Air Quality Assessment

Ward Barnsley Site

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TETRA TECH

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Executive summary

This report details the air quality assessment undertaken to accompany the permit application for Ward's site at Boulder Bridge Lane, Cudworth, Barnsley S71 3HJ. It covers the emissions to air from two stacks on the site; both emitting particulate matter (PM_{10} and $PM_{2.5}$).

The assessment has been undertaken based upon appropriate information provided by Ward and its project team. In undertaking this assessment, Tetra Tech experts have exercised professional skills and judgement to the best of their abilities and have given professional opinions that are objective, reliable and backed with scientific rigour. These professional responsibilities are in accordance with the code of professional conduct set by the Institution of Environmental Sciences for members of the Institute of Air Quality Management (IAQM).

Regarding the operational phase, the most important consideration is stack emissions. This assessment predicts that ground-level concentrations will be within acceptable levels across the modelled grid and at sensitive receptors and will not give rise to any significant adverse effects based on the criteria in the Environment Agency online guidance 'Environmental management – guidance, Air emissions risk assessment for your environmental permit'.

The proposed development does not, in air quality terms, conflict with national or local policies. There are no constraints to the operations in the context of air quality.

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1.0 Introduction

1.1 This report details the air quality assessment undertaken to accompany the permit application for Ward's site at Boulder Bridge Lane, Cudworth, Barnsley S71 3HJ. It covers the emissions to air from two stacks on the site; both emitting particulate matter (PM_{10} and $PM_{2.5}$).

1.2 This report begins by setting out the policy and legislative context for the assessment. The methods and criteria used to assess potential air quality effects have then been described. The baseline air quality conditions have been established taking into account Defra estimates, local authority documents and the results of any local monitoring. The results of the assessment of air quality impacts have been presented. A conclusion has been drawn on the significance of the residual operational-phase effects.

1.3 A stack height determination has not been undertaken due to the stacks being preexisting. Impacts on ecological sites have also not been considered due to only Particulate Matter being emitted.

2.0 Policy and Legislative Context

Environmental Permitting Regulations

2.1 The Environmental Permitting Regulations (EPR) 2016 [1] define activities that require an Environmental Permit from the Environment Agency (EA).

2.2 EPR is a regulatory system that employs an integrated approach to control the environmental impacts of certain listed industrial activities including the generation of energy from waste. The intention of the regulatory system is to ensure that best available techniques (BAT) are used to prevent or minimise the effects of an activity on the environment, having regard to the effects of emissions to air, land and water via a single permitting process.

2.3 To gain a permit, Operators have to demonstrate in their applications, in a systematic way, that the techniques they are using or are proposing to use are the BAT for their installation and meet certain other requirements taking account of relevant local factors. The permitting process also places a duty on the regulating body to ensure that the requirements are included for permitted sites to which these apply.

2.4 The essence of BAT is that the techniques selected to protect the environment should achieve a high degree of protection of people and the environment taken as a whole. Indicative BAT standards are laid out in national guidance and where relevant, should be applied unless a different standard can be justified for a particular installation. The EA is legally obliged to go beyond BAT requirements where EU Air Quality Limit Values may be exceeded by an existing operator.

2.5 The Environment Agency's on-line guidance entitled '*Environmental management – guidance, Air emissions risk assessment for your environmental permit'* [2] provides guidelines for air dispersion modelling. The assessment of air quality effects for the proposed development is consistent with this guidance.

Air Quality Standards Regulations

2.6 The Air Quality Standards Regulations 2010 [3] amended by The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 [4], sets limit values for ambient air concentrations for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). These limit values are legally binding on the Secretary of State. The Government and devolved administrations operate various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

2.7 Table 2.1 presents the statutory air quality limit values used in this assessment.

Table 2.1: Statutory Air Quality Limit Values

Pollutant	Averaging Period	Limit Values	Not to be Exceeded More Than
Particulate Matter (PM_{10})	24 hour	50 $\mu g.m^{-3}$	35 times pcy
	Annual	40 $\mu g.m^{-3}$	-
Particulate Matter ($PM_{2.5}$)	Annual	20 $\mu g.m^{-3}$	-

Non-Statutory Air Quality Objectives and Guidelines

2.8 The Environment Act 1995 established the requirement for the Government and the devolved administrations to produce a National Air Quality Strategy (AQS) for improving ambient air quality, the first being published in 1997 and having been revised several times since, with the latest published in 2007 [5]. The Strategy sets UK air quality standards♦ and objectives# for the pollutants in the Air Quality Standards Regulations plus 1,3-butadiene and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the Air Quality Standards Regulations.

2.9 The limit values and objectives relevant to this assessment are summarised in Table 2.2. Although the limit values and the AQS objectives are numerically equal, there are some differences in where they apply and who is responsible for their achievement.

2.10 The Environment Agency online guidance entitled 'Environmental management – guidance, Air emissions risk assessment for your environmental permit' [6] provides further assessment criteria in the form of Environmental Assessment Levels (EALs).

Table 2.2: Non-Statutory Air Quality Objectives and Guidelines

Pollutant	Averaging Period	Guideline
Particulate Matter ($PM_{2.5}$)	Annual	Target of 15% reduction in concentrations at urban background locations
	Annual	20 $\mu g.m^{-3}$

♦ Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date.

