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Environmental Risk Assessment

Stoke Tyre Pyrolysis Facility

Murfitts Industries Ltd

CRM.0180.001.PE.R.004

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Environmental Risk Assessment – CRM 0180 001 PE R 005

Project:	Stoke Tyre Pyrolysis Facility
For:	Murfitts Industries Ltd
Status:	**FINAL**
Date:	July 2025
Author:	Steph Charnaud, Director of Permitting
Reviewer:	Peter Cumberlidge, Director

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1.0 Introduction

1.1 Introduction

1.1.1 This Environmental Risk Assessment has been prepared to support an Environmental Permit application, for a Small Waste Incineration Plant (SWIP) to be located at Campbell Road, Oakhill (the 'Facility').

1.1.2 The plant will process up to 11 388 tonnes per annum of end of life tyre crumb. The plant will convert the end of life tyre crumb into tyre pyrolysis (TPO) oil, raw recovered carbon black (rCB) for export off-site and syngas using pyrolysis technology. The syngas is combusted to produce heat to raise steam in a boiler. The steam produced by the boiler will be utilised in the neighbouring Michelin tyre-retreading process.

1.1.3 Once the operation has commenced, the pyrolysis unit and boiler will operate continuously.

1.1.4 The Operator will be Murfitts Industries Limited, hereby referred to as the 'Operator'. This report has been prepared in response to questions on the City of Stoke-on-Trent Council's Small Waste Incineration Plant (SWIP) application form.

1.1.5 This document has been prepared to fulfil the requirements set out in Section, C2.2, C2.3, D2, D9, D10 of the Permit application form.

1.2 Overview of Processes

1.2.1 The Operator is applying for a Part A(2) Permit to operate the SWIP comprising a single process line consisting of a pyrolysis unit, and a combustion unit linked to a boiler, which will utilise the syngas produced by the pyrolysis process to generate steam. The Facility will also produce TPO, and raw rCB. Full details of the proposed operations are provided in the '*Operational Techniques and Monitoring Plan*' submitted with this application referenced CRM.0180.001.PE.R.006.

1.2.2 Pyrolysis is the chemical decomposition of organic material that occurs at high temperatures in the absence of oxygen. The conditions created during pyrolysis cause complex organic chemicals to break down into simpler molecules, irreversibly altering their properties at a molecular level. The pyrolysis process is completely enclosed in an oxygen-free environment, and the syngas produced is captured and condensed to form TPO. The remaining non-condensable gases are then used in the boiler to produce steam. The steam will be utilised at the neighbouring Michelin site. The pyrolysis process also produces char material that will be cooled and bagged and sent to Murfitts Industries Lakenheath facility where it will undergo treatment including milling and pelletising to give a final rCB product ready for delivery to end users. The TPO is collected and sent off-site for use.

1.3 Scope of Assessment

1.3.1 Assessments have been carried out to determine the environmental risks from the proposed SWIP. The assessments have been carried out in accordance with National, European and International legislation, statutory and non-statutory guidance documents including:

- Environmental Permitting Technical Guidance PG13/1 (20) Draft Reference document for the operation of small waste incineration plants (referred to as 'PG1/3'); and

- Risk assessments for your environmental permit, Environment Agency (EA), last updated November 2023.

1.3.2   The objectives of the assessment process are as follows:

- Identify potential risks that the activity may present to the environment.

- Screen out those that are insignificant and don't require detailed assessment.

- Where appropriate, identify potentially significant risks and undertake detailed assessment.

- Identify control measures required to minimise risks.

- Report the findings of the assessment.

1.3.3   This report contains justification for all risk assessments completed or screened out from requiring further consideration and provides an overall assessment of the impact of the proposed Facility.

1.4   Facility Location and Environmental Setting

1.4.1   The address of the proposed Facility will be;

Stoke Tyre Pyrolysis Facility
Campbell Road,
Oakhill,
Stoke-on-Trent,
ST4 4EW.

1.4.2   The proposed Facility will cover an area of approximately 0.23ha, within an existing industrial and business park, located to the north of the A500 Queensway, adjacent to Michelin's UK head office, commercial headquarters and the wider Michelin site.

1.4.3   Figure 1.4.1 below illustrates the Facility location.

Figure 1.4.1: Facility Location

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1.4.4 The National Grid Reference for the Facility is: SJ 86964 43232.

1.4.5 A review of the flood map for planning on the Gov.UK website indicates that the application site is designated as Flood Zone 1. Land lying within Flood Zone 1 has a low probability of flooding as shown by Figure 1.4.2 below.

Figure 1.4.2: Flood Map
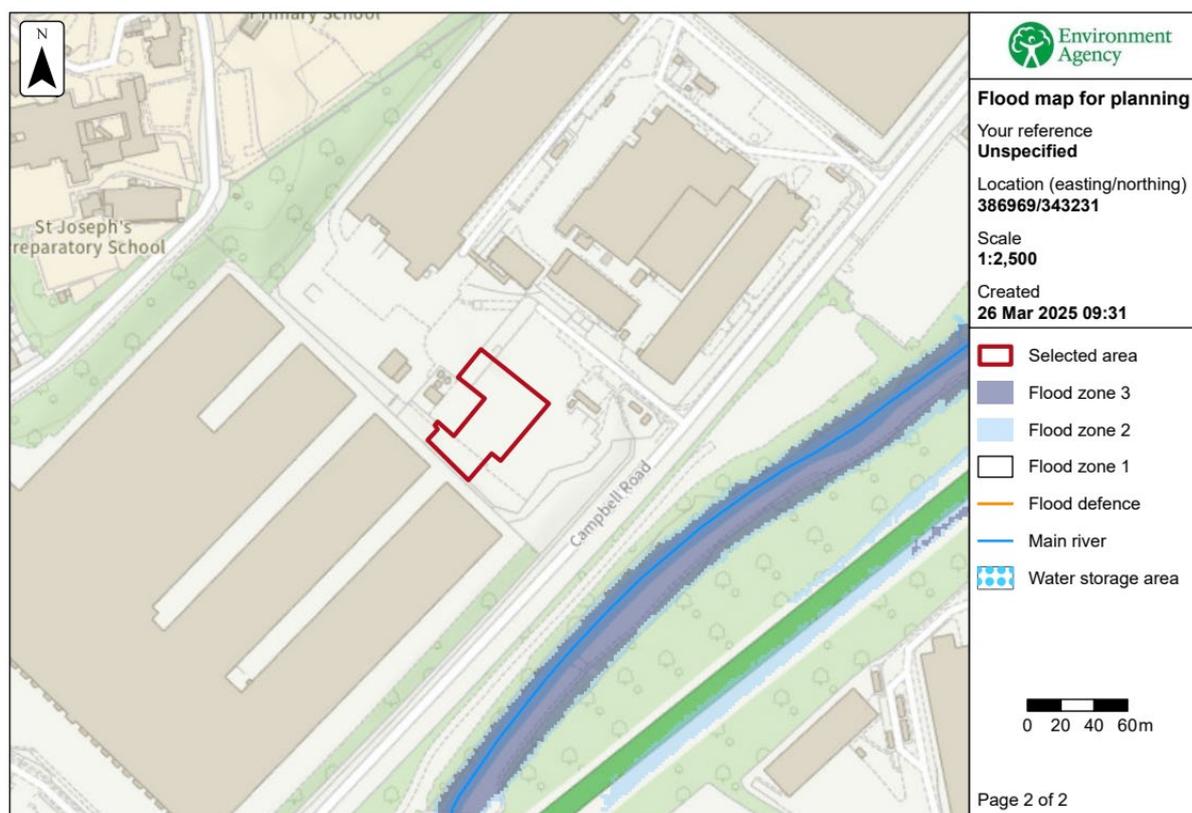
© Environment Agency copyright and/or database rights 2025. All rights reserved.   © Crown copyright and database rights 2025 Ordnance Survey licence number AC0000807064.

1.4.6 The proposed Facility is located over a Secondary A aquifer in the bedrock and a Secondary A aquifer in the superficial deposits. The groundwater vulnerability beneath the Facility is low across the north and west of the Facility, and medium-high across the remainder of the Facility. The Facility is not located within a Groundwater Source Protection Zone.

1.4.7 The nearest surface water feature is the River Trent, a designated main river which is located to the eastern side of Campbell Road approximately 134m from the boundary of the proposed Facility.

1.4.8 There are no National Nature Reserves (NNR) within 2km of the proposed Facility, the nearest is Heath Woods LNR which is over 2500m to the south of the proposed Facility.

1.4.9 The nearest human-sensitive receptors are workers in the adjacent Murfitts Industries and Michelin facilities.

1.4.10 The nearest residential property is approximately 311m to the north of the Facility on Kensington Road.

1.4.11 The DEFRA interactive air quality management area map shows the site to be within both the Stoke On Trent Air Quality Management Area 2011, and the Fenton Burnham Street AQMA.

1.5 Nearby Sensitive Receptors

1.5.1 Nearby receptors within 2000m of the application site have been identified. Key receptors that have the potential to be impacted by emissions from the Facility are summarised in Table 1.5.1 below.

1.5.2 A search was carried out using Defra's Magic Map facility. This identified some Local Nature Reserves (LNRs) and a Site of Special Scientific Interest (SSSI) within 2000m of the proposed site boundary.

1.5.3 There are 4no Local Wildlife Sites (LWS) within 2km of the proposed facility based on a search carried out using Defra's Magic Map facility and the Wildlife Trusts website.

1.5.4 No Ramsar sites, Special Areas of Conservation (SAC) or Special Protection Areas (SPA) were found within 10kms of the proposed site boundary.

1.5.5 Five years of hourly sequential meteorological data used in this assessment was taken from Shawbury meteorological station located approximately 40 km south east of the facility. Appendix B shows the 5-year wind rose dataset. The meteorological data was provided by ADM Ltd, which is an established distributor of meteorological data within the UK. The prevailing winds are from the south, west and south west.

Table 1.5.1: Sensitive Receptors

Receptor	Type	Distance from site boundary (m)	Direction
Superficial geology secondary A aquifer	Hydrological	Onsite	-
Bedrock geology secondary A aquifer	Hydrological	Onsite	-
Murfitts Industries ELT facility	Industrial	Adjacent	East and South
Boiler site	Industrial	Adjacent	North West
Michelin Hanford Warehouse	Industrial	Adjacent	West and South West
Eon Facilities Compound	Industrial	Adjacent	South East
Michelin	Industrial	14	North East, North and North West
River Trent	Ecological	134	East
River Trent Path	Recreational	151	East
St Joseph's Preparatory School	Educational	240	North West
Marks and Spencer's Distribution Centre	Industrial	263	North East
St Joseph College	Educational	274	North West
Sainsburys Stoke	Commercial	276	South East
Oakhill Primary School	Educational	296	North West
Waters Edge Business Park	Commercial	310	North East
Ferrand Close LWS	Ecological	310	South East
Residential property off Kensington Road	Residential	311	North
Lookers BMW Stoke-on-Trent	Commercial	383	East
Riverside Park Business park	Commercial	391	North East

Receptor	Type	Distance from site boundary (m)	Direction
Stone Road Business Park	Commercial	398	South West
Michelin Training and Information Centre	Commercial	438	West
Residential property off Clermont Ave	Residential	467	South East
Residential property off Ferrand Close	Residential	468m	South South East
St Teresa of the Child Jesus Catholic Church	Non-residential	480	South West
Residential off Stone Road	Residential	522	South West
High Street off London Road	Commercial	533	North
St Teresa's RC Primary School	Educational	545	South West
Dunelm warehouse	Industrial	548	North East
Warehouse off Birmingham Road	Industrial	580	North East
Oakhill Bowling & Recreation Club	Recreational	645	North
St Johns Centre	Non-residential	687	West
Industrial Park off Campell Road	Industrial	737	North East
St John's Church Trent Vale	Non-residential	781	North West
GXO distribution centre	Industrial	811	East
Michelin Sports and Conference Facility	Commercial	872	South West
North Midlands Operations Incinerator	Industrial	878	East
Residential property off Fletcher Road	Residential	881	North East
Dougie Mac Hanford Charity Shop	Commercial	886	South
Residential property off Campell Road	Residential	906	North East
Queensbury Hub	Non-residential	918	North West
Well Pharmacy	Commercial	1081	South
Commercial Complex off Campell Road	Commercial	1095	North East
DSV office	Commercial	1100	South East
Trentham Barbers	Commercial	1128	South
Co-op Food Hanford	Commercial	1153	South
Hanford Dental and Implant Centre	Commercial	1159	South
Trentham Rugby Union Football Club	Recreational	1182	South
Bridgetts Pool LNR & LWS	Ecological	1189	North north-west
Trainyard off Whieldon Road	Industrial	1210	North East
Hanford Care Home	Residential	1214	South
bet365 Stadium	Recreational	1247	East
Springfield Retail Park	Commercial	1277	North West
Industrial Complex Campbell Road	Industrial	1298	North East
London Road Sports and Social Club	Recreational	1310	North
Car Dealers off Stanley Matthews Way	Commercial	1322	East
Priory C of E Academy	Education	1330	South
Farm off Cambridge Drive	Agricultural	1345	West

