Air Emissions Risk Assessment: Detailed Modelling

Fortis IBA Ltd

December, 2025

A303 Enviropark

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Document Control Sheet

Project Information

Title	Air Emissions Risk Assessment: Detailed Modelling
Job Code	ZRBA303A
Report Ref	ZRBA303A_AQA
Report Type	Air Emissions Risk Assessment: Detailed Modelling
Client	Fortis IBA Ltd
Client Contact	Lauren Tuffin (Raymond Brown)
Revision	A
Status	Final
Date of Issue	04/12/25

Revision History

Revision	Date	Author	Reviewer	Approver	Status
A	04/12/2025	Paul Eaton	Gordon Allison	Gordon Allison	Final

Distribution

Organisation	Contact	Date of Issue	Copies
Raymond Brown	Lauren Tuffin	04/12/25	01

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Report Prepared By

DustScanAQ
Unit 8 Nimrod
De Havilland Way
Witney
OX29 0YG
United Kingdom
Tel: + 44 (0) 1608 810110
E-mail: info@dustscan.co.uk

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Glossary of terms

Term	Definition
AQA	Air Quality Assessment
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Standard
AEL	Associated Emission Levels
ASR	Annual Status Report
CERC	Cambridge Environmental Research Consultants
Defra	Department for Environment, Food and Rural Affairs
DS	DustScanAQ
EA	Environment Agency
EAL	Environmental Assessment Level
EPUK	Environmental Protection UK
EQS	Environmental Quality Standard
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
MMOL	Minimum Monin-Obukhov Length
NAQS	National Air Quality Strategy
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM	Particulate Matter

1 Introduction

1.1 Overview

Fortis IBA Ltd have been processing incinerator bottom ash (IBA) at the A303 IBA Facility for over 10 years, located at A303 Enviropark, Drayton Road, Barton Stacey, Andover SO21 3QS. The imported ash is generated from municipal waste incineration and the resultant IBA Aggregate is sold from the site as an aggregate substitute and used as a direct replacement for primary aggregates in construction.

Fortis IBA Ltd are proposing to 'replant' the existing processing plant and extend the site, in order to construct and operate an enhanced IBA Recovery Facility. Both processes will be housed in separate buildings. Within the enhanced IBA recovery facility building, the non-ferrous fraction will be further refined (using wet & dry processing plants). This building will include de-dusting equipment to extract any generated airborne particulate matter and vent externally via two separate local exhaust ventilation (LEV) extraction systems, hereby referred to an Emissions Points - EP1 and EP2.

DustScanAQ produced a Technical Note dated 08 October 2025, providing an assessment of emissions using the H1 Risk Assessment Tool. The Technical Note was submitted as part of Environmental Permit Variation Application (EPR/FB3805GN). In response, the Environment Agency (EA) stated the following:

> **3) Emissions to air**
>
> *You have provided 'Assessment of Emissions to Air to Support Permit Variation Application – H1' but not included the H1 assessment undertaken*
>
> **a) Provide a copy of the completed H1 assessment for emissions to air**
>
> You have stated within '*Assessment of Emissions to Air to Support Permit Variation Application – H1' that "The long term PC for $PM_{2.5}$ is above 1% of the EAL (20 μg/m^3), and the PEC is more than 70% of the EAL." In line with our guidance 'Air emissions risk assessment for your environmental permit' "You'll need to do detailed modelling of emissions that do not meet both of the following requirements:*
>
> - The short term PC is less than 20% of the short term environmental standards minus twice the long term background concentration
> - The long term PEC is less than 70% of the long term environmental standards"
>
> **b) Provide detailed modelling in line with our guidance Air emissions risk assessment for your environmental permit.**

This report addresses bullet point b from the above.

1.2 Site Location

The assessment site is located at A303 Enviropark, Drayton Road, Barton Stacey, Andover SO21 3QS. The site lies approximately 470 m north-northeast of the A303 dual carriageway. To the east of the site lies the Owls Lodge Shooting School; to the south lies the Collard Group Ltd Skip Hire Andover; and to the north lies the Owls Lodge Solar Farm.

The location of the site is shown in Figure 1.1.