3.0 Assessment Methodology

Approach

3.1 This air quality assessment includes the key elements listed below:

- Establishing the background Ambient Concentration (AC) from consideration of Air Quality Review & Assessment findings and assessment of existing local air quality through a review of available air quality monitoring and Defra background map data in the vicinity of the proposed site.
- Quantitative assessment of the operational effects on local air quality from stack emissions utilising a “new generation” Gaussian dispersion model, ADMS 6. Assessment of Process Contributions (PC) from the facility in isolation, and assessment of resultant Predicted Environmental Concentrations (PEC), taking into account cumulative impacts through incorporation of the AC.

3.2 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments. The air quality team members involved at various stages of this assessment have professional affiliations that include Member of the Institute of Air Quality Management and Member of the Institution of Environmental Sciences and have the required academic qualifications for these professional bodies.

Pollutant Concentrations

3.3 In urban areas, pollutant concentrations are primarily determined by the balance between pollutant emissions that increase concentrations, and the ability of the atmosphere to reduce and remove pollutants by dispersion, advection, reaction and deposition. An atmospheric dispersion model is used as a practical way to simulate these complex processes; such a model requires a range of input data, which can include emissions rates, meteorological data and local topographical information. The model used and the input data relevant to this assessment are described in the following sub-sections.

3.4 The atmospheric pollutant concentrations in an urban area depend not only on local sources at a street scale, but also on the background pollutant level made up of the local urban-wide background, together with regional pollution and pollution from more remote sources brought in on the incoming air mass. This background contribution needs to be added to the fraction from the modelled sources, and is usually obtained from measurements or estimates of urban background concentrations for the area in locations that are not directly affected by local emissions sources. Background pollution levels are described in detail in Section 4.0.

Dispersion Model Selection

3.5 A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources. Modelling for this study has been undertaken using ADMS 6, a version of the ADMS (Atmospheric Dispersion Modelling System) developed by Cambridge Environmental Research Consultants (CERC) that models a wide range of buoyant and passive releases to atmosphere either individually or in combination. The model calculates the mean concentration over flat terrain and also allows for the effect of plume rise, complex terrain, buildings and deposition. Dispersion models predict atmospheric concentrations within a set level of confidence and there can be variations in results between models under certain conditions; the ADMS 6 model has been formally validated and is widely used in the UK and internationally for regulatory purposes.

3.6 ADMS comprises a number of individual modules each representing one of the processes contributing to dispersion or an aspect of data input and output. Amongst the features of ADMS are:

- An up-to-date dispersion model in which the boundary layer structure is characterised by the height of the boundary layer and the Monin-Obukhov length, a length scale dependent on the friction velocity and the heat flux at the surface. This approach allows the vertical structure of the boundary layer, and hence concentrations, to be calculated more accurately than does the use of Pasquill-Gifford stability categories, which were used in many previous models (e.g. ISCST3). The restriction implied by the Pasquill-Gifford approach that the dispersion parameters are independent of height is avoided. In ADMS the concentration distribution is Gaussian in stable and neutral conditions, but the vertical distribution is non-Gaussian in convective conditions, to take account of the skewed structure of the vertical component of turbulence;
- A number of complex modules including the effects of plume rise, complex terrain, coastlines, concentration fluctuations and buildings; and
- A facility to calculate long-term averages of hourly mean concentration, dry and wet deposition fluxes and radioactivity, and percentiles of hourly mean concentrations, from either statistical meteorological data or hourly average data.

Model Inputs

Meteorological Data

3.7 The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability as described below:

- Wind direction determines the sector of the compass into which the plume is dispersed;
- Wind speed affects the distance that the plume travels over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models, including ADMS, use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

3.8 For meteorological data to be suitable for dispersion modelling purposes, a number of meteorological parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

3.9 The year of meteorological data that is used for a modelling assessment can have a significant effect on source contribution concentrations. Dispersion model simulations have been performed using five years of data from Emley Moor between 2021 and 2025.

3.10 Wind roses have been produced for each of the years of meteorological data used in this assessment and are presented in Figure 1.

Stack Parameters and Emissions Rates used in the Model

3.11 Flue gases are emitted from an elevated stack to allow dispersion and dilution of the residual combustion emissions. The stack needs to be of sufficient height to ensure that pollutant concentrations are acceptable by the time they reach ground level. The stack also needs to be high enough to ensure that releases are not within the aerodynamic influence of nearby buildings, or else wake effects can quickly bring the undiluted plume down to the ground.

3.12 Stack emissions characteristics modelled are provided in Table 3.1. The stack location is shown in Figure 2.

Table 3.1: Stack Characteristics

Parameter	Unit	Value (A1)	Value (A2)
Stack height	m	12.5	9.5
Internal diameter	m	1.0	1.0
Efflux velocity	$m.s^{-1}$	13.9	12
Efflux temperature	°C	21.7	22.7

Parameter	Unit	Value (A1)	Value (A2)
Actual Volumetric Flow Rate	$m^3.s^{-1}$	10.9	9.4
Concentration (Particulate Matter)*	$mg.m^{-3}$	5**	5**
Mass emission rate (Particulate Matter))	$g.s^{-1}$	0.050	0.043

*assumed that all the pollutant emissions will either be PM_{10} or $PM_{2.5}$

**Monitoring data undertaken during the previous operations of the site processing the same types of waste have confirmed that operation within the BAT AEL can be met.

