µg/m ³)				
		2015	2016	2017	2018	2019
R6	Residential - Park View	24.50	24.82	24.70	24.83	24.86
R7	Residential - Woodyard Lane	22.56	22.59	22.06	22.58	22.56
R8	Residential - Woodyard Lane	21.91	22.09	21.64	21.93	21.94

5.3.8 As indicated in Table 14, 1-hour mean NO₂ PECs were below the AQO of 200µg/m³ at all sensitive receptor locations for all meteorological data sets.

5.3.9 Reference should be made to Figure 7 for a graphical representation of predicted 99.8th %ile 1-hour mean NO₂ concentrations throughout the assessment extents.

5.3.10 The significance of predicted impacts on 1-hour mean NO₂ concentrations at the sensitive receptors are summarised in Table 15. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 15. Predicted Impacts on 1-hour Mean NO₂ Concentrations

Receptor		Predicted Concentration Change as Proportion of AQO (PC) (%)	Impact Significance
R1	Residential - Miry Lane	Less than 10	Negligible
R2	Residential - The Bungalow	Less than 10	Negligible
R3	Residential - Dark Lane	Less than 10	Negligible
R4	Residential - Heath Top Farm	Less than 10	Negligible
R5	Residential - Woodyard Lane	Less than 10	Negligible
R6	Residential - Park View	Less than 10	Negligible
R7	Residential - Woodyard Lane	Less than 10	Negligible
R8	Residential - Woodyard Lane	Less than 10	Negligible

5.3.11 As indicated in Table 15, impacts on 1-hour mean NO₂ concentrations as a result of the proposed plant were predicted to be **negligible** at all sensitive receptors. As such, overall impacts on 1-hour mean NO₂ concentrations are considered to be **not significant**, in accordance with the IAQM guidance¹⁵.

¹⁵ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

6 CONCLUSION

- 6.1.1 Professional Consult Limited, working with our approved associate consultant Redmore Environmental Ltd, was instructed by Meller Ltd to prepare an Air Quality Assessment for the development of two CHP units at the existing Muller Milk and Ingredients facility off Park Avenue, Dove Valley Park, Derby.
- 6.1.2 Combustion emissions from the plant have the potential to cause air quality impacts during operation. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and assess potential changes in pollution levels as a result of the development.
- 6.1.3 Dispersion modelling was undertaken using ADMS-5 in order to predict pollutant levels as a result of emissions from the CHP plant. Impacts at sensitive receptors were quantified and the results compared with the relevant AQOs and IAQM significance criteria.
- 6.1.4 Predicted concentrations of NO₂ were below the relevant AQOs at all sensitive receptors for all meteorological data sets modelled. Review of the dispersion modelling results indicated that impacts on annual mean and 1-hour mean NO₂ concentrations were predicted to be **negligible** at all locations. As such, overall impacts are considered to be **not significant**, in accordance with IAQM guidance.
- 6.1.5 Based on the assessment results, air quality issues are not considered a constraint to planning consent for the scheme.

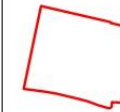
APPENDIX 1: GLOSSARY

AQAP	Air Quality Action Plan
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO	Nitric oxide
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
PC	Process Contribution
PEC	Predicted Environmental Concentration
z ₀	Roughness length
%ile	Percentile