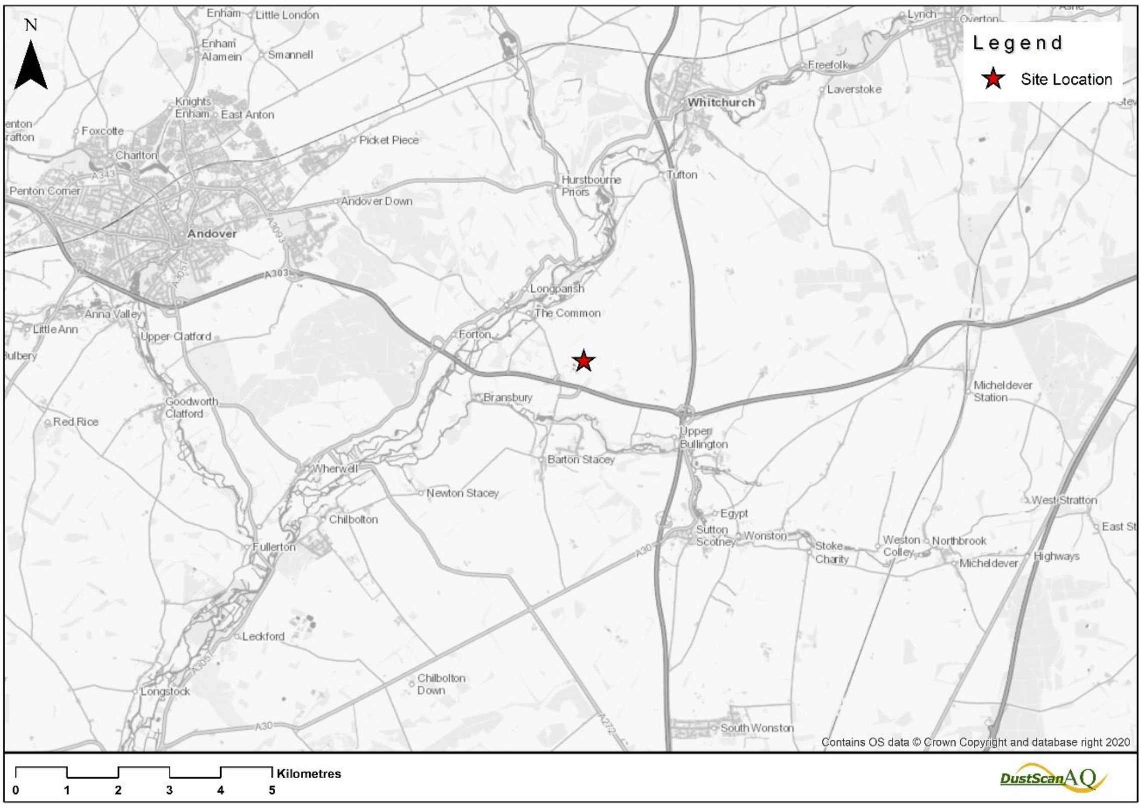

Figure 1.1: Site Location

1.3 Key Pollutants

1.3.1 Particulate Matter

Particulate matter (PM) is a complex mixture of solid and liquid particles suspended in the air. PM can vary widely in size, shape and chemical composition. Particles are therefore generally classified by aerodynamic diameter size as: PM_{10} (diameter of 10 microns (µm) or less); $PM_{2.5}$ (diameter of 2.5 µm or less), also called fine particles; and $PM_{0.1}$ (diameter of 0.1 µm or less), called ultrafine particles.

PM_{10} is known to arise from a number of sources such as construction sites, road traffic movement, industrial and agricultural activities. When inhaled, PM_{10} is likely to be deposited on surfaces of larger airways of the upper region of the lung and is associated with respiratory mortality, exacerbation of airway diseases and reduction of lung function. PM with an aerodynamic diameter of less than 10 µm have a greater impact on human health.

Due to its size, $PM_{2.5}$ is able to accumulate more, stay in the air for longer and travel farther than PM_{10}[1] making it a regional pollutant. A significant proportion of $PM_{2.5}$ concentrations in a particular area originating from natural and transboundary contributions and emissions from neighbouring areas[2]. Local authorities therefore face challenges with the management of local $PM_{2.5}$ concentrations. There is increasing pressure on governing bodies to reduce long-term average $PM_{2.5}$ concentrations in light of emerging research, public awareness on air pollution and recent technical advancements in low-cost sensors for monitoring.