3.13 The stacks will be in operation for 16 hours per day, 6 days a week. This is a total of 4,992 hours a year and 16 hours a day at constant emission rates.

3.14 Predicted concentrations with annual-mean averaging periods were multiplied by 4992/8760. Predicted concentrations with daily-mean averaging period were multiplied by 16/24.

Terrain

3.15 The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and by increasing turbulence and, hence, plume mixing. A complex terrain file has been used within the model.

Surface Roughness

3.16 The roughness of the terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length.

3.17 A surface roughness length of 0.3 m, which the software developer recommends for use in agricultural areas, has been used within the model to represent the average surface characteristics across the study area.

Building Wake Effects

3.18 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. The dominant structures (i.e. with the greatest dimensions likely to promote turbulence) included within the model are listed in Table 3.2.

Table 3.2: Dimensions of Buildings Included Within the Dispersion Model

ID	Name	X (m) Approx Centre Location	Y (m) Approx Centre Location	Height (m)	Length (m)	Width (m)	Angle (Degrees)
1	Granulation	437676	410454	11.4	32.5	65.1	82
2	Watchtower	437697	410426	15	5.8	5.8	85
3	Offsite East	437730	410454	9	20.95	15.84	166
4	Offsite East 2	437723	410418	6	12.01	10.39	358
5	Offsite South	437690	410396	11	22.50	16.50	4
6	Offsite South 2	437664	410410	6	7.91	11.90	175

Model outputs

Receptors

3.19 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG22 [7] provides examples of exposure locations and these are summarised in Table 3.3.

Table 3.3: Examples of Where Air Quality Objectives Apply

Averaging Period	Objectives should apply at:	Objectives should generally 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.	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's façades), or any other location where public exposure is expected to be short-term.
Daily-mean	All locations where the annual-mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building's façade), or any other location where public exposure is expected to be short-term.

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g. 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 to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

3.20 The ground level concentrations have been modelled at locations across a grid of 3 km by 3 km, with a spacing of 19 m, centred on the stack.

3.21 In addition, the effects of the proposed development have been assessed at the façades of a representative selection of discrete local existing receptors. All human receptors have been modelled at a height of 1.5 m, representative of typical head height. The locations of these discrete receptors are listed in Table 3.4 and illustrated in Figure 2.

Table 3.4: Modelled Sensitive Receptors

ID	Description	X	Y
1	111 Shaw Lane	437912	410371
2	165 Royston Road	438217	410465
3	213 Weetshaw Lane	438220	410505
4	97 East End Crescent	437336	411158
5	Outwood Academy	436733	410434
6	107 Shaw Lane	437396	410147
7	63 Shaw Lane	437038	410007
8	Bloemfontein Street	438275	408922
9	22 Queens Drive	438748	411255

3.22 The EALs for all the different averaging periods apply at the façades of the modelled sensitive receptors.

Significance Criteria

3.23 The on-line EA guidance entitled *'Environmental management – guidance, Air emissions risk assessment for your environmental permit'* [2] has been used. This guidance provides details for screening out substances for detailed assessment. In particular, it states that:

"To screen out a PC for any substance so that you don't need to do any further assessment of it, the PC must meet both of the following criteria:

- *the short-term PC is less than 10% of the short-term environmental standard*
- *the long-term PC is less than 1% of the long-term environmental standard*

If you meet both of these criteria you don't need to do any further assessment of the substance.

If you don't meet them you need to carry out a second stage of screening to determine the impact of the PEC."

3.24 It continues by stating that:

"You must do detailed modelling for any PECs not screened out as insignificant."

3.25 It then states that further action may be required where:

- *"your PCs could cause a PEC to exceed an environmental standard (unless the PC is very small compared to other contributions – if you think this is the case contact the Environment Agency)*
- *The PEC is already exceeding an environmental standard"*

3.26 The EA online guidance '*Environmental permitting: air dispersion modelling reports'* [8] states:

"For a detailed modelling assessment PCs are insignificant where they are less than:

- *10% of a short-term environmental standard*
- *1% of a long-term environmental standard*

At the detailed modelling stage there are no criteria to determine whether:

- *PCs are significant*
- *PECs are insignificant or significant*

You must explain how you judged significance and base this on the site specific circumstances."

3.27 On that basis, the results of the detailed modelling presented in this report have been used as follows:

- The effects are not considered significant if the short-term PC is less than 10% of the short-term EAL or the PEC is below the EAL; and
- The effects are not considered significant if the long-term PC is less than 1% of the long-term EAL or the PEC is below the EAL.

Uncertainty

3.28 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

3.29 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

3.30 Each of the data inputs for the model, listed earlier, will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the range informed by an analysis of relevant, available data.

3.31 The main components of uncertainty in the total predicted concentrations, made up of the background concentration and the modelled fraction, include those summarised in Table 3.5.