APPENDIX 2: FIGURES



Legend



Site Boundary

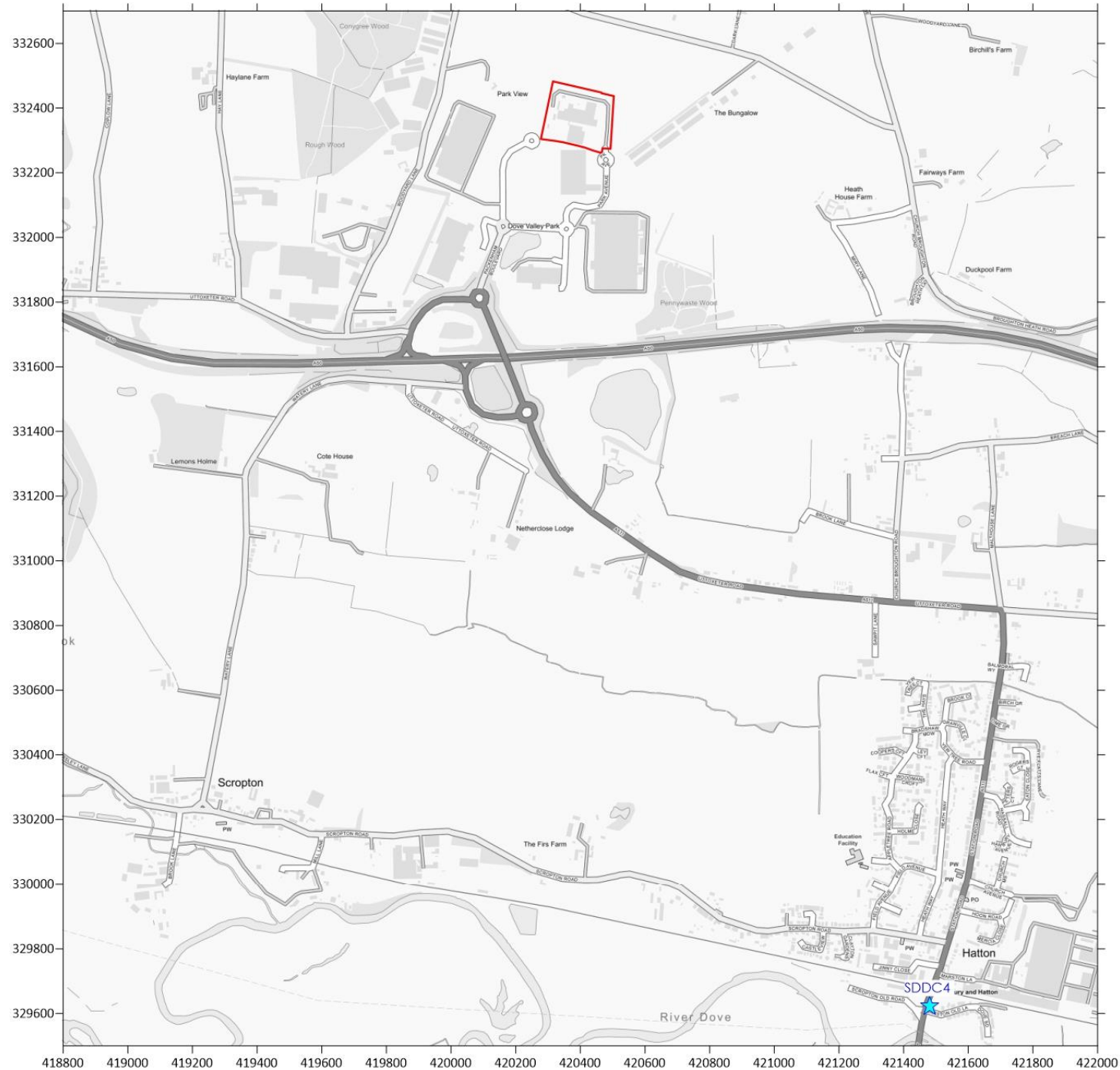
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Figure 1 - Site Location Plan