In 2019, the Global Burden of Disease estimated the global ambient $PM_{2.5}$-related deaths was over 4 million[3]. The Committee on the Medical Effects of Air Pollution (COMEAP) estimated 29,000 attributable deaths from $PM_{2.5}$ occur a year in the UK[4]. The size and shape of $PM_{2.5}$ means it is likely to travel into, and deposit on the surface of, deeper parts of the lung. A recent review, commissioned by Greater London Authority, highlighted the lifelong health impacts of air pollution and found no evidence to identify a threshold where $PM_{2.5}$ did no harm[5]. Health effects associated with short- and long-term exposure of $PM_{2.5}$ includes a range of respiratory and cardiovascular diseases, increased incidence of strokes, preterm births and lung cancer as well as increased risk of Alzheimer's, Parkinson's and other neurodegenerative diseases[1]. $PM_{2.5}$ is generally associated with combustion and vehicle traffic and is more likely to be associated with the operational phase of the proposed development.

[1] Thangavel, Park and Lee, (2022). 'Recent Insights into Particulate Matter ($PM_{2.5}$)-Mediated Toxicity in Humans: An Overview'. Accessible at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9223652/
[2] Department for Environment, Food and Rural Affairs. (2022), 'Air Quality $PM_{2.5}$ targets: Detailed evidence report'.
[3] Sang et al., (2022). 'The global burden of disease attributable to ambient fine particulate matter in 204 countries and territories, 1990 – 2019: A systemic analysis of the Global Burden of Disease Study 2019'. Accessible at: https://www.sciencedirect.com/science/article/pii/S0147651322004286?via%3Dihub#sec0060
[4] Committee on the Medical Effects of Air Pollutants, (2018). 'Associations of long-term average concentrations of nitrogen dioxide with mortality'
[5] Imperial College London, (2023). 'Impacts of air pollution across the life course – evidence highlight note'

2 Relevant Air Quality Standards

A summary of the relevant Air Quality Objectives (AQOs) is presented in Table 2.1. The AQOs here are the Environmental Assessment Levels (EALs) for the purpose of this assessment.

The AQO listed in Table 2.1 are only applicable at locations where a member of the public could be reasonably expected to spend the relevant averaging period. Further examples of this are presented in Table 2.2.

Table 2.1: AQO relevant to the proposed development

Pollutant	Averaging Period	EAL ($\mu g/m^3$)	Exceedance Allowance	Percentile Equivalent
Particulate Matter (as PM_{10})	Annual	40	-	-
	24-hour	50	35 per annum	90.4th
Particulate Matter (as $PM_{2.5}$)	Annual	20	-	-

Table 2.2: Examples of where the AQO should apply

Averaging period	Objectives should apply at	Objectives should not apply at
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24 Hour	All locations where the annual mean objective would apply, together with hotels and gardens of residential properties[(a)].	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.

3 Methodological Approach

This section sets out the approach taken to assess the potential impact on air quality from EP1 and EP2.

3.1 Scope of the Assessment

As detailed in section 1.1, DustScanAQ produced a Technical Note dated 08 October 2025, providing an assessment of emissions using the H1 Risk Assessment Tool. The Technical Note was submitted as part of Environmental Permit Variation Application (EPR/FB3805GN). As a result of comments received from the EA, dispersion modelling has been undertaken to provide further details on emissions to air.

The assessment procedure follows that published by the government to be used in the context of environmental permitting (for the Environment Agency)[6].

3.2 Dispersion Model

Dispersion modelling was undertaken using ADMS-6 (v 6.0.0.1), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-6 is a PC based dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere from either single or multiple sources. 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.

The model typically requires the following input data:

- Locations and dimensions of all sources and nearby structures;
- Output grid and receptor locations;
- Meteorological data;
- Terrain data (if modelling terrain effects);
- Emission rates, emission parameters (e.g. temperature) and emission profiles (e.g. one hour per day) for modelled pollutants; and
- Surface roughness and Monin-Obukhov length.

3.2.1 Modelled Scenarios

One Do Something model scenario has been modelled, for an operational year of 2026. For the purpose of comparison against EA screening criteria, all particulate matter has been assumed to be $PM_{2.5}$ for comparison against annual mean AQS. There is no short term AQS for $PM_{2.5}$ however, so for the purpose of assessing short-term impacts, all particulate matter has been assumed to be PM_{10} for comparison against the PM_{10} short term AQS.