Receptor	Type	Distance from site boundary (m)	Direction
Residential property off Cambridge Drive	Residential	1384	West
Premier Foods Stoke-on-Trent, food factory	Commercial	1458	North West
Residential property off Grove Road	Residential	1468	North East
Thistley Hough Academy	Educational	1512	North
Northwood Garden Centre	Commercial	1514	West
Penkhull Village Hall	Recreational	1514	North
Residential property off Northwood Lane	Residential	1536	West
Clayton Hall Academy	Educational	1539	West
Trentham Academy	Educational	1558	South
St Thomas' Church	Non-residential	1561	North
Shops off Cambridge Drive	Commercial	1562	North West
Wing Lee Supermarket	Commercial	1589	East
Holiday Inn	Commercial	1593	East
Residential House on Stanley Matthews Way	Residential	1605	South East
Yellow Power office	Commercial	1629	South East
Farm off Northwood Lane	Agricultural	1630	South West
Ferndown LNR & LWS	Ecological	1637	South West
Poultry Paddock farm	Agricultural	1652	South West
Morphy Richards warehouse	Industrial	1662	East
Stoke City FC Academy Dome	Recreational	1663	East
Industrial Park off Grove Road	Industrial	1672	East
Clayton Sports Centre	Recreational	1691	North West
Light Church	Non-residential	1694	North
Amazon Warehouse	Industrial	1705	South East
Residential property off Northwood Lane	Residential	1717	South West
EFM Europe	Commercial	1738	East
M Club Spa and Fitness	Recreational	1771	North West
Trentham Mews Surgery	Commercial	1786	South
Industrial Park off Whieldon Road	Industrial	1789	North East
Office off Queens Road	Commercial	1819	North
St James The Great C of E Church	Non-residential	1821	West
Fast Lane Service Centre Garage	Commercial	1821	South
Harplands Hospital	Commercial	1833	North West
Sainsbury's	Commercial	1848	North
King's and Hargreaves Woods SSSI	Ecological	1855	South South West
Longton Rugby Club	Recreational	1863	South East
Nuffield Health North Staffordshire Hospital	Commercial	1865	West

Receptor	Type	Distance from site boundary (m)	Direction
Bupa Dental Care Clayton	Commercial	1867	West
Shops on Lonsdale Street	Commercial	1875	North East
BP fuel station	Commercial	1901	West
Smith's Pool LNR & LWS	Ecological	1915	North East
The Darwin Centre Hospital	Commercial	1918	North
Esso fuel	Commercial	1920	West
Screwfix Direct Warehouse	Industrial	1932	South East
Keele University Clinical Education Centre	Educational	1941	North West
Commercial Complex off Woodhouse Street	Commercial	1983	North East

2.0 Environmental Risk Assessments

2.1 Scope of Assessments Completed

2.1.1 This ERA identifies the following potential risks to the environment which must be considered and included in the assessment, if they are likely to be present:

- point source releases to air;

- point source discharges to surface waters;

- point source discharges to sewer;

- point source discharges to ground or groundwater;

- odour impacts;

- noise impacts;

- impacts from accidents;

- fugitive emissions to air, land, surface waters and to groundwater; and

- disposal or recovery of wastes produced on site.

2.1.2 This ERA has been compiled to determine the environmental risks posed by the proposed Facility and to ensure there are no significant impacts on the environment or human health, in accordance with regulatory guidance. Appropriate to the nature of the activities and potential impacts on site, the following qualitative assessments of the following aspects have been carried out:

- As the Facility will potentially generate noise, a noise assessment has been prepared to support this risk assessment, which is summarised below and provided in Appendix C.

- As there will be point source emissions to atmosphere, an air emissions assessment has been prepared to support this risk assessment, which is summarised below and provided in Appendix D.

- The Facility's wastes have been quantified with demonstration of how the waste hierarchy will be achieved.

- Fugitive releases & accidents. Qualitative risk assessments arising from the proposed Facility are presented in Appendix A.

2.1.3 There will be no emissions to surface water or groundwater other than clean rainwater, run off from the roof of the buildings and the hardstanding. Therefore, the need for a quantitative assessment of emissions to water is not required.

2.1.4 Process emissions consisting of condensate and boiler blowdown are disposed of to the sewer with trade effluent consent from Severn Trent Water as the neighbouring Michelin site.

2.1.5 A qualitative risk assessment has been undertaken to assess fugitive and accidental releases to water and land.

2.1.6 An odour assessment has not been carried out as the activities are not inherently odorous due to the nature of feedstock and the enclosed nature of the process.

2.1.7 Each assessment completed is summarised below with a qualitative assessment of the risks from the proposed Facility provided in Appendix A. Full details of control measures compared with techniques described in the sector guidance are presented in the Operational Techniques and Monitoring Plan, OTMP referenced CRM.0180.001.PE.R.006.

2.2 Point Source Emissions to Air

2.2.1 There will be one main emission point to air from the proposed facility during normal operations comprising:

- 1no. Boiler stack

2.1.1 There will be 2no emissions points to air arising from abnormal operations comprising:

- 1no. Emergency Flare

- 1no. Emergency Diesel Generator

2.2.2 Details of emission points are provided in Table 2.1.1 and are marked on the Site Layout Plan in the Drawings Section of this application.

Table 2.1.1: Point Source Emissions to Air

Air Emission Point Reference	Source of Emission	Basis for release	Emissions
A1	Exhausts from Boiler	Normal operation	CO, CO_2, PM, NOx, SOx, TOC, HCL, HF, PAHs
A2	Emergency Flare	Abnormal operation	CO, NOx, SOx, TOC, HCL, HF, PAHs
A3	Emergency Generator	Abnormal operation	NOx, SOx, particulates
Pressure Relief Valves (PRVs)	Steam system boiler	Periodic Release	Steam
Vents	TPO tanks	Periodic release	VOC's

2.2.3 An air quality assessment has been carried out to determine the risk posed by the release of gaseous emissions from the proposed boiler plant (A1) on site that will combust the syngas produced by the process and the dust extraction system from the char treatment process ventilation.

2.2.4 The Air Quality Assessment (AQA) was undertaken in June 2025 using AMDS 6 (v6.0.2.1). Impacts at sensitive receptors were quantified and the results were compared with the relevant Environmental Quality Standards (EQS) and criteria provided by Environmental Protection UK (EPUK), the Institute of Air Quality Management (IAQM) and the Environment Agency (EA).

2.2.5 Impacts were based on the proposed development emitting the maximum permitted pollutant concentration for a full calendar year, as well the use of the maximum predicted concentrations over the 5-year meteorological data set. Subsequently, the predicted concentrations are considered a significant overestimation of actual impacts.

2.2.6 The assessment considered the air impacts from this main point source emission on all identified residential, sensitive and ecological receptors. The dispersion modelling results

indicated that impacts upon human and ecologically sensitive receptors were predicted to be not significant for all pollutants and criteria.

2.2.7 A copy of the air quality assessment is provided in Appendix D to this report which concludes that there will be no adverse effects on receptors or exceedances of Air Quality Standards or Environmental Assessment Levels from the proposed Facility.

2.3 Fugitive Emissions to Air

2.3.1 The key sensitive receptors at risk of exposure to potential fugitive emission to air from the Facility have been identified as local workplaces, users of the River Trent Path and local residences. Sensitive receptors are listed in Table 1.5.1.

2.3.2 The primary sources of potential fugitive emissions will be the dust which may escape from the pyrolysis building when the roller shutter doors are opened. Dust may also be generated from plant and vehicle movements.

2.3.3 The tyre crumb will be delivered directly to the processing building, within enclosed big bags, and the roller shutter doors will be closed immediately following delivery to minimise the risk of emissions of dust.

2.3.4 The big bags are discharged into the conveyor system for input into the pyrolysis process. This takes place within the pyrolysis building.

2.3.5 rCB is loaded into sealed big bags within the pyrolysis building. The big bags are then loaded onto a curtain sided trailer ready for removal from the site and transport to Murfitts Lakenheath site.

2.3.6 The assessment in Appendix A concludes that the risk from the release of dust is low based on the control measures to be put in place.

2.4 Noise and Vibration

2.4.1 The key sensitive receptors at risk of exposure to noise are the residential properties on Kensington Road, Gerrand Close and Highgrove Road to the north, south and west of the proposed Facility along with St Joseph's Preparatory School, St Joseph's College and Oakhill Primary School.

2.4.2 The primary noise sources are from the combustion unit, boiler and flue gas treatment process, along with the fan sets which will be housed in acoustic enclosures. The pyrolysis unit and associated equipment are housed within the pyrolysis building.

2.4.3 Sound levels generated by the proposed development have been predicted using CadnaA and assessments have been made in accordance with the guidance contained in BS4142:2014 +A1:2019 with reference made to the internal noise criteria outlined in British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings (BS8233). The assessment concluded that the proposed development could operate without adversely affecting nearby sensitive receptors in terms of acoustic impact. The noise assessment is provided in Appendix C of this report.

2.4.4 A noise complaints procedure will be in place with actions recorded and causes investigated to prevent a recurrence.

2.4.5 The potential hazard from vibration is low based on the limited sources of vibration and the control measures to be put in place.

2.5 Point Source Emissions to Water

2.5.1 There will be clean surface water run-off from the roof of the buildings and the impermeable hardstanding yard areas. Uncontaminated rainwater run-off will be released to surface water drains via crates and an interceptor.

2.5.2 Process effluent consisting of boiler blowdown and condensate is piped over to the existing infrastructure at the neighbouring Michelin site as part of the shared steam services. These streams will be disposed of to foul sewer, via a trade effluent consent from Sever Trent Water.

2.6 Fugitive Emissions to Water and Land

2.6.1 Receptors identified are the ground and groundwater beneath the Facility and the River Trent which runs approximately 134m to the east of the Facility's perimeter.

2.6.2 The potential fugitive emissions may arise under emergency or abnormal conditions such as spillages/leaks from on-site pyrolysis oil tanks or spillages of fuel or oil associated with plant and machinery.

2.6.3 The facility will use existing and new infrastructure which has been engineered to provide sealed impermeable surfacing to ensure that there will be no fugitive emissions released to surface water, ground or groundwater.

2.6.4 All above ground tanks will have:

- impermeable bunds with a capacity of 110% of the largest volume;

- fill points provided with secondary containment;

- be subject to regular visual inspection; and

- nearby spill kits which will include materials suitable for absorbing and containing minor spillages.

2.6.5 Drip trays will be in place under coupling points during TPO tank filling operations.

2.6.6 Management controls including spill procedures will be in place, with training for staff on how to use spill kits.

2.6.7 Full details of control measures to minimise fugitive emissions to water and land compared with requirements detailed in the relevant technical guidance notes are provided in the OTMP.

2.6.8 The assessment in Appendix A concludes that the risk from fugitive releases to water and land is low based on the control measures to be put in place.

2.7 Waste Generated and Waste Management

2.7.1 For any wastes generated on site, the waste hierarchy as defined within the Waste Framework Directive will be applied, with the option of disposal only considered once all other options have been screened out as not being feasible.

2.7.2 All process wastes will be stored inside appropriate containers/vessels prior to removal off-site. Containers will be clearly labelled, sealed and stored in a secure location.

2.7.3 Full details of control measures to minimise the generation of waste compared with requirements detailed in the relevant technical guidance notes is described in the Operational Techniques and Monitoring Plan.

2.7.4 The following residues will be generated by the Facility; rejected tyre crumb, rejected rCB, rCB, tyre pyrolysis oil, boiler blowdown, APCr, and condensate.

Rejected Input Materials

2.7.5 Small quantities of rejected tyre crumb may require removal from the Facility as waste, however, this will be minimised as the tyre crumb is sourced directly from Murfitts Industries own facilities through an agreed tyre crumb specification. Pre-acceptance checks are undertaken.

2.7.6 Any rejected material will be sent back to the source site.

rCB

2.7.7 rCB is a solid product generated by the pyrolysis of waste tyres. The pyrolysis process removes organic contaminants from the char which is then cooled and bagged and sent off-site for further processing to become a saleable product, subject to receiving an end of waste position.

Tyre Pyrolysis Oil Product

2.7.8 Pyrolysis oil produced as part of the process will be stored within dedicated storage tanks. The TPO will be piped from the storage tanks into road going tankers for removal off-site and transporting to end users.

2.7.9 Obtaining an 'end of waste' position for the TPO is currently being investigated. If an agreement is achieved the oil will be exported from the Facility as a product, not as a waste. Until this agreement is determined, all residues will be handled as 'waste'. The pyrolysis oil will be exported to the Operator's customers, primarily for use as a substitute for fossil oils in a refining process.