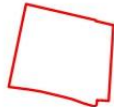
Project

Air Quality Assessment
Park Avenue, Dove Valley Park, Derby

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Legend

-  Site Boundary
-  Monitor

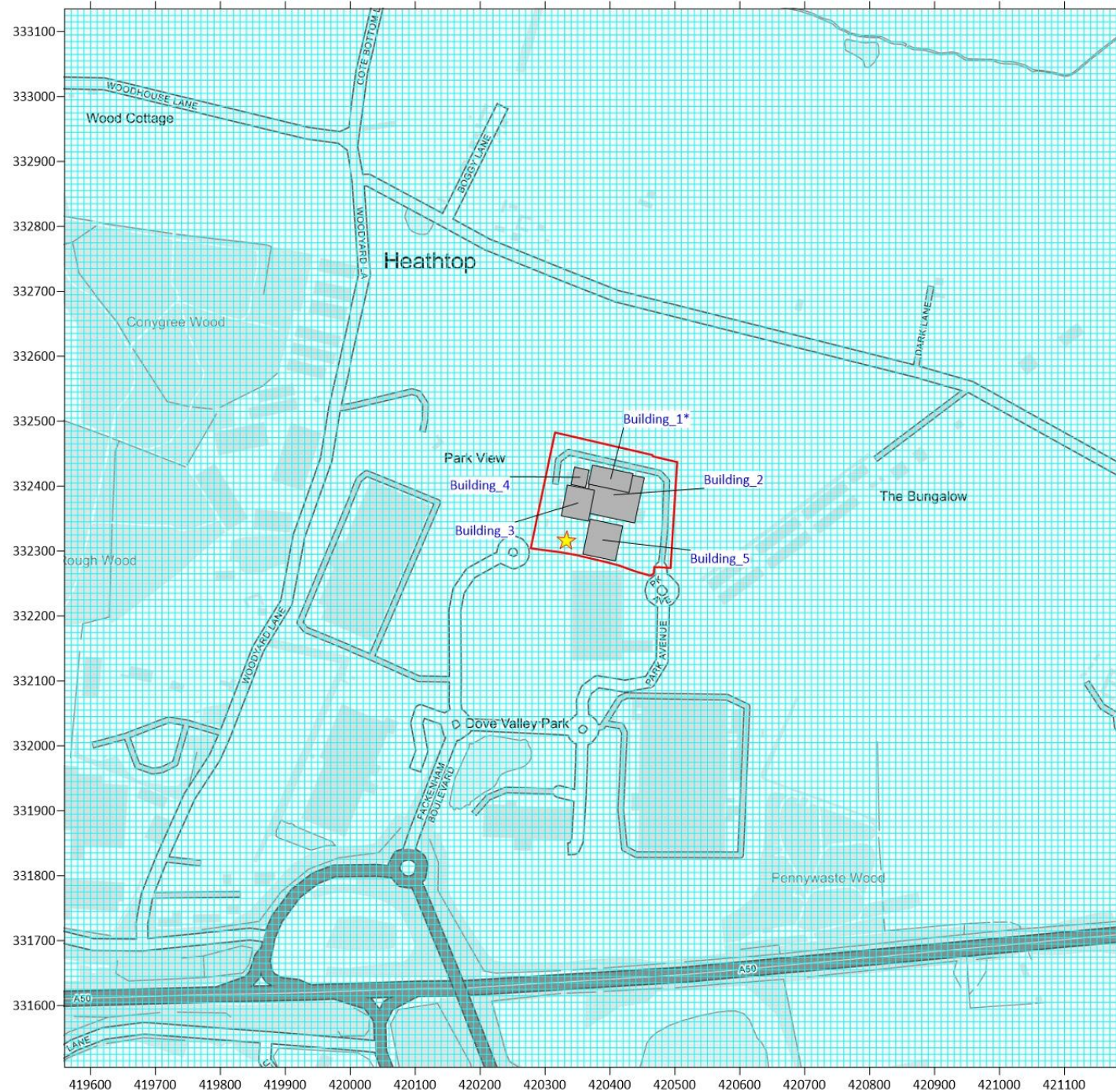
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Figure 2 - Monitor Location