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

The model outputs have been set up for the:

- long-term (annual mean) $PM_{2.5}$ concentration; and
- short-term (24-hour mean) 90.41st %ile PM_{10} concentration.

3.2.2 Site Layout (Building and Structural Effects)

The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures that are in excess of one third of the height of the stack can have a significant effect on dispersion by interrupting wind flows and causing significantly higher ground-level concentrations close to the source than would otherwise occur.

The grid references and the size dimensions of all buildings included in the dispersion model are set out below in Table 3.1. The positions of the modelled buildings are illustrated in Figure 3.1.

All the buildings at the site pertinent to the model have pitched roofs; all buildings within the model are flat roofed. Therefore, each modelled building has been modelled with a height deemed representative with respect to the dispersion of pollutants from the emissions points.

Table 3.1: Modelled building dimensions

Name	Shape	X (m)	Y (m)	Height (m)	Length (m)	Width (m)	Angle (°)
Building001 (main)	Rectangular	444318.27	143041.64	13.33	70.06	108.75	68.84
Building002	Rectangular	444254.72	143033.89	13.25	27.80	79.65	69.36

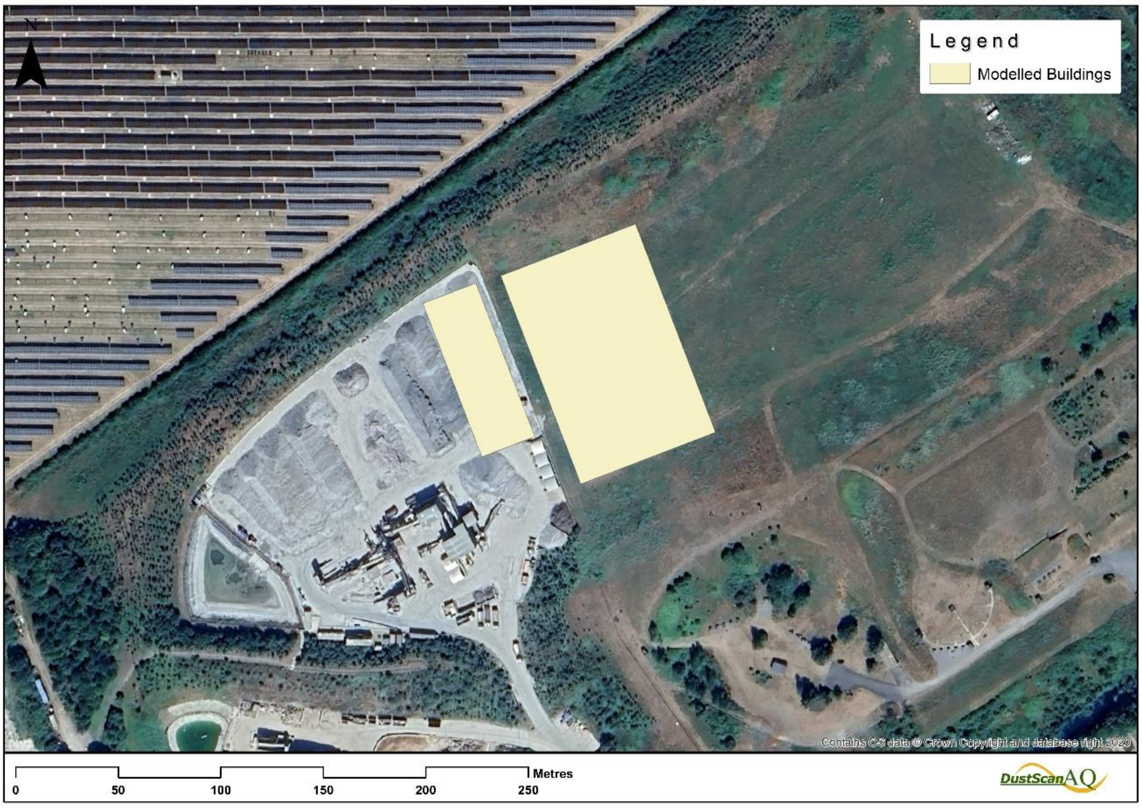

Figure 3.1: Modelled buildings (Google Earth image date 13/07/2025)

3.2.3 Source and Emission Parameters

Source parameters and emissions data have been supplied by the applicant based on design assumptions at this stage. Filter performance for the LEV system is understood to be able to achieve an emission concentration of particulate matter of 5 mg/m^3. As a conservative assumption, emissions are assumed to be constant at this concentration, with all PM in the $PM_{2.5}$ fraction. This also means that all the PM emission is in the PM_{10} fraction as well, since $PM_{2.5}$ is a sub-fraction of PM_{10}.