Summary of Residues

2.7.10 Table 2.7.1 summarises the residues generated from the process.

Table 2.7.1: Residues Generated

Description of Waste	Quantity (tonnes per annum)	Source	Fate
rCB	4214	Pyrolysis process	Recycled: Used as a product
Tyre pyrolysis oil	4783	Pyrolysis process	Recovered: Used as a product (primarily in refining process)
Air pollution control Residues (APCr)	407	Gas conditioning and clean up	Recovery where possible

2.8 Litter, Mud and Pests

2.8.1 There are limited sources of litter however it is possible for the tyre crumb to be released into the environment. The tyre crumb is delivered in closed Big Bags, directly into the processing building minimising the potential for release. The generation of litter is highly unlikely as the building, operates under negative pressure and benefits from fast acting roller shutter doors.

2.8.2 Any wastes generated will be stored securely in dedicated buildings to prevent release.

2.8.3 Based on the output of the risk assessment in Appendix A, the potential risk from litter is low.

2.8.4 Generation of mud is highly unlikely as the Facility is surfaced with impermeable hardstanding throughout.

2.8.5 There are no sources of nutrients therefore risks from pests or vermin have not been considered further.

2.9 Accidents

2.9.1 The key sensitive human receptors identified near the Facility are employees at the local industrial sites, residents, users of the River Trent and its pathway and local residents. Ecological sensitive receptors include the River Trent and local wildlife sites. Receptors are identified in table 1.5.1 above.

2.9.2 Proposed management and mitigation controls, including a maintenance and inspection regime will ensure that all activities are managed and controlled to minimise the risk of accidents.

2.9.3 The Facility will be operated in accordance with the Environmental Management System (EMS), relevant guidance documents and the Environmental Permit. The Facility's EMS will include security measures to prevent unauthorised access as well as fire and spillage procedures.

2.9.4 Full details of controls to minimise the impact of accidents compared with requirements detailed in the relevant technical guidance notes are described in the OTMP.

2.9.5 The assessment in Appendix A concludes that the risk from accidents is low based on the control measures to be put in place.

2.10 Conclusions

2.10.1 Environmental risk assessments have been carried out to determine whether the proposed Facility can be operated without causing pollution to the environment. All risk assessments have been undertaken in accordance with relevant guidance and best practice.

2.10.2 The assessments undertaken consider the possible impacts on sensitive receptors from a range of potential emissions from the proposed Facility. The risk assessments have considered both the intended design and operational practices at the Facility and concluded that:

- A quantitative air quality assessment has modelled potential impacts on receptors. Modelling has concluded that the impacts of the emissions to air associated with the proposed facility were considered not significant in accordance with the EPUK, IQAM and EA guidance.

- The tyre crumb is accepted onto the site in sealed big bags from Murfitts Industries' permitted facilities. The crumb is delivered to the processing building which benefits from fast acting roller shutter doors and negative pressure. The rCB bagging also takes place within the processing building. The proposed management measures and the enclosed nature of the treatment processes mean the risk of dust emissions is minimised.

- The calculated noise rating levels from activities carried out at the Facility are not likely to adversely affect local receptors as determined by the Noise Assessment document appended to this report.

- Following the implementation of management measures and controls, potential risks from fugitive emissions to land, air and water are low.

- The overall risk to receptors from accidents is low due to the low-risk nature of activities at the Facility and the controls in place.

- The overall risks from odour, mud, vermin, pests and litter are very low to the nature of the wastes and treatment processes carried out.

Table 1: Noise and Vibration

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
Noise from vehicle movements	On site operations	Noise through the air and vibration through the ground	On-site staff; Local human population; access to the Facility; Employees of neighbouring industrial units;	Low	Medium	Medium	Vehicle movements into and out of the Facility are small with the worst case being 2 per hour. With the majority of movements occurring during between 0700-1900. Vehicles will be subject to regular maintenance and service schedules. White noise reversing alarms will be used on all vehicles. All roadways and car park surfaces will be located on impermeable hardstanding which are fully maintained with speed limits in place.	Low
Noise and vibrations associated with the operation of the Facility	On site operations	Noise through the air and vibration through the ground	On-site staff; Local human population; access to the Facility; Employees of neighbouring industrial units;	Medium	Medium	Medium	The process will operate continuously; however, the tyre crumb acceptance and removal of materials will generally take place between 0700-1900. The pyrolysis process will be contained within a sealed unit in a building. Relevant plant and equipment will be fitted with appropriate sound attenuation and acoustic isolation and will be subject to regular inspection and maintenance schedules to maintain operational performance. Noise assessment predicts no adverse effects on receptors. Any plant vibration issues will be resolved during the plant commissioning period.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
Noise associated with the pumping of TPO from the storage tanks to vehicles for removal off-site.	On-site operations	Noise through the air	On-site staff; Local human population; access to the Facility; Employees of neighbouring industrial units;	Low	Low	Low	The TPO pumping will only operate intermittently. The TPO transfer will likely occur for a maximum of 6 hours per day, i.e. 3 times per day for a maximum of 2 hours per transfer. Plant and equipment will be subject to regular inspection and maintenance schedules to maintain operational performance.	Low

Table 2: Fugitive Emissions to Air

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
Releases of particulate matter from incoming /outgoing vehicles	Vehicle movements	Air transport and inhalation	On-site staff; Local human population; access to the Facility; Employees of neighbouring industrial units;	Low	Medium	Medium	Tyre crumb is delivered in enclosed bags. rCB is removed in sealed big bags. All vehicles removing waste residues from the Facility will be covered. Impermeable roadways to prevent mud and dust. In the unlikely event of dust generation caused by vehicle movements, roadways will be swept and/or dampened down as appropriate to	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
							prevent the mobilisation of dust during dry and windy weather.	
Releases of particulate matter from the Facility.	On-site operations	Air transport and inhalation	On-site staff; Local human population; Employees of neighbouring industrial units;	High	Medium	High	Tyre crumb is delivered within enclosed bags. All vehicle loads removing residues from the facility will be enclosed. The pyrolysis process is enclosed. Storage of tyre crumb and bagging of rCB is within a building operated under negative pressure. rCB is removed in sealed big bags.	Low

Table 3: Fugitive Emissions to Water and Land

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
Contaminated run-off/rainwater from the Facility's surfaces	Contamination from materials stored on site	Percolation through soils, direct run-off from the Facility across the ground	Pollution of nearby surface water; Pollution of groundwater	Medium	Medium	Medium	Impermeable surfaces with sealed construction joints. Chemicals and oils are stored within sealed tanks provided with dedicated secondary containment with a capacity of 110% of the	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
		and entering surface water or groundwater					volume of the largest tank or 25% of the total volume, whichever is the greater. Regular inspections of containment will identify leaks. High-level alarms will be fitted to storage tanks where required. Operational procedures in place to ensure drainage system and surfacing are inspected regularly; any damage will be repaired and actions recorded. Clean up procedures will be implemented to prevent pollution from liquids in the event of a spill. All staff will be trained in the procedures and correct use of equipment and sufficient spill kits will be maintained on site. These procedures will include the use of booms or drain mats to seal all drains during the spill event. Drip trays will be in place under coupling points during pyrolysis oil tanker filling operations. Staff will be trained to minimise emissions to water and records maintained.	
Chemicals and oils stored on site	Loss of containment on site	Percolation through soils, direct run-off from the Facility across the ground	Pollution of nearby surface water; Pollution of groundwater	High	Medium	High	Chemicals and oils are stored within sealed tanks provided with dedicated secondary containment with a capacity of 110% of the volume of the largest tank or 25% of the total volume, whichever is the greater.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
		and entering surface water or groundwater					Regular inspections of containment will identify leaks and high-level alarms will be fitted to storage tanks where required. A spill clean-up procedure is in place to minimise the impact from spills and leaks. Staff will be trained in the procedures and correct use of equipment and sufficient spill kits will be maintained on site. These procedures will include the use of booms or drain mats to seal all drains during the spill event. Drip trays will be in place under coupling points during pyrolysis oil tanker filling operations. All chemicals will be handled in accordance with COSHH Regulations. Full product data sheets will be available for review by personnel on site. Staff will be trained to minimise emissions to water and records maintained.	

Table 4: Litter

| Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
Litter	Litter from tyre crumb	Transportation through the air and over land	On-site staff; Local human population after gaining unauthorised access to the Facility; Employees of neighbouring industrial units; River Trent	Low	Low	Low	All tyre crumb is delivered to the Facility within sealed big bags. Tyre crumb is accepted into and stored within a building preventing release. All rCB is loaded through a sealed system into big bags and all rCB leaving the facility is in sealed big bags A high standard of housekeeping will be maintained through regular checks for any litter and debris. Wastes generated will be stored securely within buildings. Any issues identified will be recorded, investigated and appropriate remedial action will be taken as soon as practicable.	Low

Table 5: Accidents

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
Impact by vehicle	All on-site machinery and vehicles	Direct physical contact	Drivers; On-site staff; Local human population after gaining unauthorised access to the Facility; Employees of neighbouring industrial units	Low	Medium	Medium	Activities will be managed and operated in accordance with a management system which will include security measures to prevent unauthorised access. Security measures to prevent unauthorised access will include security locks on the buildings. The Facility has security fencing around the perimeter and security gates at the main entrance. General traffic movements at the Facility will be in accordance with the site rules. Appropriate signage for vehicles will be provided. Drivers/visitors to the Facility will be given health and safety inductions and instructions on safe routing and speed limits.	Low
Overfilling of tanks and spillages of chemicals	Tanks and containment	Direct contact, air, surface water runoff	On-site staff; River Trent; Groundwater; Ground beneath site; Local human population after gaining unauthorised	Medium	Medium	Medium	Impermeable surfaces with sealed construction joints. Chemicals and oils are stored within sealed tanks provided with dedicated secondary containment with a capacity of 110% of the volume of the largest tank or 25% of the total volume, whichever is the greater. High-level alarms will be fitted to storage tanks where required.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
			access to the Facility; Employees of neighbouring industrial units				Procedures will be in place for dealing with any spills and clean up procedures and staff training will be provided. A spill clean-up procedure is in place to minimise the impact from spills and leaks. Staff will be trained in the procedures and correct use of equipment and sufficient spill kits will be maintained on site. These procedures will include the use of booms or drain mats to seal all drains during the spill event. All chemicals will be handled in accordance with COSHH Regulations. Full product data sheets will be available for review by personnel on site. The tank filling process is controlled electronically via the SCADA system which can be accessed remotely. Any abnormal conditions (e.g. high level alarms) will trigger automatic shut-down procedures and appropriate controls to prevent overfilling.	
Arson and / or vandalism and or theft causing the release of polluting materials to air (smoke or fumes), water or land.	Unauthorised access	Transportation through the air of smoke then inhalation. Spillages and contaminated firewater by	On-site staff; River Trent; Employees of neighbouring industrial units	Medium	High	High	Activities will be managed and operated in accordance with a management system (which will include fire and spillage procedures). The Facility will have a monitored fire detection and alarm system as well as being manned 24 hours a day, 7 days a week.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
		direct run off from the Facility.	Members of the public and local residents; Nearby natural habitats; Unauthorised users of site equipment				Security measures to prevent unauthorised access includes a perimeter security fence and security gates around the Facility. Security gates will be kept locked and secured outside normal delivery hours.	
Accidental fire/explosion causing the release of polluting materials to air (smoke or fumes), water or land.	On-site machinery	Transportation through the air of smoke then inhalation. Spillages and contaminated firewater by direct run off from the Facility.	On-site staff; Employees of neighbouring industrial units; Members of the public and local residents; Nearby natural habitats; Unauthorised users of equipment.	Low	High	High	Nitrogen gas is used to prevent the ignition of flammable vapours and combustible solids. Activities will be managed and operated in accordance with a management system, which will include security measures to prevent unauthorised access. All plant and equipment will be maintained in good working condition and subject to routine inspection and planned preventative maintenance. The facility has security fencing around the perimeter and security gates at the main entrance. The Facility's management system will include procedures and actions required in the event of fire to prevent or minimise off-site pollution. Firefighting equipment will be maintained on site in accordance with fire regulations. The Facility will be a non-smoking site.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of risk	Risk Management	Residual risk
							Any fire at the Facility will be treated as an emergency and will be extinguished at the earliest opportunity utilising local Fire & Rescue Services if required. All staff will be fully trained in the fire procedure and the use of firefighting equipment. Any incidents of fire will be reported to the Local Authority and records kept. The pyrolysis process is controlled electronically via SCADA which can be accessed remotely. Any abnormal conditions will trigger automatic shut-down procedures and appropriate controls to prevent the build-up of an explosive atmosphere.	