Table 3.5: Approaches to Dealing with Uncertainty used Within the Assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as, in reality, background concentrations are likely to reduce over time as cleaner vehicle	The background concentration is the major proportion of the total predicted concentration. The conservative assumptions adopted ensure that the background concentration used within the model contributes towards the results being towards

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
		technologies form an increasing proportion of the fleet.	the top of the uncertainty range, rather than a central estimate.
Model Input/ Output Data	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for 5 full years of meteorological conditions.	
	Receptors	The model has been run for a grid of receptors. In addition, receptor locations have been identified where concentrations are highest or where the greatest changes are expected.	
	Emissions Data	The two modelled stacks emit a combination of PM_{10} and $PM_{2.5}$. A conservative assumption has been made that the stacks emit 100% PM_{10} and 100% $PM_{2.5}$ instead of a combination of the two.	

4.0 Baseline Air Quality Conditions

Overview

4.1 The ambient concentration often represents a large proportion of the total pollution concentration, so it is important that the ambient concentration selected for the assessment is realistic. EPUK & IAQM guidance highlight public information from Defra and local monitoring studies as potential sources of information on air quality.

4.2 For this assessment, the background air quality has been characterised by drawing on information from the following public sources:

- Defra maps [9], which show estimated pollutant concentrations across the UK in 1 km grid squares; and
- published results of local authority Review and Assessment (R&A) studies of air quality, including local monitoring and modelling studies; and
- results published by national monitoring networks.

4.3 A detailed description of how the baseline air quality has been derived for this Proposed Development site is summarised in the following paragraphs.

Local Background Monitoring

4.4 Background concentrations have been derived from comparisons of monitored local data and Defra background maps. Table 4.1 shows the results of local monitoring.

Table 4.1: Monitored Annual-Mean Concentrations

Monitor Name	Approximate Distance from the Application Site (km)	Pollutant	Concentration µg.m^{-3}	
			2023	2024
BAR3	5.9	PM_{10}	12	11.4
		$PM_{2.5}$	7	7.1

Defra Mapped Concentration Estimates

Defra's total annual-mean PM_{10} and $PM_{2.5}$ concentration estimates have been collected for the 1 km grid square of the monitoring sites and are summarised in

4.5 Table 4.2.

Table 4.2: Defra Mapped Annual-Mean PM_{10} and $PM_{2.5}$ Concentration Estimates

Monitor Name	Approximate Distance from the Application Site (km)	Pollutant	Concentration μg.m^{-3}	
			Range of Monitored	Estimate Defra Mapped
Ward Barnsley	-	PM_{10}	-	12.0
		$PM_{2.5}$	-	6.5
BAR3	5.9	PM_{10}	11.4-12	11.0
		$PM_{2.5}$	7-7.1	6.4

Appropriate Background Concentrations for the Development Site

4.6 For PM_{10}, the Defra mapped background concentration estimates are generally smaller than the range of the results from monitoring and the use of these data would not be conservative. Automatically monitored annual-mean PM_{10} concentrations at the BAR3 monitor range from 11.4 to 12 μg.m^{-3}. To ensure the assessment is conservative, the background annual-mean $PM_{2.5}$ concentration has been derived from the 12 μg.m^{-3}, monitored in 2023.

4.7 For $PM_{2.5}$, the Defra mapped background concentration estimates are generally smaller than the range of the results from monitoring and the use of these data would not be conservative. Automatically monitored annual-mean $PM_{2.5}$ concentrations at the BAR3 monitor range from 7 to 7.1 μg.m^{-3}. To ensure the assessment is conservative, the background annual-mean $PM_{2.5}$ concentration has been derived from the 7.1 μg.m^{-3}, monitored in 2024.

4.8 The ambient concentrations (AC) used in the assessment are set out in Table 4.3.

Table 4.3: Summary of Assumed Ambient Concentrations

Pollutant	Long-term	Data Source
PM_{10}	12.0	BAR3 (2023)
$PM_{2.5}$	7.1	BAR3 (2024)

5.0 Assessment of Operational-Phase Air Quality Impacts

Stack Emissions

5.1 For each of the five years of meteorological data (2021 to 2025), the maximum predicted ground-level concentration across the modelled domain and concentrations at sensitive receptors have been derived and are reported below.

5.2 Table 5.1 and Table 5.2 summarises the predicted annual mean and daily mean PM_{10} PCs.

5.3 Table 5.3 summarises the predicted annual mean $PM_{2.5}$ PCs.

Table 5.1: Predicted Annual Mean PM_{10} Process Contributions

Averaging period	EAL (µg.m^{-3})	PC (µg.m^{-3})	PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC (µg.m^{-3})	PEC (µg.m^{-3})	PEC as % of EAL	PEC is Potentially Significant?
111 Shaw Lane	40	0.33	1	1	No	12	-	-	-
165 Royston Road		0.08	0		No		-	-	-
213 Weetshaw Lane		0.07	0		No		-	-	-
97 East End Crescent		0.02	0		No		-	-	-
Outwood Academy		0.02	0		No		-	-	-
107 Shaw Lane		0.04	0		No		-	-	-
63 Shaw Lane		0.02	0		No		-	-	-
Bloemfontein Street		0.01	0		No		-	-	-
22 Queens Drive		0.01	0		No		-	-	-
Max Across the Grid		4.47	11		Yes		16.47	41	No