Time varying emissions have been used in the assessment as EP1 and EP2 will only emit during working hours.

Source geometry is presented below in Table 3.2.

Table 3.4 presents PM emissions data for the emission points. Emissions rates have been calculated based on reasonable assumptions about the proposed operation at this stage.

The locations of the modelled point sources are illustrated below in Figure 3.2.

Table 3.2: Source geometry

Source	Height (m)	X (m)	Y (m)	Diameter (m)	Main Building
EP1	8.88	444355.1378	143044.1279	1	Building001 (main)
EP2	8.88	444364.6845	143019.6102	1	Building001 (main)

Table 3.3: Source Characteristics

Source	Vertical Exit Velocity (m/s)	Temperature (°C)
EP1, EP2	0.0	Ambient

Table 3.4: Emission Data (PM (PM_{10}, $PM_{2.5}$))

Source	Emission Rate (g/s)
EP1	0.11
EP2	0.06

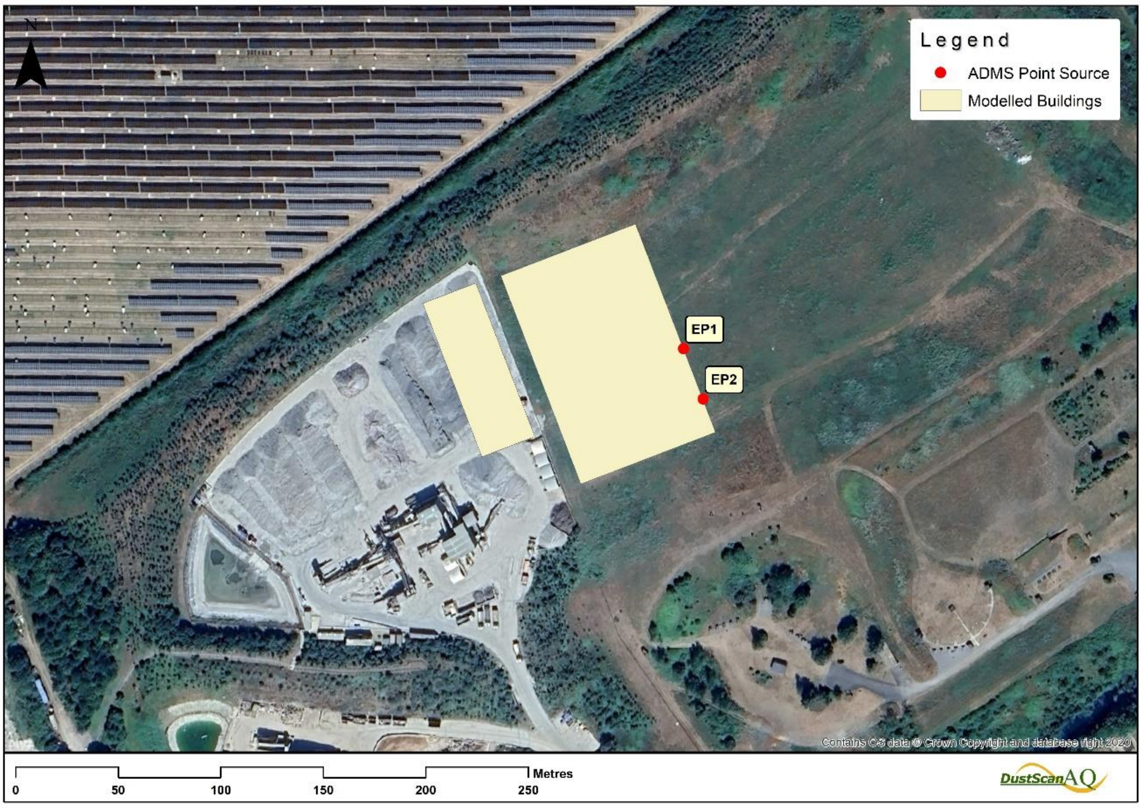

Figure 3.2: Modelled point sources (Google Earth image date 13/07/2025)

3.2.4 Meteorological Data

The key meteorological parameters for dispersion modelling are wind speed and wind direction. Meteorological parameters such as cloud cover, surface temperature, precipitation rate and relative humidity are also taken into account.