Figure 2 Wind Rose Plots
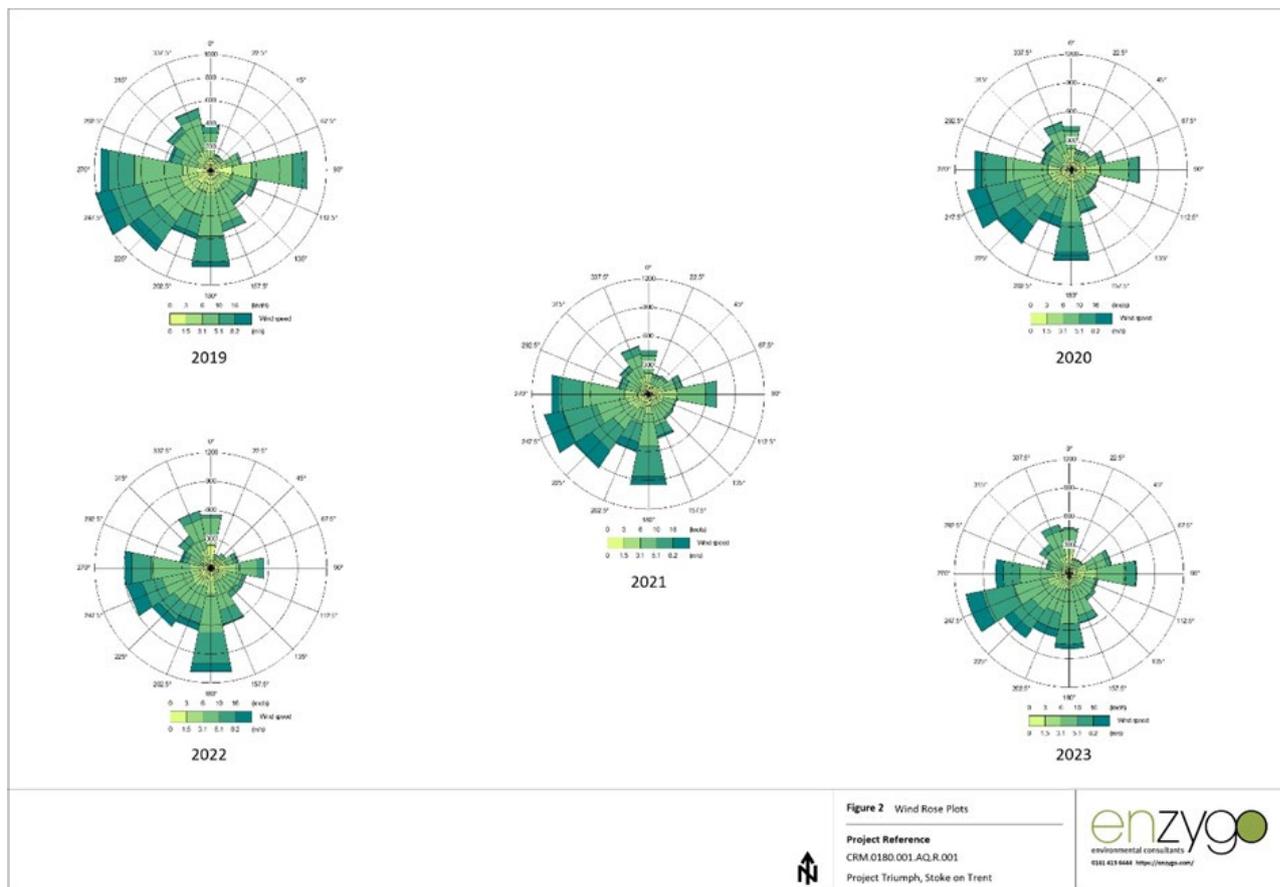
Project Reference
CRM.0180.001.AQ.R.001
Project Triumph, Stoke on Trent

Permit Noise Assessment - Pyrolysis

Construction & Operation of End-of-Life Tyre Processing Facility for the Production of rCB and TPO at Campbell Road, Oakhill, Stoke-on-Trent, England, ST4 4EW

Murfitts Industries Ltd

CRM.0180.001.NO.R.003

'Experience and expertise working in union'

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Permit Noise Assessment - Pyrolysis

Project:	Construction & Operation of End-of-Life Tyre Processing Facility for the Production of rCB and TPO Campbell Road, Oakhill, Stoke-on-Trent, England, ST4 4EW
For:	Murfitts Industries Ltd
Status:	Final
Date:	June 2025
Author:	Darren Lafon-Anthony MSc MIOA FIQ
Reviewer	Peter Cumberlidge, Senior Director MCIWM

Contents

Tables & Figures

1   Introduction

1.1   Project Introduction

1.1.1   Enzygo Limited has been commissioned by Murfitts Industries Ltd to undertake a noise impact assessment to support a permit application for the proposed construction and operation of their end-of-life tyre processing facility to produce rCB and TPO at Campbell Road, Oakhill, Stoke-on-Trent, England, ST4 4EW

1.1.2   The noise assessment has been undertaken to assess the potential impacts, in accordance with the relevant standards and guidance, at the nearest noise-sensitive properties to the site and to provide outline mitigation advice if considered necessary.

1.1.3   Details of the assessment methodology employed, together with the results of the noise predictions, assessment and conclusions are presented within this report.

1.2   Site Description

1.2.1   The proposed development site is located off Campbell Road, Oakhill, Stoke-on-Trent, ST4 4EW. The site is in an industrialised area of Stoke-on-Trent south of the Michelin Roundabout and adjacent to the dualled A500 Queensway.

1.2.2   To the north of the site are industrial premises with residential properties on Kensington Road beyond. To the east is Campbell Road, a container storage area, the River Trent and the A500 Queensway, and beyond this is further industrial development. To the south is a container storage area, the River Trent and the A500 Queensway, beyond which is Hanford Cricket Club and residential properties on Ferrand Close and Clermont Avenue. To the west is further industrial development with residential properties on Highgrove Road.

1.2.3   St Joseph's Preparatory School and St Joseph's College are located to the northwest on the northern side of Rookery Lane.

1.2.4   There are nearby residential properties identified as the nearest noise-sensitive receptors to the proposed development site, specifically:

      ML01   No.109 Kensington Road

      ML02   No.6 Ferrand Close

      ML03   No.105 Highgrove Road

1.2.5   The site and receptor locations are shown in Figure 1-1 below.

Figure 1-1: Site & Monitoring Location Plan

1.3 Proposed Development

1.3.1 The proposed development comprises reception and processing buildings, associated external equipment, weighbridge, laboratory and offices.

1.3.2 The current site layout, on which the noise assessment is based, is shown in Figure 1-2 below.

Figure 1-2: Site Layout
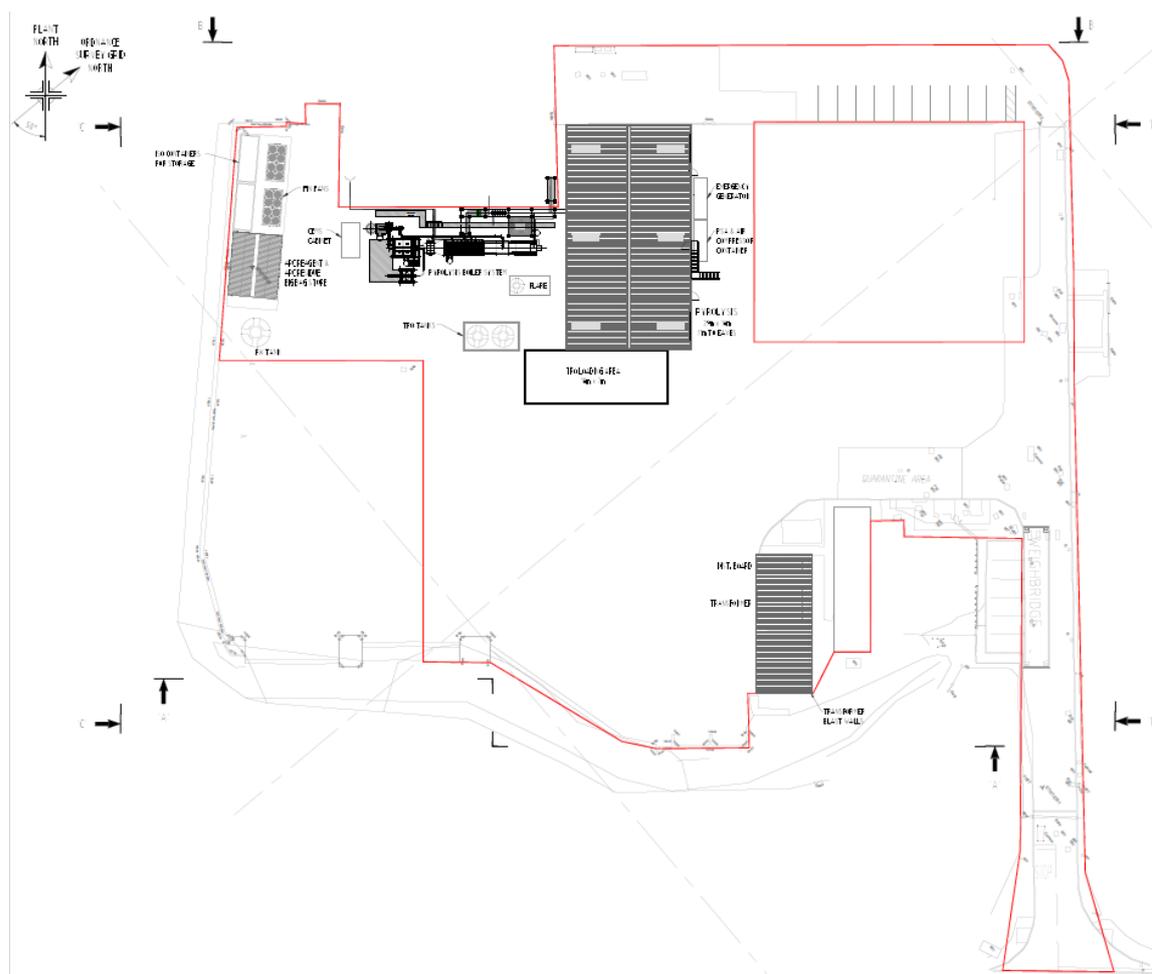
1.4 Noise Assessment Methodology

1.4.1 A noise assessment for the current proposals has been undertaken in accordance with the guidance contained in British Standard 4142:2014+A1:2019 *Method for rating and assessing industrial and commercial sound* (BS4142) with reference made to the internal noise criteria outlined in British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (BS8233).

1.4.2 Noise levels generated by the proposed development have been predicted to the nearest noise-sensitive receptors, using the calculation methodology outlined in ISO9613:2024 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering methods of the prediction of sound pressure levels outdoors* (ISO9613) using the proprietary noise modelling software CadnaA.

1.4.3   The assessment is based upon the results of baseline noise surveys undertaken at locations representative of the nearest residential receptors to the site over representative daytime and night-time periods.

2 Standards and Guidance

2.1 Planning Practice Guidance: Noise

2.1.1 The Planning Practice Guidance: Noise is the Government's online guidance on managing potential noise impacts from new developments.

2.1.2 The guidance includes a noise exposure hierarchy table which relates response to noise and example outcomes to effect levels. The hierarchy table also identifies actions required for each effect level.

2.1.3 Particularly relevant to this assessment are the No Observed Effect Level and the No Observed Adverse Effect Level (NOAEL) to which the guidance states:

Table 2-1: Noise Hierarchy Table Excerpt

Response	Example of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No specific measures required

2.2 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

2.2.1 BS4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes.

- Sound from fixed installations which comprise mechanical and electrical plant and equipment.

- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises.

- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

2.2.2 The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be

concluded based upon the premise that typically "*the greater this difference, the greater the magnitude of the impact*". This difference is then considered as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

- A difference of around +5dB is likely to be an indication of an adverse impact, depending upon context.

- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

2.2.3   BS4142 further states that "*where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact*" again depending upon the specific context of the site. The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that "*not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact*", thus implying that all sites should be assessed on their own merits and specifics.

2.2.4   The Standard quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical Daytime	07:00 – 23:00	1-hr assessment period
Typical Night-time	23:00 – 07:00	15-min assessment period

2.2.5   The Standard outlines methods for defining appropriate "*character corrections*" within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

2.2.6   The Subjective Method is based on the following corrections:

Table 2-2: BS4142 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for "Other sound characteristics"	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable +3 dB	If intermittency is readily identifiable +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

2.3   British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

2.3.1   BS8233 provides guidance and recommendations for the control of noise from outside sources to maintain an internal acoustic environment appropriate for the intended use. The Standard suggests appropriate criteria and limits for differing situations which are, primarily, intended to guide the design of new or refurbished buildings undergoing a change of use rather than to

assess the effect of changes to the external noise climate. However, it is considered that the guidance provides suitable criteria for the assessment of internal noise levels in this instance.

2.3.2   The Standard suggests suitable guidance values for residential dwellings shown in Table 2-3.

Table 2-3: BS8233 Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 Hours	23:00 to 07:00 Hours
Resting	Living room	35dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

2.3.3   Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

"*If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.*"

2.3.4   The Standard suggests that the level of noise reduction provided by a partially open window would be approximately 15dB.

2.3.5   BS8233 also sets out a design-criteria for external noise in external amenity spaces such as gardens and patios stating:

"*it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.*"

2.3.6   These guideline design-criteria values are meant for new residential development rather than for assessing new noisy development being introduced into a residential area. However, the guideline values provide good noise limits to attain in this instance.