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Legend

-  Site Boundary
-  Stack
-  Output Grid
-  Building

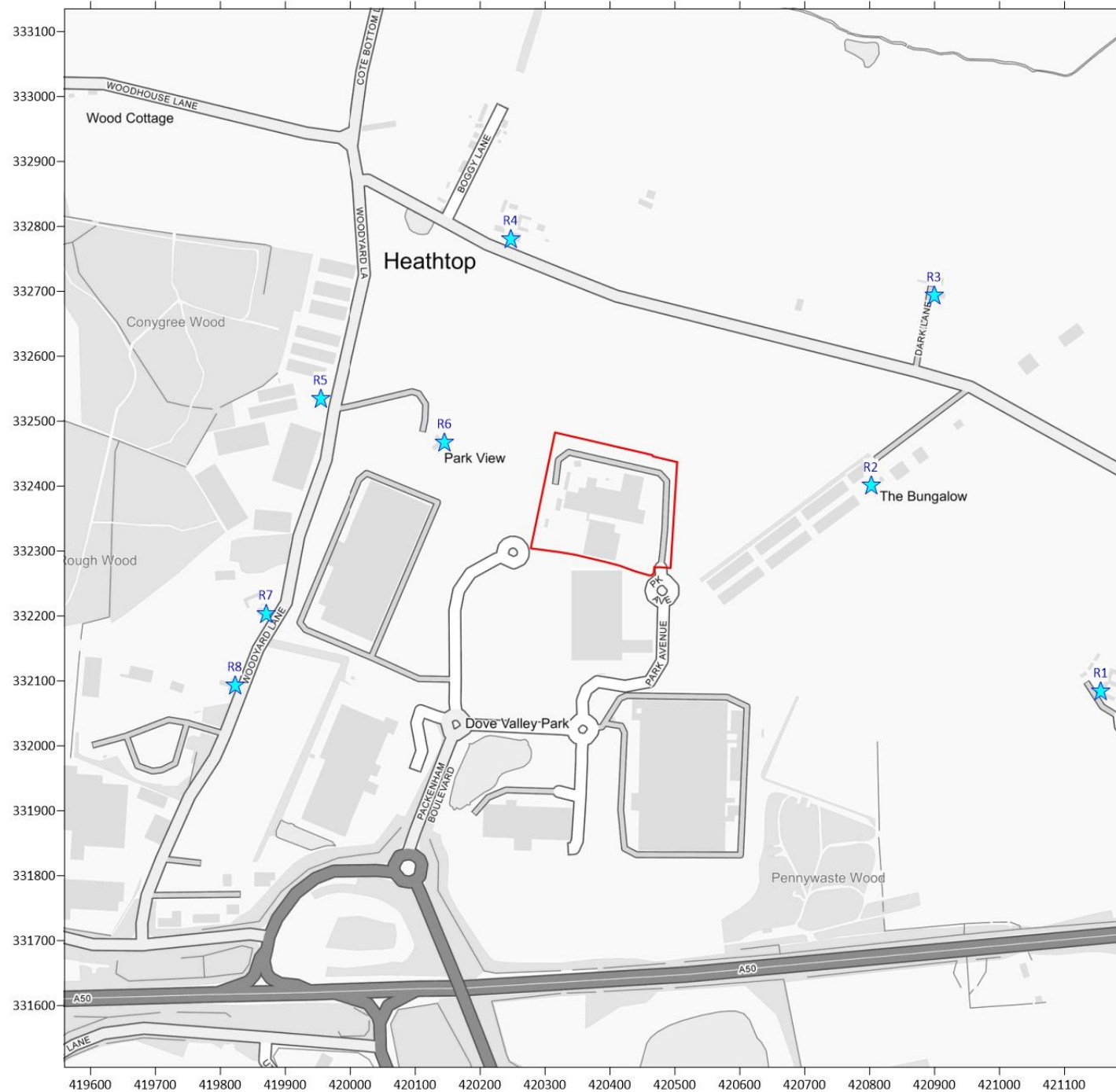
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Figure 3 - ADMS-5 Inputs

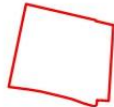
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Legend