For dispersion modelling, hourly-resolved data are required and often it is difficult to find a local site that can provide reliable data for all the meteorological parameters at this resolution.

Based upon the above, Middle Wallop is considered to be a representative meteorological monitoring station, located approximately 14.7 km west-southwest of the site.

To account for variation in meteorological conditions, this quantitative assessment and dispersion modelling has been carried out with meteorological data from the period 2022 to 2024. Figure 3.3 below presents the wind rose for each modelled year.

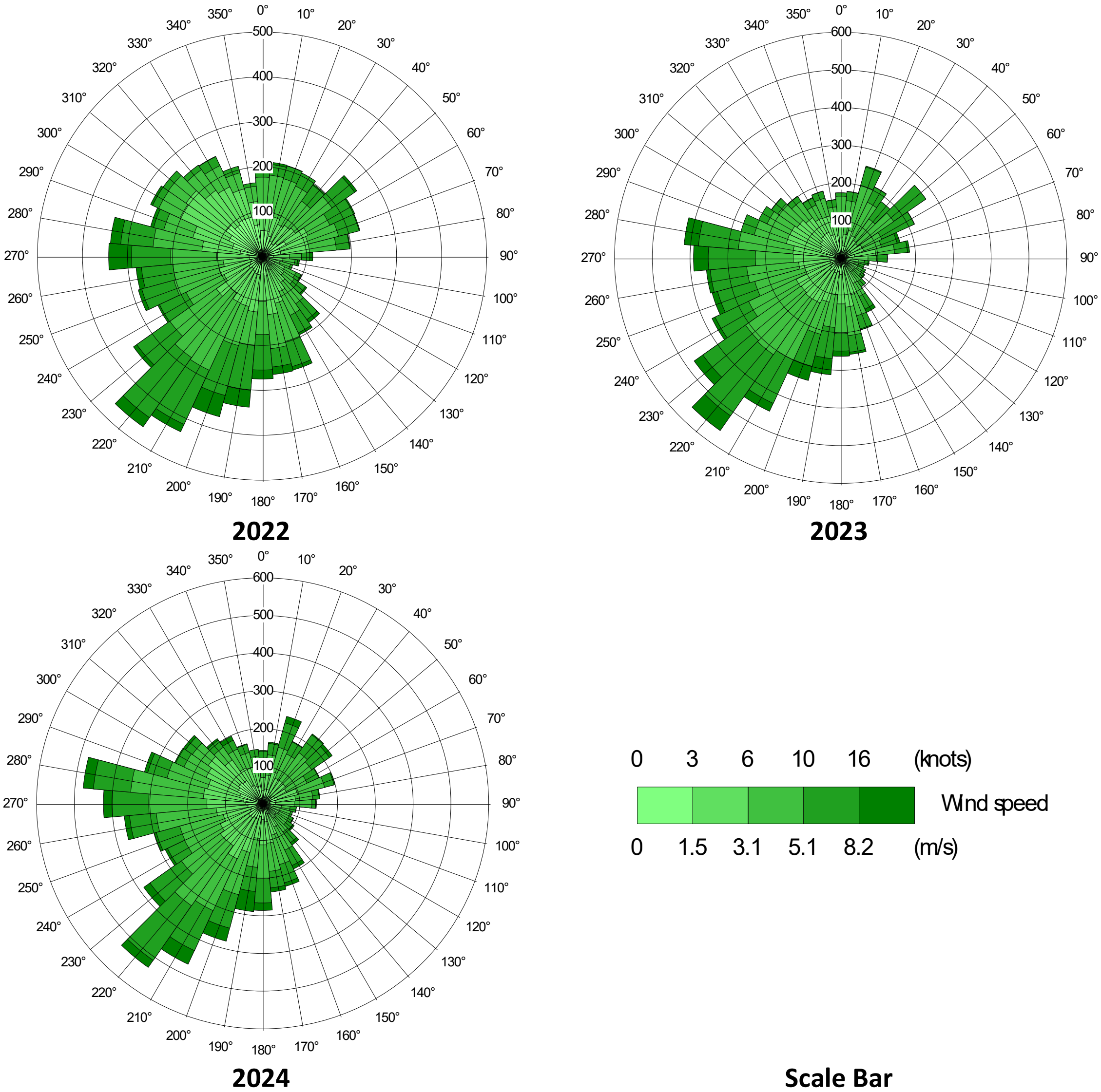

Figure 3.3: Middle Wallop meteorological station Windrose Plots: 2022 - 2024

3.2.5 Topography

The presence of elevated terrain can significantly affect ground level concentrations of pollutants emitted from elevated sources, such as stacks, by reducing the distance between the plume centre line and ground level, increasing turbulence and, hence, plume mixing.

Complex terrain has been used in this model.

3.2.6 Surface Roughness

The dispersion site surface roughness length (z0) was set to 0.3 m (for the dispersion site and to 0.3 m for the meteorological site location.

3.2.7 Minimum Monin-Obukhov Length

The Minimum Monin-Obukhov Length (MMOL) provides a measure of the stability of the atmosphere. The model default MMOL value of 1 m was used in the dispersion model to describe the modelling area and the meteorological station location. These values are considered representative of the respective surrounding areas.

3.3 Specified Receptors

This assessment is assessing against both annual mean and 24-hour mean EALs. Therefore, receptors have only been included where either the annual mean or 24-hour mean is applicable. Table 3.5 details the modelled discrete receptors and Figure 3.4 illustrates their locations.

Table 3.5: List of receptors

Receptor ID	X (m)	Y (m)	Z (m)
R1	443746.61	143838.42	1.5
R2	443645.12	142595.25	1.5

Figure 3.4: Modelled receptors (Google Earth image date 13/07/2025)

3.4 Screening Criteria

The EA risk assessment guidance[7] provides criteria for assessing the significance of emissions with respect to the background air quality and air quality standards.

Stage 1: Criteria for screening out insignificant Process Contributions (PCs)

PCs can be screened out from detailed dispersion modelling if both of the below criteria are met:

- PC long-term < 1 % of the long-term environmental standard; and
- PC short-term < 10 % of the short-term environmental standard.

If both of these criteria are met, no further assessment of the pollutant in question is required. If one or both of the criteria are not met then further screening criteria are applied, outlined below in stage 2.