2.4   ISO9613 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors*

2.4.1   The noise levels generated by the operation of the proposed development have been predicted using the calculation methodology set out in ISO9613-2. The methodology considers the distance between the sources and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

2.4.2   The methodology assumes downwind propagation, i.e., a wind direction that assists the propagation of noise from the source to all receptors.

3   Baseline Survey Information & Results

3.1   Baseline Noise Survey

3.1.1   Due to the security of the monitoring locations, attended baseline noise surveys were undertaken on Sunday 13th into Monday 14th October, and Sunday 1st December 2024 to gather the quietest background and ambient noise levels at locations representative of the nearest noise-sensitive receptors to the proposed development site.

3.1.2   The monitoring locations used for the survey are shown in Figure 1-1 and detailed in Table 3-1 below. The measurement microphone was mounted on a tripod with a windshield approximately 1.5m above the ground in free-field conditions.

Table 3-1: Noise Monitoring Locations

Monitoring Location	Approx. Distance from Site	Reflecting Surfaces between Source & Receptor	Topography of Intervening Ground	Justification for Choice of Measurement Location
ML01	250m	Intervening industrial buildings adjacent to the proposed development site	Greenspace to industrial development rising from the receptor then falling away to the site location	Nearest noise-sensitive residential receptor locations identified
ML02	430m	None	Generally open greenspace rising approaching the receptor location	
ML03	260m	Intervening industrial buildings adjacent to the proposed development site	Greenspace to industrial development rising from the receptor then falling away to the site location	

3.2   Weather Conditions

October 2024

3.2.1   Weather conditions during the October survey were suitable for environmental noise monitoring being overcast with no rain. Temperatures during the daytime were around 17°C falling to 11°C at night. Winds were light from the southwest.

December 2024

3.2.2   Weather conditions during the December survey were also suitable for environmental noise monitoring it being overcast with no rain. Temperatures during the day were around 13°C. Winds were light from the southeast.

3.3   Measuring Equipment

3.3.1   The noise monitoring equipment used during the surveys is shown in Table 3-2 and was set to record the $L_{Aeq,T}$, L_{A90}, L_{A10} and L_{AFmax} parameters.

3.3.2   The following set-up parameters were used on the sound level meter during all the noise measurements undertaken:

Time Weighting: Fast

Frequency Weighting: "A"

3.3.3 The sound level meters were field calibrated, using the acoustic calibrator, prior to and upon completion of the overall survey. No drifts in calibration were noted.

Table 3-2: Noise Monitoring Equipment

Date	Period	Location	Equip. Make & Model	Class	Serial No.	Calibration Date Prior to Survey
12/24	Day	ML01	Rion NL:52 Sound Level Meter	1	00520992	August 2024
10/24	Night				00721020	November 2022
12/24	Day	ML02	Rion NL:52 Sound Level Meter	1	00721020	November 2024
10/24	Night				00721020	November 2022
10/24	Both	ML03	SVANTEK 971 Sound Level Meter	1	55548	November 2022
12/24	All		RION NC:75 Acoustic Calibrator	-	34724233	August 2024

3.3.4 The external calibration documentation for the equipment used is available upon request.

3.4 Survey Details and Results

3.4.1 The results of the baseline surveys are summarised in Table 3-3 below and can be found in full in Appendix A.

Table 3-3: Summary of Baseline Survey Results, dB

Location	Period	Duration hh:mm	Average dB $L_{Aeq,T}$	dB L_{AFmax}	dB L_{A90}	dB L_{A10}
ML01 Kensington Road	Day	03:00	50.8	76.2	48.3	51.9
	Night	02:00	41.5	60.8	39.4	43.0
ML02 Ferrand Close	Day	03:00	56.2	80.3	57.7	53.8
	Night	02:00	49.0	75.3	42.5	48.8
ML03 Highgrove Road	Day	04:00	56.6	94.9	44.5	50.7
	Night	02:00	44.8	57.5	42.3	46.4

3.5 Existing Context

ML01 Kensington Road

3.5.1 During the daytime survey, noise from road traffic on the A500 was considered the dominant noise source. Occasional traffic on Kensington Road, overhead aircraft and birdsong were audible. There was no noise audible from the adjacent industrial/commercial units.

3.5.2 During the night-time survey, noise from road traffic on the A500 was considered the dominant noise source. No other noise sources were identified at the time of the survey.

ML02 Ferrand Close

3.5.3   During the daytime survey noise from road traffic on the A500 was considered the dominant noise source. Occasional traffic on Clermont Avenue, overhead aircraft and birdsong were audible. There was no noise audible from nearby industrial/commercial units.

3.5.4   During the night-time survey, noise from road traffic on the A500 was considered the dominant noise source. No other noise sources were identified at the time of the survey.

ML03 Highgrove Road

3.5.5   During the daytime survey noise from road traffic on the A500 was considered the dominant noise source. Occasional traffic on Clermont Avenue, overhead aircraft and birdsong were audible. There was no noise audible from nearby industrial/commercial units.

3.5.6   During the night-time survey, noise from road traffic on the A500 was considered the dominant noise source. No other noise sources were identified at the time of the survey.

4   Assessment of Impacts

4.1   Introduction

4.1.1   Specific sound levels generated by the development proposals have been predicted to the site facing façade or site facing outdoor amenity space of the nearest noise-sensitive receptors identified using the calculation methodology outlined in ISO9613.

4.1.2   The resulting predicted specific sound levels have then been assessed in accordance with the guidance contained in BS4142 with reference made to sleeping conditions in bedrooms at night in accordance with the guidance contained in BS4142 and BS8233.

4.2   Sources Being Assessed

4.2.1   All buildings on site are of steel portal frame construction supporting Kingspan KS1000RW trapezoidal wall and roof panel systems giving a noise reduction 25dB R_W.

4.2.2   It is assumed that all roller shutter doors are fast acting and acoustically treated with a noise reduction of 18dB R_W and would remain closed other than for access. For the purposes of this assessment the roller shutters are modelled as being open during the day and closed at night.

4.2.3   HGV movements within the site are based on a site speed limit of 10mph (16kph).

4.2.4   The noise source data advised by the client and used in the assessment is shown in Table 4-1.

Table 4-1: Noise Source Information

Process Location	Description	Qty	Noise Level
Pyrolysis Process (24/7)	Feed Screws	2	80dB(A) @ 1m
	Primary Pyrolysis	2	85dB(A) @ 1m
	Secondary Pyrolysis	2	85dB(A) @ 1m
	Pyrolysis Gas Quench Tower	2	80dB(A) @ 1m
	Pyrolysis Gas Demister Tower	2	80dB(A) @ 1m
	Recirculate Pyrolysis Oil Storage Tank	2	80dB(A) @ 1m
	Pyrolysis Oil Recirculation Pump	2	80dB(A) @ 1m
	Pyrolysis Oil Discharge Pump	2	80dB(A) @ 1m
	Pyrolysis Gas Extraction Fan	2	80dB(A) @ 1m
	Pyrolysis Oil Transfer Pump	1	80dB(A) @ 1m
	rCB Cooling Screw	2	80dB(A) @ 1m
	Raw rCB Bagging Station	1	85dB(A)@1m
	Resulting Internal Reverberant Noise Level Modelled		**78.8dB(A) L_i**
External Plant (24/7)	Pyrolysis Gas Combustion System	1	85dB(A) @ 1m
	Natural Gas Anchor Flame Combustion System	1	85dB(A) @ 1m

Process Location	Description		Qty	Noise Level
	Flue Gas Recirculation Fan		1	85dB(A) @ 1m
	Combustion Air Fan		1	85dB(A) @ 1m
	Boiler		1	85dB(A) @ 1m
	Economiser		1	85dB(A) @ 1m
	Boiler Feedwater Pump		1	85dB(A) @ 1m
	Steam Dump Condenser System		1	85dB(A) @ 1m
	Sodium Bicarbonate & Activated Carbon Dosing System		1	85dB(A) @ 1m
	Bag Filter		1	85dB(A) @ 1m
	ID Fan		1	85dB(A) @ 1m
	CEMS		1	85dB(A) @ 1m
	Stack		1	85dB(A) @ 1m
	APC Residue Collection System		1	85dB(A) @ 1m
Balance of External Plant	Air Compressor and Reciever Package	24/7	1	75dB(A) @ 1m
	Nitrogen PSA Package	24/7	1	75dB(A) @ 1m
	Plant Water Package	24/7	1	85dB(A) @ 1m
	TPO Storage Vessel	24/7	2	85dB(A) @ 1m
	Effluent Collection Tank and Pump Package	24/7	1	85dB(A) @ 1m
	Emergency Generator Package	On request	1	85dB(A) @ 1m
	Closed Loop Cooling Water Package	24/7	1	85dB(A) @ 1m
	Flare	On request	1	85dB(A) @ 1m
Vehicle Movements	Estimated movement per hour (worst-case)		2	106.9dB(A) L_W

4.3 Noise Modelling Protocols

4.3.1 The model was constructed using the proprietary noise modelling software package CadnaA utilising Google Earth geo-referenced 1:1 scaled aerial photography, openstreetmap.org mapping data, and noise sources and source data supplied by the client/equipment manufacturer.

4.3.2 It is assumed that the ground between the site and the receptors would be at least 50% soft ground. Wind and temperature gradient assisted sound propagation has been assumed to all receptors. The noise model has been set to 3 orders of reflection.

4.3.3 The assessment is based on roller shutter doors being open for access during the day and closed at night.

4.4 Predicted Sound Levels

4.4.1 For the purposes of this assessment the predicted sound levels assume that all equipment would be operating simultaneously thereby providing a worst-case scenario of operational noise from the site.

4.4.2 Predicted specific sound levels at Kensington Road have been predicted to a height of 1.5m to represent outdoor amenity space during the day and 4.0m to represent a 1st floor bedroom window at night.

4.4.3 Predicted specific sound levels at the bungalows on Ferrand Close have been predicted to a height of 1.5m to represent outdoor amenity space during the day and a ground floor bedroom window at night.

4.4.4 Predicted specific sound levels at Highgrove Road have been predicted to a height of 1.5m to represent outdoor amenity space during the day, 4.0m to represent a 1st floor balcony amenity space during the day, and 4.0m to represent a 1st floor bedroom window at night.

4.4.5 Predictions at St Joseph's Preparatory School have been made to ground (1.5m), first (4.0m) and second floors (6.5m) under the assumption that they are all classrooms facing the site. The results are shown in Table 4-2.

Table 4-2: Predicted Specific Sound Levels at the Receptors

Receptor Location	Period (hrs)	Receptor Height (m)	Predicted Specific Sound Level dB $L_{Aeq,T}$
ML01 Kensington Road	07:00 – 23:00	1.5	25.0
	23:00 – 07:00	4.0	30.9
ML02 Ferrand Close (Bungalows)	07:00 – 23:00	1.5	32.7
	23:00 – 07:00		31.3
ML03 Highgrove Road	07:00 – 23:00	1.5 (Ground Floor Amenity)	23.7
	07:00 – 23:00	4.0 (1st Floor Balcony Amenity)	27.5
	23:00 – 07:00	4.0 (1st bedroom window)	27.3
St Joseph's Preparatory School	Daytime Only	Ground Floor	28.9
		First Floor	33.1
		Second Floor	36.1

4.5 Subjective Impressions at the Receptors

4.5.1 As the development proposals are in the planning stage there are currently no specific noise sources at site other than the existing production operations, the ambient sound level and residual sound levels are considered to be equal and are taken as the measured $L_{Aeq,T}$.

4.5.2   There have been no corrections applied to the measured sound levels. The specific sound level will be predicted using the proprietary noise modelling software CadnaA.

4.6   Sound Rating Levels

Existing Context

4.6.1   The identified receptors are sited close to major transport infrastructure (A500 Queensway dual carriageway) and existing industrial and commercial development and are therefore habituated to similar development to that proposed.

Derived Sound Rating Levels

4.6.2   It is considered that, due to the proximity of the noise from existing transport infrastructure and industrial developments, any acoustic features which may, or may not, be generated by the development proposals will not be noticeable at the receptor locations against those already existing in the area. Therefore, no acoustic feature corrections have been made.

4.7   Assessment of the Impacts

4.7.1   BS4142 states:

"*The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.*"

4.7.2   A comparative assessment has been made against the measured background noise levels to determine the potential impact of worst-case predicted sound rating levels (when all equipment is operating simultaneously). Table 4-3 summarises the results of the assessment. Measured background levels have been rounded to the nearest whole decibel.

Table 4-3: BS4142 Assessment

Location	Period	Location	Rating Level dB $L_{Aeq,T}$	Background Noise Level dB L_{A90}	Difference dB
Kensington Road	Day	Amenity	25	48	-23
	Night	1st Floor Bedroom Window	31	39	-8
Ferrand Close	Day	Amenity	33	58	-25
	Night	Grd Floor Bedroom Window	31	43	-12
Highgrove Road	Day	Amenity	24	45	-21
	Day	1st Floor Balcony Amenity	28	45	-17
	Night	1st Floor Bedroom Window	27	42	-15

4.7.3   Table 4-3 shows that the worst-case predicted sound rating levels during both the day and overnight would be below the measured background noise levels at all locations assessed indicating that the specific sound level would have a low impact, depending on the context.