Table 5.2: Predicted Daily Mean PM_{10} Process Contributions

Averaging period	EAL ($\mu g.m^{-3}$)	PC ($\mu g.m^{-3}$)	PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant?
111 Shaw Lane	50	1.07	2	10	No	12	-	-	-
165 Royston Road		0.23	0		No		-	-	-
213 Weetshaw Lane		0.22	0		No		-	-	-
97 East End Crescent		0.08	0		No		-	-	-
Outwood Academy		0.09	0		No		-	-	-
107 Shaw Lane		0.22	0		No		-	-	-
63 Shaw Lane		0.09	0		No		-	-	-
Bloemfontein Street		0.02	0		No		-	-	-
22 Queens Drive		0.04	0		No		-	-	-
Max Across the Grid		11.03	22		Yes		23.03	46	No

Table 5.3: Predicted Annual Mean $PM_{2.5}$ Process Contributions

Averaging period	EAL ($\mu g.m^{-3}$)	PC ($\mu g.m^{-3}$)	PC as % of EAL	Criteria (%)	PC is Potentially Significant?	AC ($\mu g.m^{-3}$)	PEC ($\mu g.m^{-3}$)	PEC as % of EAL	PEC is Potentially Significant?
111 Shaw Lane	20	0.33	2	1	Yes	7.1	7.43	37	No
165 Royston Road		0.08	0		No		-	-	-
213 Weetshaw Lane		0.07	0		No		-	-	-
97 East End Crescent		0.02	0		No		-	-	-
Outwood Academy		0.02	0		No		-	-	-
107 Shaw Lane		0.04	0		No		-	-	-
63 Shaw Lane		0.02	0		No		-	-	-
Bloemfontein Street		0.01	0		No		-	-	-
22 Queens Drive		0.01	0		No		-	-	-
Max Across the Grid		4.47	22		Yes		11.57	58	No

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5.4 The results presented in Table 5.1 shows that the predicted PCs are below 1% of the relevant long-term EAL for PM_{10} at all receptors except for the maximum across the grid. When the maximum across the grid long-term PC is added to the background AC, the PEC is well below 100% of the EAL. Therefore, the impacts are not considered significant.

5.5 The results presented in Table 5.2 show that the predicted PCs are below 10% of the relevant short-term EAL for PM_{10} at all receptors except for the maximum across the grid. When the maximum across the grid short-term PC is added to the background AC, the PEC is well below 100% of the EAL. Therefore, the impacts are not considered significant.

5.6 The results presented in Table 5.3 show that the predicted PCs are below 10% of the relevant long-term EAL for $PM_{2.5}$ at all receptors except for 111 Shaw Lane and the maximum across the grid. When the maximum across the grid long-term PCs are added to the background AC, the PECs are well below 100% of the EAL. Therefore, the impacts are not considered significant.

5.7 As noted in section 3.0, the total PM emission is assumed to be both 100% PM_{10} and 100% $PM_{2.5}$. Therefore, actual concentrations of $PM_{2.5}$ will be lower than presented in this report.

5.8 Contour plots of the annual-mean PM PC and the 90.41st percentile daily mean PM_{10} PC are shown in Figure 3 and Figure 4. The contours are for the year with the maximum PC across the grid.

5.9 The maximum across the grid points of impact for both the long-term and short-term PCs fall within the site boundary.

Significance of Effects

5.10 It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

5.11 Using professional judgement, the resulting air quality effect is considered to be ‘not significant’ overall.

Sensitivity and Uncertainty

5.12 As set out in Section 3, it is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively. Professional judgement by a competent, suitably qualified professional is required to establish the significance associated with the consequence of the impacts.

5.13 Based on the predicted concentrations, the effects are deemed to be not significant, with no predicted exceedances of any objectives or standards with relevant exposure across the modelled grid.

6.0 Mitigation

6.1 Predicted concentrations of pollutants have been demonstrated by the assessment to meet all relevant air quality standards, objectives and EALs. On that basis, no mitigation is proposed.