-  Site Boundary
-  Sensitive Receptor

Title

Figure 4 - Sensitive Receptor Locations

Project

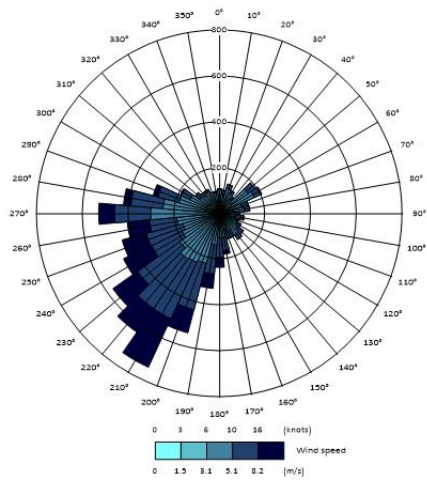
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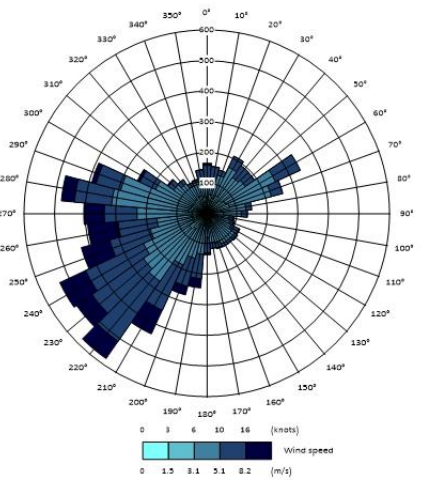
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Title
Figure 5 - Wind Roses of 2015 to 2019
East Midlands Meteorological data

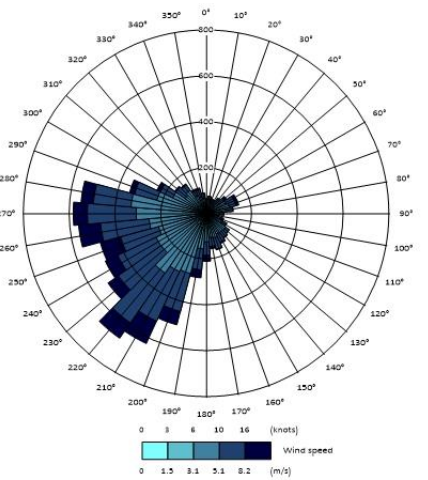
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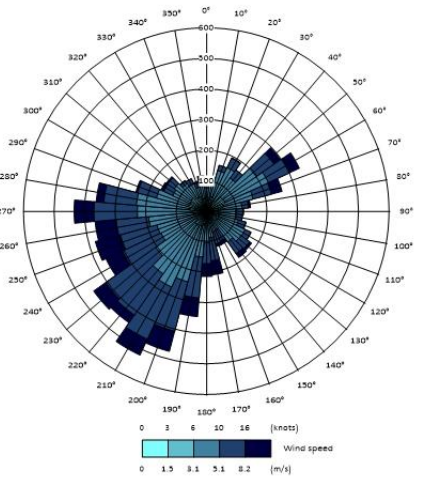
2015 Meteorological Data