4.8 Context

4.8.1 BS4142 states that where the initial estimate of impact needs to be modified due to the context, all pertinent factors should be taken into consideration.

The Absolute Level of Sound

4.8.2 Background noise levels have been measured on a Sunday during the day and on a Sunday into Monday during the night; this is considered to represent the typically quietest periods and therefore lowest background and ambient levels of the week and thereby presenting a worst-case situation.

4.8.3 The specific sound levels generated by the operations are predicted to be below the existing prevailing average ambient, $L_{Aeq,T}$ and background, L_{A90}, noise levels at the receptors assessed during both the day and at night.

4.8.4 Noise levels from the proposed development would not increase the ambient noise levels when considered cumulatively within the existing noise climate during either the day or overnight.

Sensitivity of the Receptors

4.8.5 The nearest receptors identified are residential in nature and as such could be sensitive to noise impact during both the day and overnight. However, as noted in paragraphs 4.6.1 the receptors are located close to other noise generating developments.

Summary of Context

4.8.6 The predicted levels are below the existing background noise levels and would therefore be masked by other environmental sounds in the area during the day and overnight.

4.8.7 During the night, it is unlikely that residents would be using outdoor amenity spaces and are more likely to be indoors resting or sleeping. Internal noise levels would therefore become more important than the external assessment against background levels.

4.8.8 Worst-case internal noise levels at night would occur at Ferrand Close where, when considering a 15dB reduction for a partially open window for ventilation, internal levels would be around 16dB (as a worst-case) easily falling within the guideline values for sleeping in bedrooms at night.

4.9 BB93 Assessment

4.9.1 Building Bulletin 93 *Acoustic Design of Schools* gives guidance on suitable indoor ambient noise levels for clear communication of speech between teacher and student, and between students and for study activities. As such, it is considered that noise from the proposed development should not exceed the recommended levels outlined in the bulletin.

4.9.2 The predicted internal noise levels are based on external levels outside the window less a sound reduction of approximately 15dB for a window left partially open for ventilation.

4.9.3   For the purposes of this assessment the upper limit for the indoor ambient noise level, $L_{Aeq,30min}$, for nursery school quiet rooms, secondary school classrooms and general teaching areas of 35dB has been used.

4.9.4   Table 4-4 details the results of the assessment based on the worst-case predicted noise level outside the windows of the site facing façade of St Joseph's College.

Table 4-4: BB93 Assessment – St Joseph's College

Location	Predicted External Noise Level, dB $L_{Aeq,T}$	Predicted Internal Noise Level, dB $L_{Aeq,T}$	Guidance Levels dB $L_{Aeq,30min}$	Difference, dB
Ground Floor	29	14		-21
1st Floor	33	18	35	-17
2nd Floor	36	21		-14

4.9.5   Table 4-4 shows that predicted internal noise levels, with the windows left partial open for ventilation, would achieve the guidance values outlined in BB93.

4.10   Cumulative Impacts

4.10.1   A cumulative impact assessment has been made based on the potential change in ambient noise levels due to the introduction of the development proposals. The assessment of the potential impact has been made against the descriptors contained in the Institute of Environmental Management and Assessment document Guidelines for Environmental Noise Impact Assessment shown in Table 4-5 below.

Table 4-5: IEMA Effect Descriptors

Effect Descriptor	Description
Very Substantial	Greater than a 10dB L_{Aeq} change in sound level perceived at the receptor of great sensitivity to noise
Substantial	Greater than a 5dB L_{Aeq} change in sound level perceived at a noise sensitive receptor, or a 5 to 9dB L_{Aeq} change in sound level at a receptor of great sensitivity
Moderate	A 3 to 4.9dB L_{Aeq} change in sound level at a sensitive or highly sensitive receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than a 2.9dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

4.10.2   Table 4-6 summarises the cumulative effect at each receptor assessed based on the above.

Table 4-6: Cumulative Effect

Location	Period/Floor	Ambient Noise Level, dB $L_{Aeq,T}$		Difference dB	Effect
		Measured Existing	Predicted Future		
Kensington Road	Day (ground)	50.8	50.8	0	None/Not Significant
	Night (1st)	41.5	41.9	+0.4	
Ferrand Close	Day (ground)	56.2	56.2	0	
	Night (ground)	49.0	49.1	+0.1	
Highgrove Road	Day (ground)	56.6	56.6	0	
	Day (1st)	56.6	56.6	0	
	Night (1st)	44.8	44.9	+0.1	
St Joseph's College*	Day (ground)	56.6	56.6	0	
	Day (1st)	56.6	56.6	0	
	Day (2nd)	56.6	56.6	0	
* Ambient noise levels measured at ML03 (Highgrove Road) used for St Joseph's College					

4.10.3   Table 4-6 shows that the introduction of the proposed development would have a 'none/not significant' effect at all the receptors assessed.

4.10.4   Based on the findings of the assessments above, it is considered that mitigation measures to reduce the potential impacts are unnecessary.

5   Conclusion

5.1.1   Enzygo Limited has been commissioned by Murfitts Industries Ltd to undertake a noise impact assessment to support a permit application for the proposed construction and operation of their end-of-life tyre processing facility to produce rCB and TPO at Campbell Road, Oakhill, Stoke-on-Trent, England, ST4 4EW

5.1.2   The noise assessment has been undertaken to assess the potential impacts, in accordance with the relevant standards and guidance, at the nearest noise-sensitive properties to the site and to provide outline mitigation advice if considered necessary.

5.2   Noise Assessment

5.2.1   Sound levels generated by the proposed development have been predicted using CadnaA and assessments have been made in accordance with the guidance contained in BS4142:2014+A1:2019.

5.2.2   The BS4142 assessment shows that the predicted sound rating levels are below the measured background noise levels at all receptors assessed during both the day and overnight which would indicate that the specific sound has a low impact and would fall into the NOEL effect level when assessed in accordance with the Planning Policy Guidance for noise.

5.2.3   The BB93 assessment for St Joseph's College has shown that predicted internal noise levels in ground, first and second floor classrooms in the site facing façade would easily meet the 35dB $L_{Aeq,30min}$ upper limit for the indoor ambient noise level for nursery school quiet rooms, secondary school classrooms and general teaching areas.

5.2.4   The cumulative assessment shows a none/not significant effect at all receptors assessed.

5.2.5   Given the above, it has been demonstrated that, there are no reasons on noise grounds why planning consent for the proposed development cannot be granted.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to 'everyday' occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this when undertaking the measurement of noise, the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The 'loudness' of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener's ear, the time of the day and the general mood of the person.

With regards to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. Attempting produce a figure that relates this variable nature of noise to human subjective response, various statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
$L_{A10,T}$	The 10th statistical percentile of a measurement period, i.e., the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
$L_{A90,T}$	The 90th statistical percentile of a measurement period, i.e., the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all noise sources incident at one location, both in the near- and far-field (*The ambient sound comprises the residual sound and the specific sound when present).*
Ambient Sound Level **$L_a = L_{Aeq,T}$**	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Equivalent Continuous A-weighted Sound Pressure Level **$L_{Aeq,T}$**	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = $t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation: $$L_{Aeq,T} = 10lg_{10}\left\{\left(\frac{1}{T}\right)\int_{t1}^{t2}\left[p_A\frac{(t)^2}{p_0{}^2}\right]dt\right\}$$

Term	Definition
	Where p_0 is the reference sound pressure (20µPA); and $P_A(t)$ is the instantaneous A-weighted sound pressure level at time t.
Measurement Time Interval T_m	Total time over which measurements are taken (*This may consist of the sum of several non-contiguous, short-term measurement time intervals*)
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over time, T.
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T.
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T.
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of ±1dB;

- Meteorology – allowance of ±1.9dB; and

- CadnaA noise propagation modelling software – operational accuracy of ±2.1dB

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of ±3dB.

Statement of Competency

Darren Lafon-Anthony MSc MIOA FIQ

The assessment has been undertaken by, or under the supervision of, Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to the assessment of noise and the application of mitigation measures for minerals and mining sites, a qualification he has held since September 2014.

Mr. Lafon-Anthony has worked in acoustics since January 1990. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power generator and power generation markets for several noise control equipment manufacturers. Since February 2004, Mr Lafon-Anthony has worked as an environmental noise consultant in various sectors, including mineral and mining, waste disposal and recycling, industrial, energy supply (EfW, STOR, Solar and Battery Energy Storage), EV charging infrastructure and residential development across the UK, Europe and sub-Saharan Africa.

Appendix A – Baseline Noise Data

Table A1: Location ML01, Kensington Road Daytime

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
01/12/2024 11:45	50.1	73.0	47.9	51.4
01/12/2024 12:00	50.3	74.6	48.2	51.9
01/12/2024 12:15	49.7	56.8	47.8	51.3
01/12/2024 12:30	50.0	74.0	47.8	51.4
01/12/2024 12:45	51.3	70.1	49.0	52.0
01/12/2024 13:00	52.3	69.1	48.9	53.0
01/12/2024 13:15	51.4	69.0	48.9	53.6
01/12/2024 13:30	52.3	69.3	47.8	53.2
01/12/2024 13:45	49.3	71.3	47.8	50.5
01/12/2024 14:00	49.6	54.9	48.1	50.9
01/12/2024 14:15	50.2	69.8	48.5	51.3
01/12/2024 14:30	51.4	76.2	49.1	52.5
Overall	**50.8**	**76.2**	**48.3**	**51.9**

Table A2: Location ML01, Kensington Road Night-time

Start Time	$L_{Aeq,T}$, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
13/10/2024 23:02	42.5	60.8	40.6	43.8
13/10/2024 23:17	42.2	54.0	40.4	43.7
13/10/2024 23:32	41.4	47.2	39.6	42.8
13/10/2024 23:47	40.8	45.8	39.0	42.3
14/10/2024 00:02	41.9	53.3	39.6	43.7
14/10/2024 00:17	40.8	49.4	38.8	42.2
14/10/2024 00:32	41.1	50.5	38.3	42.9
14/10/2024 00:47	41.0	60.2	38.5	42.8
Overall	**41.5**	**60.8**	**39.4**	**43.0**

Table A3: Location ML02, Ferrand Close Daytime

Start Time	L$_{Aeq,T}$, dB	L$_{Afmax}$, dB	L$_{A90}$, dB	L$_{A10}$, dB
01/12/2024 11:30	59.5	73.4	63.5	53.3
01/12/2024 11:45	54.6	66.5	56.3	53.0
01/12/2024 12:00	54.1	63.2	55.5	52.3
01/12/2024 12:15	55.3	63.1	56.9	53.4
01/12/2024 12:30	54.6	63.1	56.3	52.9
01/12/2024 12:45	55.1	60.8	56.6	53.4
01/12/2024 13:00	55.9	65.2	57.6	54.0
01/12/2024 13:15	56.6	80.3	58.0	54.5
01/12/2024 13:30	56.4	65.1	57.9	54.6
01/12/2024 13:45	56.8	64.6	58.1	55.2
01/12/2024 14:00	56.5	65.6	58.0	54.7
01/12/2024 14:15	56.4	76.8	57.7	54.5
Overall	**56.2**	**80.3**	**57.7**	**53.8**

Table A4: Location ML02, Ferrand Close Night-time

Start Time	L$_{Aeq,T}$, dB	L$_{Afmax}$, dB	L$_{A90}$, dB	L$_{A10}$, dB
13/10/2024 23:26	47.0	54.5	43.8	49.1
13/10/2024 23:41	55.6	75.3	44.1	51.2
13/10/2024 23:56	45.6	51.3	42.5	47.8
14/10/2024 00:11	46.2	54.0	42.4	48.9
14/10/2024 00:26	45.5	56.0	42.1	47.9
14/10/2024 00:41	45.9	58.3	42.2	48.6
14/10/2024 00:56	45.4	54.3	41.5	48.3
14/10/2024 01:11	45.6	53.3	41.6	48.7
Overall	**49.0**	**75.3**	**42.5**	**48.8**

Table A5: Location ML03, Highgrove Road Daytime

Start Time	L_{Aeq,T}, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
13/10/2024 13:00:00	61.2	89.7	39.3	59.6
13/10/2024 13:15:00	48.2	72.5	40.0	49.5
13/10/2024 13:30:00	48.9	69.8	41.2	50.4
13/10/2024 13:45:00	45.2	64.9	41.1	46.8
13/10/2024 14:00:00	47.7	65.2	45.2	49.0
13/10/2024 14:15:00	49.4	66.3	45.8	50.5
13/10/2024 14:30:00	51.2	75.2	45.7	50.3
13/10/2024 14:45:00	50.9	71.6	45.2	50.1
13/10/2024 15:00:00	49.0	62.1	46.1	50.9
13/10/2024 15:15:00	66.8	94.9	47.0	51.7
13/10/2024 15:30:00	48.1	58.5	46.0	49.5
13/10/2024 15:45:00	49.0	66.2	45.6	49.8
13/10/2024 16:00:00	50.1	69.8	45.7	51.5
13/10/2024 16:15:00	48.6	57.1	46.4	50.2
13/10/2024 16:30:00	50.4	69.5	46.3	52.2
13/10/2024 16:45:00	49.9	72.4	46.1	49.7
Overall	**56.6**	**94.9**	**44.5**	**50.7**