Stage 2: Criteria for screening out insignificant Predicted Environmental Concentrations (PECs)

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

The PEC is the combination of the PC and the background concentration of the pollutant. Detailed dispersion modelling can be screened out if both of the below criteria are met:

- PEC long-term < 70 % of the long-term environmental standard; and
- PC short-term < 20 % of the short-term environmental standard minus twice the long-term background concentration.

Any emissions which don't meet the screening criteria for stage 2 require further detailed modelling.

Detailed modelling is also required if:

- Emissions affect an AQMA; or
- Restrictions apply for any substance emitted in this area.

No further action is required if detailed modelling shows the resulting PECs are below the relevant AQO.

3.5 Modelling Assumptions, Uncertainties and Exclusions

In addition to the parameters outlined above, some assumptions have been made for the modelling, including:

- The LEV systems emit constantly at the filter performance specification; and
- Where source parameters have not been available, DS have made conservative assumptions where data hasn't been available.

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

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

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

- Choice of model - ADMS-6 is a widely used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Emission rates - Emission rates have been calculated by DS from emissions information supplied;

- Receptor locations -Receptors have been modelled in worst-case locations for comparison with AQO;
- Variability - Where site specific input parameters were not available, assumptions were made with consideration of the conditions as necessary in order to ensure a robust assessment of potential pollutant concentrations; and
- All results presented are the maximum concentrations from a 3-year modelling period, so represent the maximum potential impact.

4 Baseline Conditions

The proposed development site is located within the jurisdiction of Test Valley Borough Council (TVBC) and lies outside of any Air Quality Management Areas (AQMAs). Under the Environment Act 1995, TVBC are responsible for Local Air Quality Management (LAQM) within their jurisdiction. The LAQM process places an obligation on local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives (AQOs) are likely to be achieved. The LAQM process also gives local authorities the power to declare Air Quality Management Areas (AQMAs) where there are breaches of the AQOs.