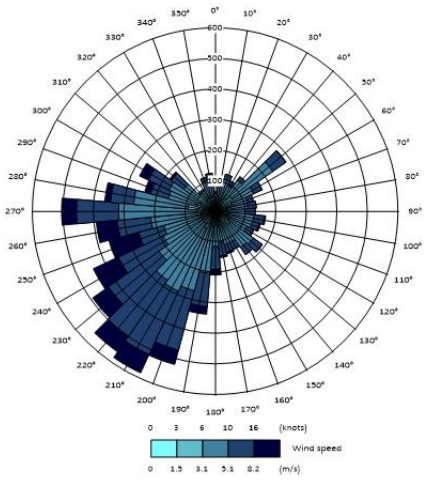
2016 Meteorological Data



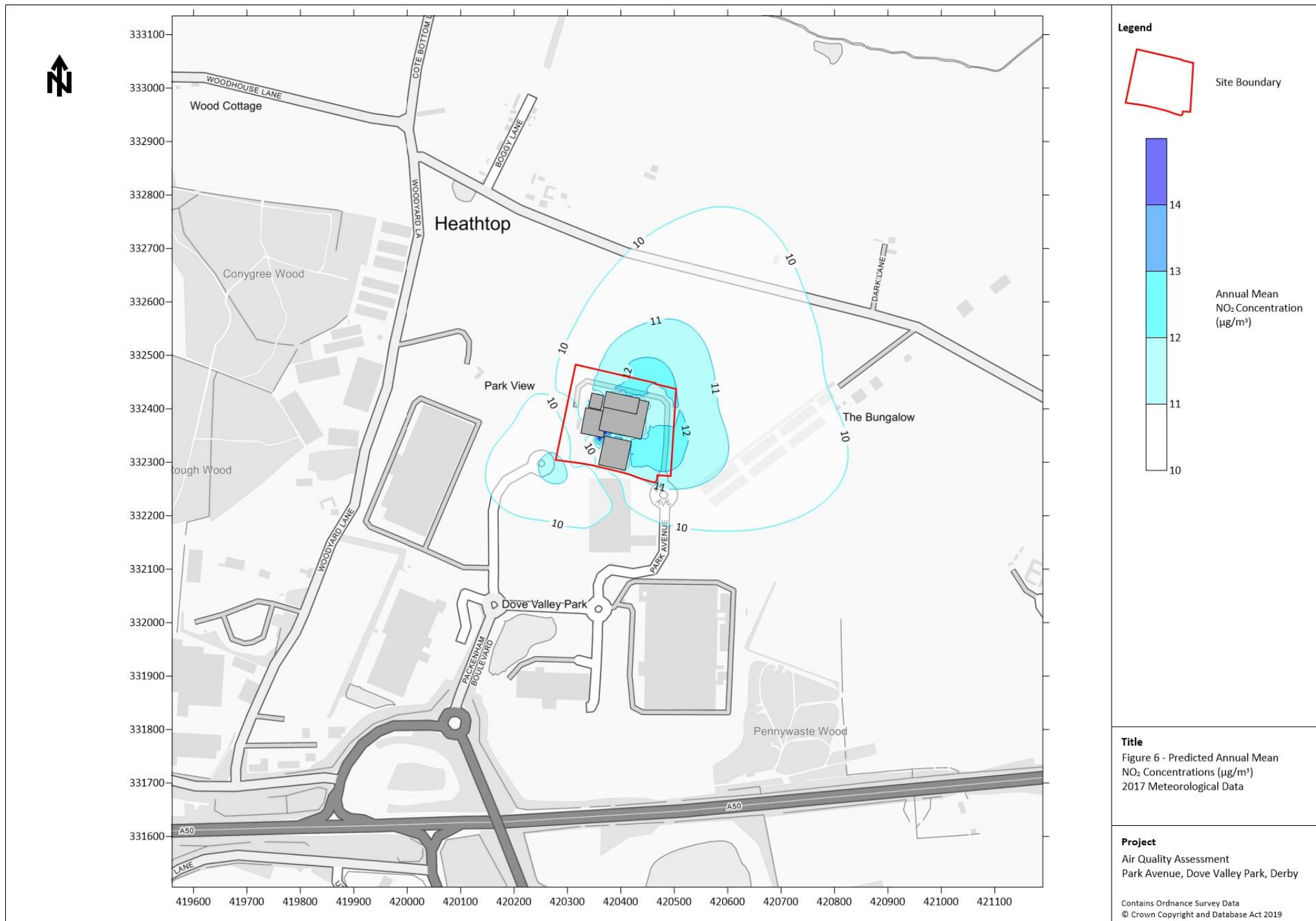
2017 Meteorological Data

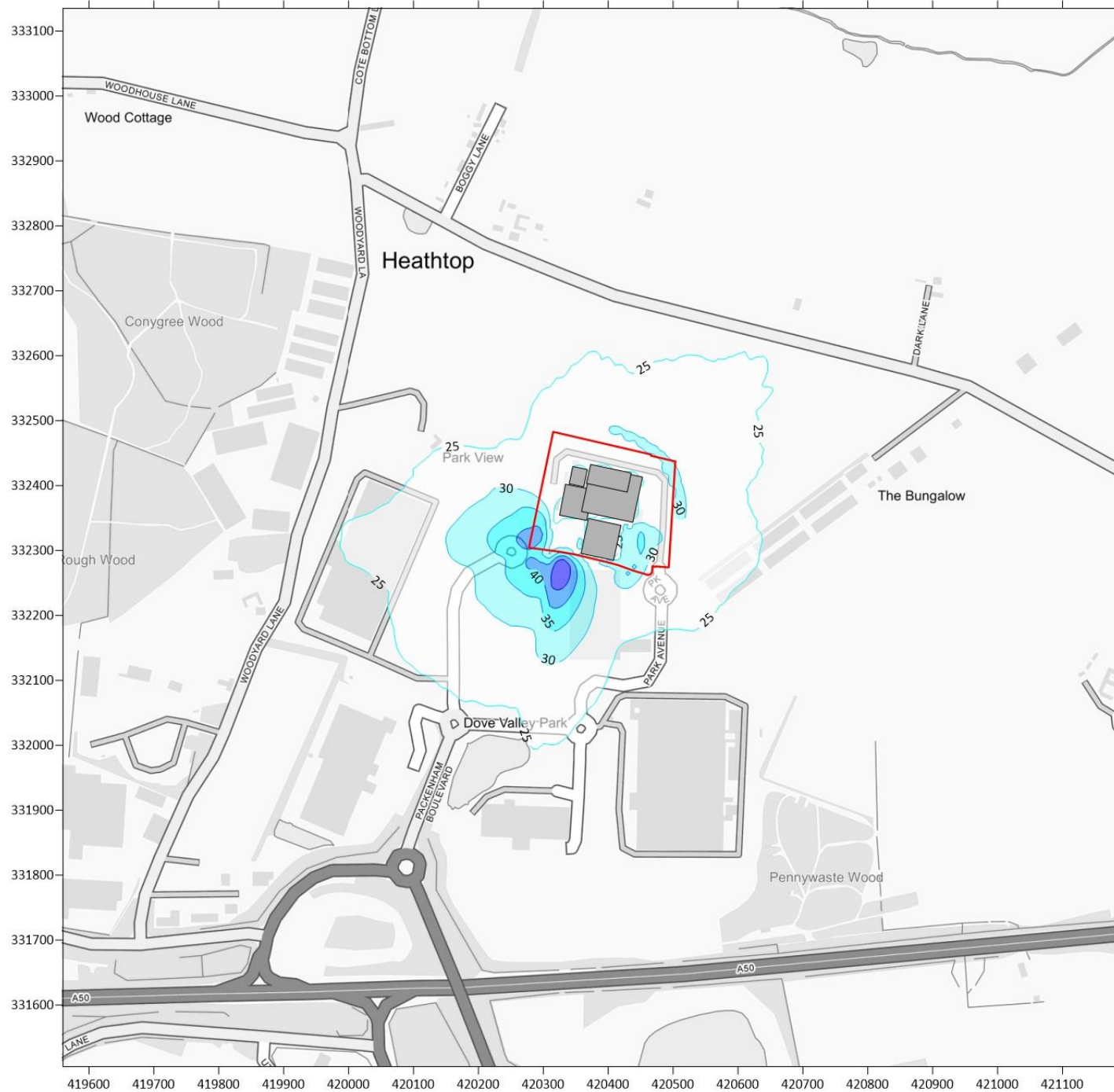


2018 Meteorological Data

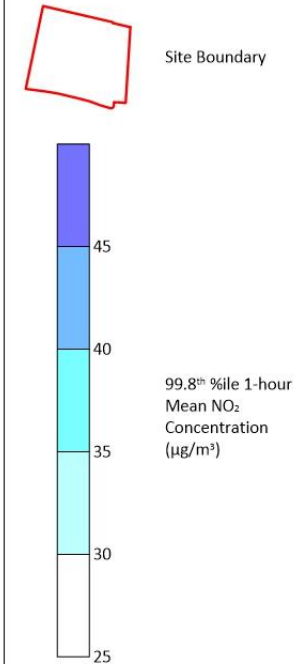


2019 Meteorological Data





Legend



Title

Figure 7 - Predicted 99.8th %ile 1-hour Mean NO₂ Concentrations (µg/m³) 2016 Meteorological Data

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