Table A6: Location ML03, Highgrove Road Night-time

Start Time	L_{Aeq,T}, dB	L_{Afmax}, dB	L_{A90}, dB	L_{A10}, dB
13/10/2024 23:15:00	46.4	57.0	43.5	48.1
13/10/2024 23:30:00	45.5	51.1	42.9	47.5
13/10/2024 23:45:00	44.9	57.5	43.0	46.3
14/10/2024 00:00:00	43.7	55.3	41.3	45.2
14/10/2024 00:15:00	44.1	55.5	41.8	45.9
14/10/2024 00:30:00	44.5	57.5	41.6	46.2
14/10/2024 00:45:00	45.0	55.5	42.8	46.7
14/10/2024 01:00:00	43.6	51.6	41.1	45.5
Overall	**44.8**	**57.5**	**42.3**	**46.4**

Figure B-1: Daytime L$_{Aeq}$ Noise Contour Plot, 1.5m high

Figure B-2: Night-time L$_{Aeq}$ Noise Contour Plot, 4m high

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Air Quality Emissions Assessment

Project Triumph, Stoke on Trent

Murfitts Industries Limited

CRM.0180.001.AQ.R.001.P03

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For:	Murfitts Industries Limited
Status:	Final
Date:	June 2025
Author:	Josh Davies BSc (Hons) – Principal Air Quality Consultant
Reviewer:	Conal Kearney BEng (Hons) MSc MIAQM MIEnvSc – Director of Air Quality

Contents

Tables and Figures

1.0 Introduction

1.1 Background

1.1.1 Enzygo Limited was commissioned by Murfitts Industries Limited (Ltd) to undertake an air quality impact assessment to support the Construction and Operation of a Pyrolysis Facility at Campbell Road, Oakhill, Stoke-on-Trent, England, ST4 4EW ("the facility").

1.1.2 The process will receive 11,500 tpa of end of life tyre (ELT) crumb delivered to site from end of life tyre processing facilities operated by Murfitts Industries. The tyre crumb delivered in big bags which are emptied into a conveying systems transferring the crumb to the first stage pyrolysis units where it is heated in the absence of oxygen causing the tyres to decompose into a raw rCB and hot pyrolysis gas. The raw rCB is transferred to a second pyrolysis chamber where it is further heated driving off any remaining volatile material, the pyrolysis gas from this second stage being blended with the pyrolysis gas from the first stage pyrolysis.

1.1.3 The raw rCB is cooled and transferred to big bags. These are transported to Murfitts Industries site in Lakenheath where the raw rCB is milled, pelletised and dried giving a final rCB product ready for delivery to end users.

1.1.4 The blended pyrolysis gas from the pyrolysis stages is passed through a condenser separating the TPO from the non-condensable syngas. The TPO is ready for collection by end users. The syngas is combusted in a steam generator. The steam is used by Michelin in their process and the flue gas is treated to remove contaminants and ensure compliance with the emission criteria.

1.1.5 Emissions during operation therefore have the potential to increase air pollutant concentrations in the vicinity of the site and an assessment is required to quantify the significance of impacts upon sensitive human and ecological receptors. Flue gas emission from the pyrolysis process will be emitted via a single 25 m flue stack.

1.1.6 It is proposed that the plant will operate continuously excluding downtime for planned maintenance.

1.1.7 The site will be managed by Murfitts Industries Ltd, hereby referred to as the 'Operator'.

1.2 Site Location and Context

1.2.1 The application site is located at approximate National Grid Reference (NGR): 387000, 343230, to the north of the A500 Queensway. The site lies within Stoke on Trent City Council's (STCC) area of administration and is surrounded by various industrial and commercial premises including Michelin's UK head office and commercial headquarters.

1.2.2 The surrounding area includes the following features:

- The A500 (Queensway) to the south;

- Human receptors to the north, including St Joseph's College, Oakhill Primary School and Trent Vale Medical Centre; and

- Residential areas.

1.2.3 The closest sensitive residential receptors are approximately 200 m to the west, adjacent to Shireoaks Road. There are also various statutory and local ecological sites within the assessment area, including Sites of Special Scientific Importance (SSSI), Local Nature Reserves (LNR) and Ancient Woodlands (AW). The application site also lies within an Air Quality Management Area (AQMA).

1.2.4 Figure 1 shows the site location and surrounding environment.

Figure 1: Site Location
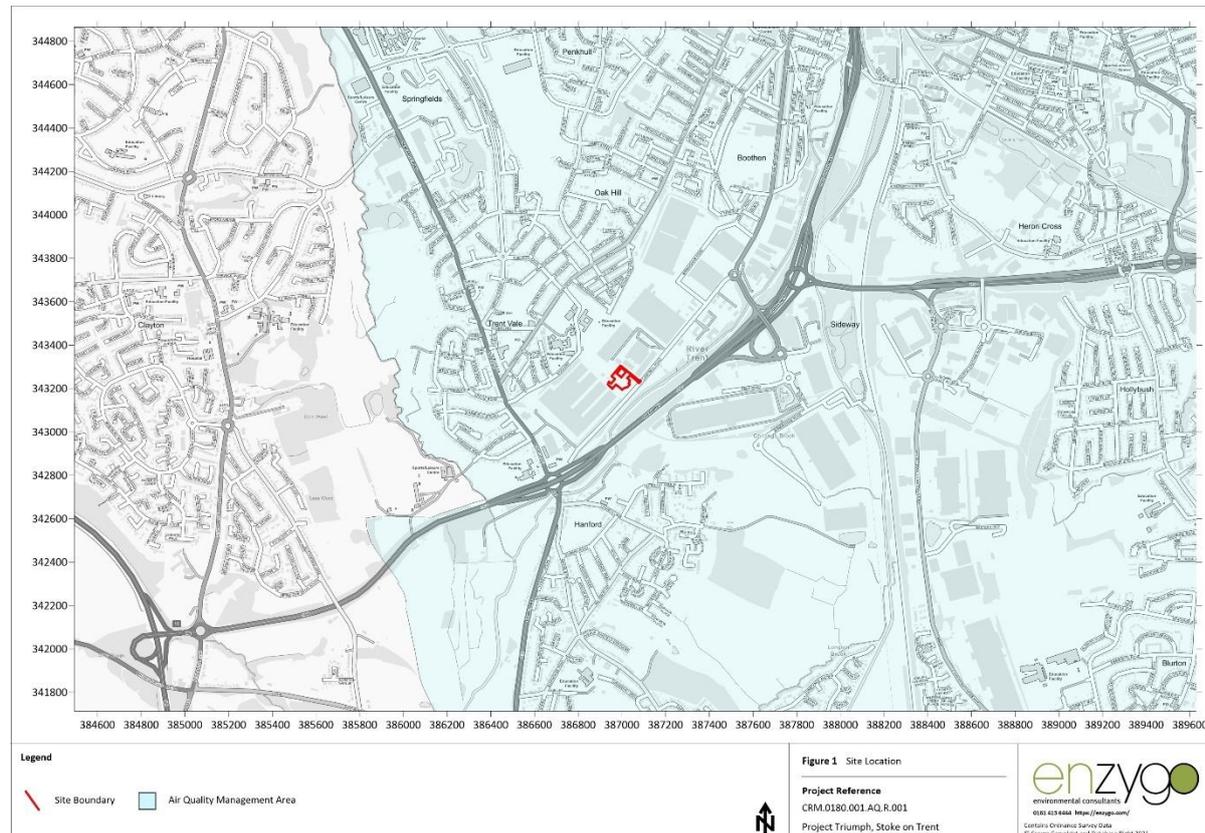
1.3 Limitations

1.3.1 This report has been produced in accordance with Enzygo's standard terms of engagement. Enzygo has prepared this report solely for the use of the Client (for planning submission) and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Enzygo; a charge may be levied against such approval.

2.0 Legislation Guidance and Policy

2.1.1 The following legislation, guidance and policy was considered and adhered to during the preparation of the Air Quality Assessment:

- The Air Quality Standards (Amendment) Regulations, updated on 31st December 2016[1];

- Part IV of the Environment Act (1995);

- The National Planning Policy Framework (NPPF), updated on 7th February 2025;

- The National Planning Practice Guidance (NPPG), relevant chapters updated on 1st November 2019;

- Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, 2022[2];

- Air emissions risk assessment for your environmental permit, Environment Agency (EA), updated on 7th January 2025[3];

- Environmental permitting (EP): air dispersion modelling reports, EA, updated on 26th March 2024[4];

- Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control) Best Available Techniques (BAT) Reference Document for Waste Treatment emission limits applied to mechanical waste treatment emissions.[5]

- Releases from waste incinerators: Guidance on assessing group 3 metal stack emissions from incinerators, EA, 2016[6];

- Environmental permitting technical guidance PG13/1(21) - Reference document for the operation of small waste incineration plants (SWIPs)[7];

- Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management (IAQM)[8]; and

- Guidance on the assessment of dust from demolition and construction , IAQM[9].

2.2 UK Legislation

2.2.1 The Air Quality Standards (Amendment) Regulations (2016) came into force on 31 December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

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1 Air Quality Strategy – Framework for Local Authority Delivery, DEFRA, 2023;

2 Local Air Quality Management Technical Guidance 2022 (LAQM.TG22), DEFRA, August 2022;

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

4 https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports;

5 Best Available Techniques Reference Document for Waste Incineration, Industrial Emissions Directive 2010/75/EU Integrated Pollution Prevention and Control, 2019;

6 Releases from waste incinerators: Guidance on assessing group 3 metal stack emissions from incinerators, EA, 2016.

7 Environmental Permitting Technical Guidance PG13/1(21) Reference document for the operation of SWIPs, EA, 2021.

8 Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, January 2017

9 Guidance on the assessment of dust from demolition and construction, IAQM, January 2024, v2.2

2.2.2 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 2023[1]. 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 exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

2.2.3 The limits set out in Table 1 and Table 2 are specified as AQOs, Environmental Assessment Levels (EALs), AQ Target Values (AQTV), or Ambient Air Directive (AAD) for ease these criteria are collectively referred to as Environmental Quality Standards (EQSs) throughout the assessment.

2.2.4 Table 1 presents the EQS for pollutants considered within this assessment.

Table 1: Air Quality Limit Values and Objectives

Pollutant	Air Quality Objectives	
	Concentration (µg/m³)	Averaging Periods
Nitrogen dioxide (NO$_2$)	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
Particulate matter with an aerodynamic diameter of less than 10µm (PM$_{10}$)	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year
Particulate matter with an aerodynamic diameter of less than 2.5µm (PM$_{2.5}$)	20	Annual mean
Carbon monoxide (CO)	10,000	8-hour running mean
Total Organic Carbon (TOC) as Benzene (C$_6$H$_6$)	5	Annual mean
	30	24-hour mean
Sulphur dioxide (SO$_2$)	125	24-hour mean; not to be exceeded more than 3 times a year
	350	1-hour mean; not to be exceeded more than 24 times a year
	266	15-minute mean; not to be exceeded more than 35 times a year
Hydrogen Chloride (HCl)	750	1-hour mean
Hydrogen Fluoride (HF)	16	Monthly mean
	160	1-hour mean
Cadmium (Cd)	0.005	Annual mean
	0.03	24-hour mean
Mercury (Hg)	0.06	24-hour mean
	0.6	1-hour mean
Polychlorinated biphenyls (PCBs)	0.2	Annual mean
	6	1-hour mean
Polyaromatic hydrocarbons (PAHs) as benzo(a)pyrene (B[a]P)	0.001	Annual mean (Target)
	0.00025	Annual mean (Objective)

2.2.5 Target values and EALs for group 3 metals including, arsenic (As), chromium (Cr), Copper (Cu), manganese (Mn), nickel (Ni), lead (Pb) antimony (Sb) and vanadium (V) are summarised in Table 2.

Table 2: Environmental Assessment Levels

Pollutant	Environmental Assessment Levels (µg/m³)	
	Annual Limit	Hourly Limit
As	0.006	-
CrIII (as Cr)	-	-
CrVI	0.00025	-
Cu	-	-
Mn	0.15	1500
Ni	0.02	0.7
Pb	0.25	-
Sb	5	150
V	5	1

a: Based on the Cr VI EAL
b: Based on the Cr III EAL

2.2.6 In line with the EA guidance where a substance has both a Target Value and a UK AQS Objective over the same averaging time with different concentrations, the lower concentration was applied.

2.2.7 There are currently no AQOs, AQTVs and EALs for thallium (TI) and cobalt (Co). Therefore, these pollutants have not been considered further within the context of this assessment

2.2.8 There is also no EQS for Dioxins and Furans (PCDD/Fs) and as such the assessment is based on the tolerable daily intake recommended by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment as detailed in Table 3.