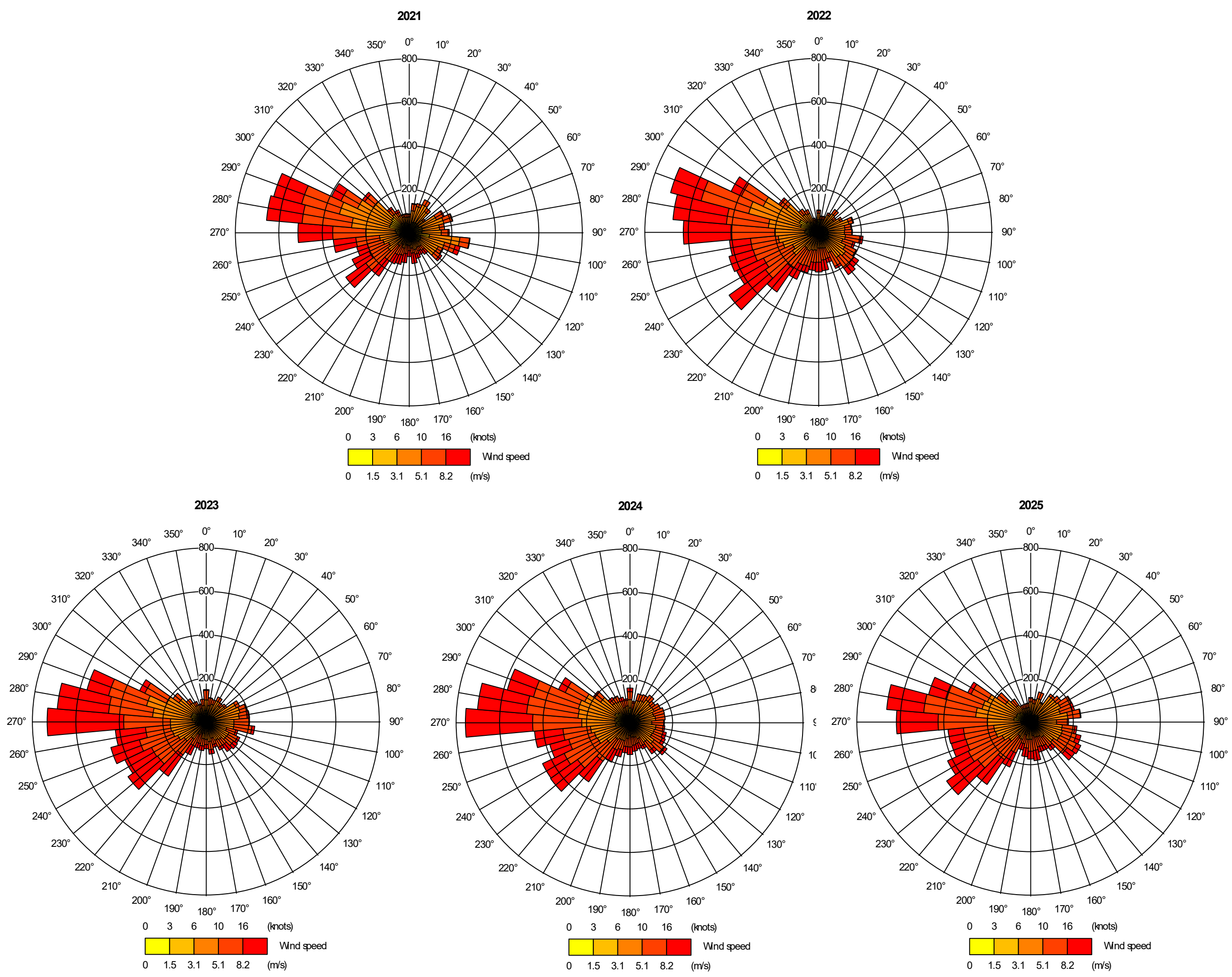
7.0 Conclusions

7.1 This assessment has considered the air quality impacts during the operational phase for Ward's site at Boulder Bridge Lane, Cudworth, Barnsley S71 3HJ.

7.2 Emissions of PM_{10} and $PM_{2.5}$ from the two stacks have been assessed through detailed dispersion modelling using best practice approaches. The assessment has been undertaken based on a number of conservative assumptions. This is likely to result in an over-estimate of the contributions that will arise in practice from the facility. The operational impact on receptors in the local area is predicted to be 'negligible' taking into account the changes in pollutant concentrations and the absolute levels. Using the criteria adopted for the assessment, together with professional judgement, the effects are not considered significant.

7.3 Overall, the effects of the facility are not considered to be significant.

Figures



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Job Ref: 794-ENV-AIR-24066	
Date: 02/06/2026	Version: 0
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Figure 1: Wind Roses – Emley Moor