Defra provides background pollution concentration estimates to assist local authorities in undertaking their 'Review and Assessment' work, required by LAQM. This data is available to download from the Defra air quality resource website for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for every 1 km X 1 km grid square for all local authorities. The current dataset is based on 2021[8] background data and future year projections are available for 2021 to 2040. The background dataset provides breakdown of pollution concentrations by different sources (both road and non-road sources) for certain pollutants. Table 4.1 below presents the relevant background concentrations for the two modelled receptor locations (grid squares 443500, 142500 and 444500, 142500).

Table 4.1: Backgrounds assigned to modelled receptors

Pollutant	Averaging Period	Background Concentration (µg/m^3)
R1	$PM_{2.5}$ Annual mean	6.19
	PM_{10} 24-hour mean [a]	13.13
R2	$PM_{2.5}$ Annual mean	6.39
	PM_{10} 24-hour mean [a]	14.50

a. Annual mean *2*0.59

[8] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021

5 Results

5.1 Operational Phase

As discussed in Section 3.1, there are potential impacts on local air quality that could arise from the operation of the proposed LEV systems. The potential impact of air quality on human health is discussed below.

The impact on air quality from the assessed LEV systems for all modelled pollutants and averaging periods is detailed in the tables below.

Table 5.1 presents the maximum PC and PEC at specified receptors (detailed in section 3.3) for particulate matter, as well as comparison against the relevant AQS.

Table 5.2 compares the concentration of particulate matter at modelled receptors against EA scoping criteria (detailed in section 3.4).

Table 5.1: Maximum Process Contributions and Predicted Environmental Contributions at Specified Receptors (Annual mean results are as $PM_{2.5}$, 24-hour mean results are as PM_{10})

Pollutant	Averaging Period	AQS (µg/m^3)	Max PC (µg/m^3)	Max PC (% AQS)	Max PEC (µg/m^3)	Max PEC (% AQS)
R1	24-hour mean	50	13.1	0.1	0.2	13.2
	Annual mean	20	6.2	0.03	0.2	6.2
R2	24-hour mean	50	14.5	0.2	0.4	14.7
	Annual mean	20	6.4	0.1	0.3	6.5

Table 5.2: Assessment of PM concentration at receptors against EA screening criteria (Annual mean results are as $PM_{2.5}$, 24-hour mean results are as PM_{10})

Pollutant	Averaging Period	Scoped out at Stage 1?	Scoped out at Stage 2?	Further Assessment required?
R1	24-hour mean	Yes	-	No
	Annual mean	Yes	-	No
R2	24-hour mean	Yes	-	No
	Annual mean	Yes	-	No

From the above tables, the PEC for $PM_{2.5}$ and PM_{10} for all modelled receptors is well below the AQO. This is a based on a very conservative assessment which assumes the LEV run at their emission performance specification.

Upon application of the first EA screening step, PM_{10} and $PM_{2.5}$ are screened out for all receptors and averaging periods.

Therefore, it can be said that there are no significant adverse impacts on air quality with respect to all pollutants at modelled human health receptors.

6 Conclusion

This report provides an assessment of the impacts associated with the proposed further development of an Incinerator Bottom Ash processing plant at Fortis IBA, located at A303 Enviropark, Drayton Road, Barton Stacey, Andover SO21 3QS. The assessment is to support the application for a variation to the Environmental Permit. The initial H1 assessment for emissions to air indicated that detailed dispersion modelling was required, since the impacts were not screened out.

This report has assessed:

- The risk of the impacts from the operation of the proposed plant's LEV systems on meeting the national air quality objectives.

Modelling has been undertaken using data provided by Fortis IBA, along with conservative assumptions by DS where data has not been available. Particulate Matter emissions were conservatively assumed to be at the performance specification of the filter system at all times during operation, and all PM was assumed to be in the $PM_{2.5}$ fraction.

The results of the dispersion modelling show that for all residential receptors and locations where the relevant air quality objectives for PM_{10} and $PM_{2.5}$ are applicable, no exceedances are expected to result from the operation of the assessed LEV systems, and the impacts are not significant. As stated in the H1 assessment, this is as expected because the relevant receptors are distant from the emission points and the emission rate is very low.

It can therefore be concluded that the risk of the emissions from the proposed LEV systems serving the IBA processing plant breaching air quality objectives at locations relevant in the legislation is very low.