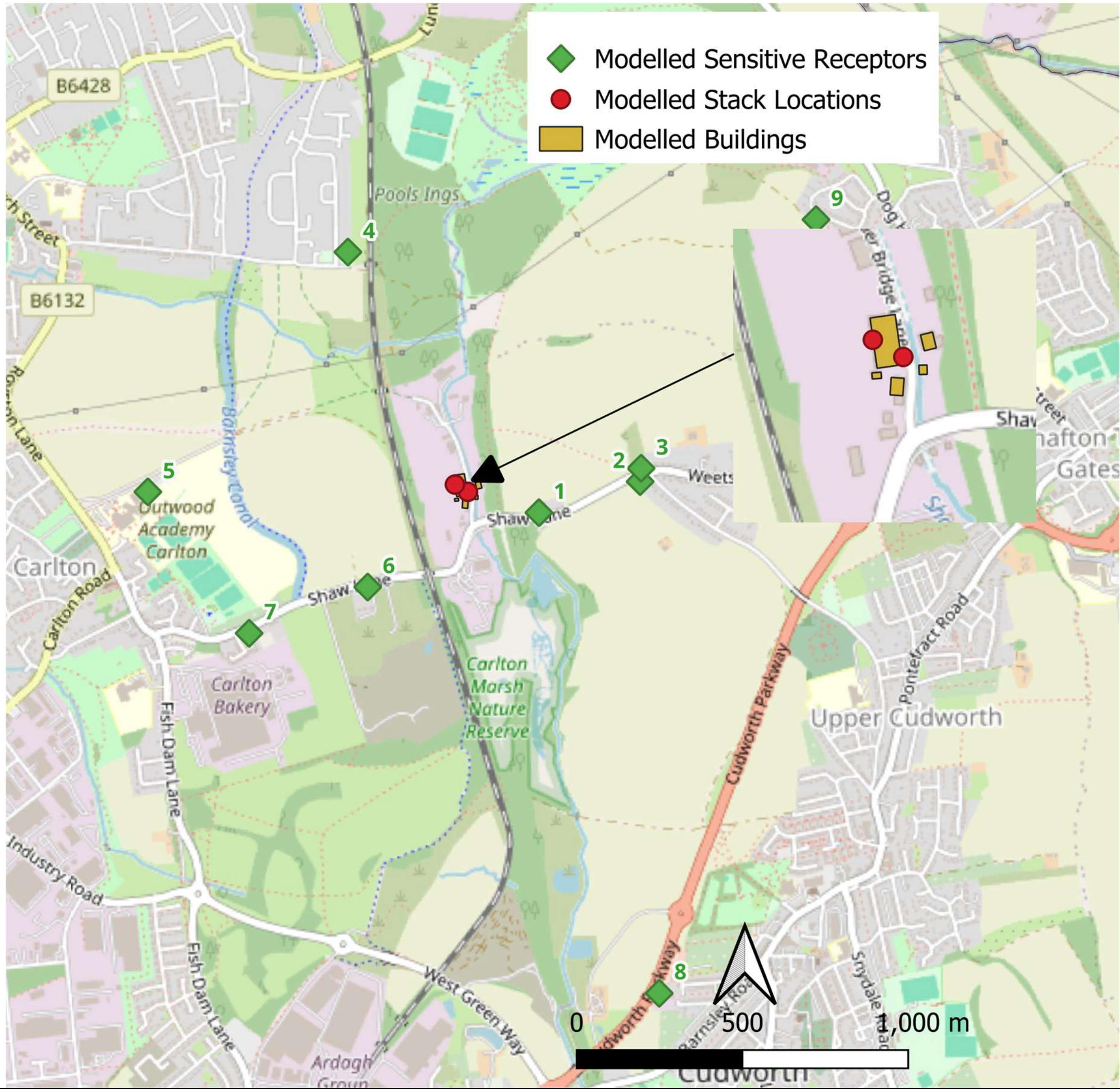

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Figure 2: Stacks, Buildings and Receptors Modelled

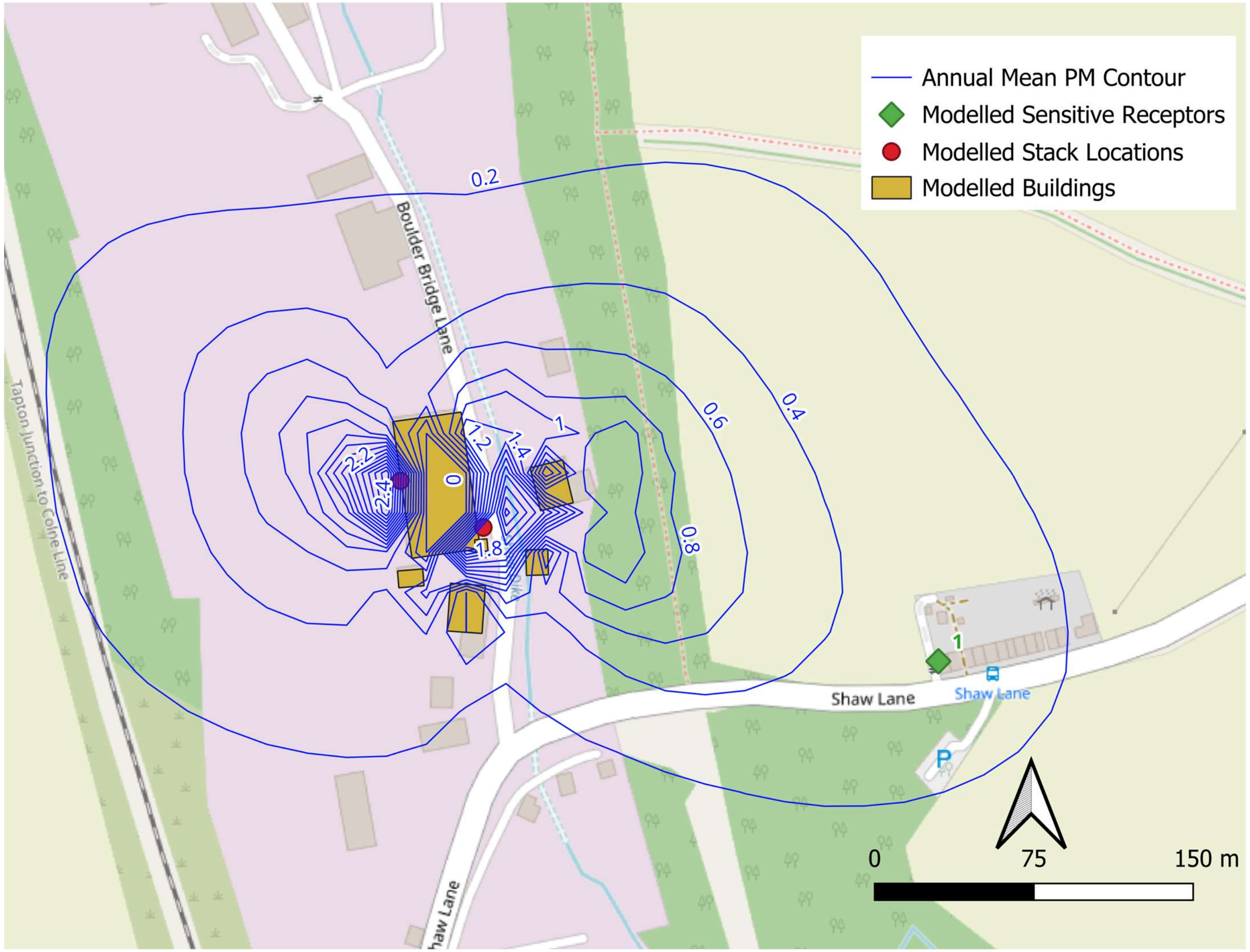

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Figure 3: Annual Mean PM Contour

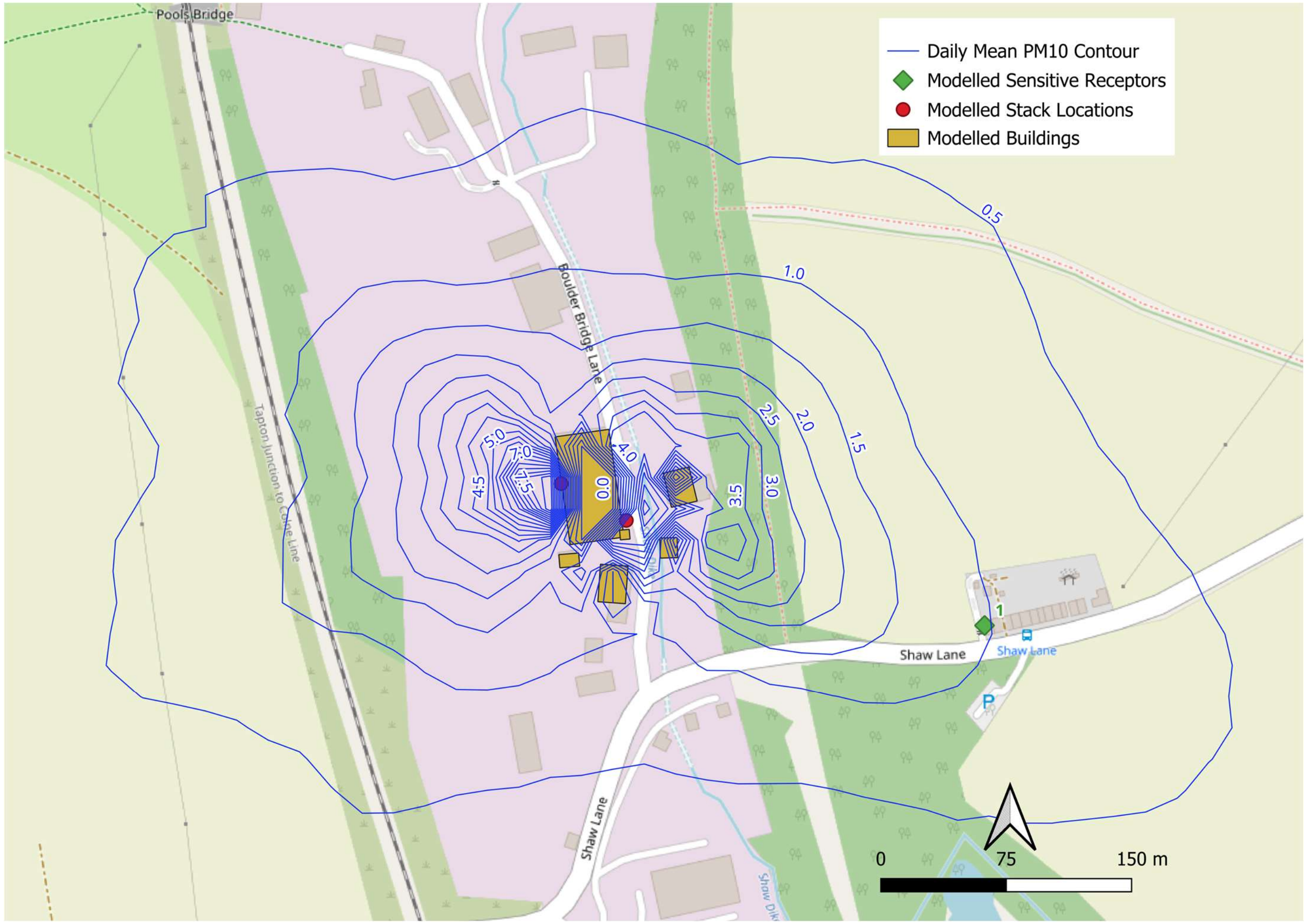

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Figure 4: Daily Mean PM_{10} Contour

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9 Drawn from Defra Maps at http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021