Table 3: Tolerable Daily Intake for Dioxins and Furans

Pollutant	Daily Tolerable Intake (fg/m³)
PCDD/Fs	2000

2.2.9 Table 4 summarises the advice provided in the DEFRA guidance LAQM.TG22[2] on where the EQS for pollutants considered within this report apply.

Table 4: Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives Should Apply At	Objectives 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 facades 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 and 8 hour mean	As above together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
1-hour mean	As above, and kerbside sites (for example, pavements of busy shopping streets) 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 are expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes	

Ecological Critical Loads and Levels

2.2.10 Impacts on ecological designations was assessed in accordance with the EA guidance[3]. Critical loads (CLd) and levels (CLv) have been designated based on the sensitivity of the receiving habitat.

2.2.11 Table 5 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

Table 5: Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration ($\mu g/m^3$)	Averaging Periods
Oxides of Nitrogen (NO_x)	30	Annual mean
	75 or 200*	24-hour mean
SO_2	20	Annual mean
	10 (Lichens or Bryophytes present)	Annual mean
HF	5	Daily mean
	0.5	Weekly mean
Nutrient Nitrogen Deposition	Site Specific (See Section 4.6)	Annual mean
Acid Nitrogen Deposition	Site Specific (See Section 4.6)	Annual mean

* Only applies where ozone is below the AOT40 critical level and sulphur dioxide is below the lower critical level of 10 $\mu g/m^3$

2.2.12 The significance of impacts was compared against the relevant critical loads and levels obtained from the UK Air Pollution Information System (APIS)[10].

2.3 Local Planning Policy

Staffordshire and Stoke-on-Trent Joint Waste Local Plan

2.3.1 The Waste Local Plan[11], adopted 2013, sets out the Staffordshire and Stoke-on-Trent policies and proposals to guide planning decisions and establishes the framework for how to manage the sustainable development of waste management facilities up to 2026, A review of the plan indicated the following policy in relation to air quality that is relevant to this assessment.

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

11 Staffordshire and Stoke-on-Trent Joint Waste Local Plan 2010 – 2026, Staffordshire County Council and City ofon Trent Council, March 2013.

Policy 4.2: *Protection of Environmental Quality*

The development of waste management facilities will be supported provided that the proposals would not give rise to materially harmful impacts, except where the material planning benefits of the proposals outweigh the material planning objections.

Where proposals have an unavoidable adverse effect on these natural and cultural assets, impacts should be minimised by design and layout. Residual impacts should be mitigated or compensated for, either on or off site.

In determining the impact of the proposed development, consideration will be given to the effect of the proposals on the following:

[…]

xiii) Protection of air, soil and water and reduction of flood risk;

2.3.2 To adhere with local planning policy a detailed dispersion modelling assessment will be undertaken to determine the significance of air quality impact upon existing human and ecological health receptors resulting from the construction and operation of the facility.

2.3.3 A review of the Local Development Framework and Core Spatial Strategy 2006 – 2026 produced by Newcastle-under-Lyme Council (NLBC) and STCC did not identify any policy relevant to the assessment.

3.0 Methodology

3.1 Scope of Assessment

3.1.1 This assessment focusses on the operational air quality emissions from stack emissions. Impacts relating to construction activities has been assessed under a standalone technical report.

3.2 Operational Phase - Stack Emissions Assessment

3.2.1 Stack emissions associated with the proposed facility have the potential to cause increases in pollutant concentrations in the vicinity of the site. The emissions can be broadly summarised as the combustion of the syngas via a flue stack.

3.2.2 The stack location is detailed in Table 7 and presented in Figure 3.

3.2.3 To quantify the process contribution, detailed dispersion modelling was undertaken using ADMS-6 (v6.0.2.1), which is a short-range dispersion modelling software package developed by Cambridge Environmental Research Consultants (CERC). The model simulates a wide range of buoyant and passive releases to atmosphere. 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.

3.2.4 The dispersion modelling procedure was informed using the following:

- Information on stack dimensions, locations and process conditions were provided by Murfitts Industries Ltd;

- Emission rates were based on the Emission Limit Values (ELVs) provided within IED BREF Document[5] and the Environmental permitting technical guidance[7] with reference to co-incineration; and

- Appropriate data to describe meteorological conditions in the vicinity of the site were obtained from Atmospheric Dispersion Modelling (ADM) Ltd.

3.2.5 A robust approach has been taken in this assessment in applying maximum EID ELVs.

3.2.6 The information as set out in the following sections was entered into ADMS-6 and processed to determine pollutant concentrations in the vicinity of the site. Results were then compared against the relevant assessment criteria to determine impact significance. Modelling predictions produced by the ADMS-6 are widely accepted by local authorities, the EA and DEFRA.

Modelling Scenarios

3.2.7 The modelled stack emission pollutant scenarios considered in the operational assessment are summarised in Table 6.

Table 6: Dispersion Modelling Scenarios

Pollutant	Modelled As	
	Short Term	Long Term
NO_2	99.79th percentile (%ile) 1-hour mean	Annual mean
NO_x	24-hour mean	Annual mean
PM_{10}	90.41%ile 24-hour mean	Annual mean
$PM_{2.5}$	-	Annual mean

Pollutant	Modelled As	
	Short Term	Long Term
CO	8-hour rolling mean	-
TOC as Benzene	24-hour mean	Annual mean
SO_2	99.9%ile 15-minute mean	Annual mean
	99.73%ile 1-hour mean	
	99.18%ile 24-hour mean	
HCl	1-hour mean	-
HF	1-hour mean	Annual mean
	Monthly mean	
Benzo[a]pyrene (BaP) as Polycyclic aromatic hydrocarbons (PAHs)	-	Annual mean
PCBs	1-hour mean	Annual mean
As	-	Annual mean
Cd	24-hour mean	Annual mean
Cr	24-hour mean (CrIII)	Annual mean (CrVI)
Cu	-	24-hour mean -
Hg	1-hour mean	-
	-	24-hour mean
Mn	1-hour mean	Annual mean
Ni	1-hour mean	Annual mean
Pb	-	Annual mean
Sb	1-hour mean	Annual mean
V	24-hour mean	-
Nitrogen deposition	-	Annual deposition
Acid deposition	-	Annual deposition

3.2.8   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. The percentiles (%ile) shown in Table 6 represent the relationship between the permitted number of exceedances of short-period concentrations and the number of periods within a calendar year.

3.2.9   For the purposes of dispersion modelling it was considered that the entire particulate matter (PM) emission consisted of only PM_{10} or $PM_{2.5}$. This allowed the maximum ground level impacts, with respect to the relevant criteria, to be assessed and this can be considered as a worst-case assumption.

3.2.10   It was assumed that the entire TOC emission consisted of only benzene. This allowed the maximum ground level impacts to be assessed with respect to the AQLV. Actual plant emissions of TOCs are unlikely to only consist of one compound, resulting in a worst-case assessment.

3.2.11   This approach also applies for Group 3 metals where each metal is considered to comprise 100% of the entire emission limit. In accordance with the EA guidance[6] this is an overly robust approach. It was also assumed that all emitted Cr is either Cr(III) or Cr(VI) compounds.

Process Conditions

3.2.12 Process conditions for the emissions stack were provided through correspondence with Murfitts Industries Ltd. As described below this includes a single stack associated with syngas combustion: A1 - Flue Gas (Pyrolysis)

3.2.13 Table 7 shows the modelled process parameters.

Table 7: Modelled Process Stack Conditions

Ref	Location (NGR)		Stack Height (m)	Stack ID (m)	Temp (°C)	Volume Flow Rate (Nm³/hr)a	Volume Flow Rate (Am³/s)	Flue Gas Velocity (m/s)
	X	Y						
A1	386955.6	343224.0	25.0	0.49	171	6,680	2.81	14.9

a) Reference conditions, standard pressure, 20°C

Emissions

3.2.14 The emission rates from the facility were calculated based on maximum permitted ELV concentrations. Two scenarios were considered where long and short term limit values apply:

- Long term (daily average) ELV limit concentrations for comparison against long and the short term EQS; and

- Short term (half-hourly average) maximum concentrations for comparison against the short term EQS.

3.2.15 The calculated mass emissions rates in grams per second are shown in Table 8.

Table 8: Emission Rates – Stack A1

Pollutant	Daily Emission Limit (mg/Nm³)a	Mass Emission Rate Per Stack (g/s)b	30 Minute Emission Limit (mg/Nm³)a	Mass Emission Rate (g/s)b
NOX	300	0.232	600	1.464
CO	75	0.059	150	0.366
PM	15	0.012	30	0.110
TOC	15	0.012	30	0.073
HCl	15	0.012	90	0.220
HF	1.5	0.001	6	0.015
SO₂	75	0.059	300	0.732
PCBs	0.005(f)	0.000004	-	-
PAH	0.001(f)	0.0000008	-	-
PCDD/Fs	0.0000001 (g)	1.17×10^{-10}	-	-
Group 1 Metals(c)	0.05 (g)	0.00018	-	-
Group 2 Metals(d)	0.05 (g)	0.00018	-	-
Group 3 Metals(e)	0.50 (g)	0.0018	-	-

a) Reference conditions 0°C, dry, 6% O₂, standard pressure
b) Actual conditions, 180°C, 13.13% O₂ (wet), moisture 5.21%
c) For the purposes of this assessment: cadmium;
d) For the purposes of this assessment: Mercury;
e) For the purposes of this assessment: Arsenic, Lead, Chromium, Copper, Nickel, Vanadium, Antimony
f) No emission limit. Emission based on EC's BREF document[5] Reference conditions 0°C, dry, 11% O₂, standard pressure
g) Reference conditions 0°C, dry, 11% O₂, standard pressure – used higher incineration limit rather than co-incineration for robustness

3.2.16   The flue gas is injected with a mixture of sodium bicarbonate and activated carbon after leaving the boiler, these neutralise acid gases and capture heavy metals.

3.2.17   Emissions of PCBs or PAH as B[a]P are not expected to be significant from the processes and no ELVs are provided for these substances. The EC's BREF document[5] which supports the IED provides a range of monitored data for B[a]P emissions from waste incineration with a maximum concentration given as 0.001 mg/Nm^3. As such to provide a robust assessment this maximum expected emission was used in this assessment.

3.2.18   Information on dioxin-like PCB emissions were also obtained from the BREF document[5]. The highest average dioxin-like PCB emission concentration was 7.5 ng/Nm^3 for a UK municipal solid waste incinerator. The application of an ELV of 0.005 mg/Nm^3 is therefore considered a worse case approach. Reference conditions for PAH and PCBs are 0°C, dry, 11% oxygen, standard pressure.

3.2.19   In accordance with EA guidance[6] case specific screening may be required as the assumption that each metal comprises 100% of the 0.50 mg/Nm^3 could result in exceedances of the environmental standards. It is suggested where significant risk is predicted during the Stage 1 assessment, the assessment should proceed to Stage 2 and consider a more realistic approach based on measured concentrations. When necessary, the maximum monitoring result from the EA guidance[6] was utilised.

3.2.20   The EA guidance provides measured emissions data obtained from 18 municipal waste incinerators and waste wood co-incinerators between 2007 and 2015. It should be noted that the measured data relates to facilities subject to IED and therefore provide capacities of >50MW.

Flare and Emergency Generator Emissions

3.2.21   Flares emissions were not modelled as they will rarely be operational and only for short periods. They are primarily designed as an emergency release (thus no data on the likely emissions from this point is currently available).

3.2.22   Similarly, the diesel generator will only be operational in emergencies when the usual power supply is down. A technical note by Air Quality Consultants[12] has shown that single emergency diesel generator emissions can be screened out of an air quality assessment (for NO_2) without the need for detailed modelling if they are tested for no more than 18 hours per year and there is no other primary source of NO_2 close by that could feasibly lead to an exceedance of the 1-hour mean standard at that location. In addition, the closest receptors are predominantly upwind of prevailing winds. NO_2 is the main pollutant of concern when considering short (1 hour of less) pollutant concentrations.

3.2.23   The above criteria applies to the proposed development and, as such, emergency generator emissions have also been screened out of this assessment.

Time Varied Emissions

3.2.24   To provide operational flexibly short term predictions the ADMS model was run reflecting operations throughout a full calendar year (8,760 hours). This ensures that the varying hourly meteorological conditions were captured. This approach does not account for shut downs periods during maintenance or faults.

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[12] Air Quality Note Air Quality Impacts from Testing Individual Emergency Diesel Generators, For Logika Group by Air Quality Consultants, February 2025.

Meteorological Data

3.2.25 Five years of hourly sequential meteorological data used in this assessment was taken from Shawbury meteorological station located approximately 40 km south east of the facility.

3.2.26 Figure 2 shows the 5-year wind rose dataset. All meteorological data used in the assessment was provided by ADM Ltd, which is an established distributor of meteorological data within the UK. Maximum emissions across the five years (2019 - 2023) were used to ensure a worse case assessment.

Figure 2: Meteorological Data Wind Roses
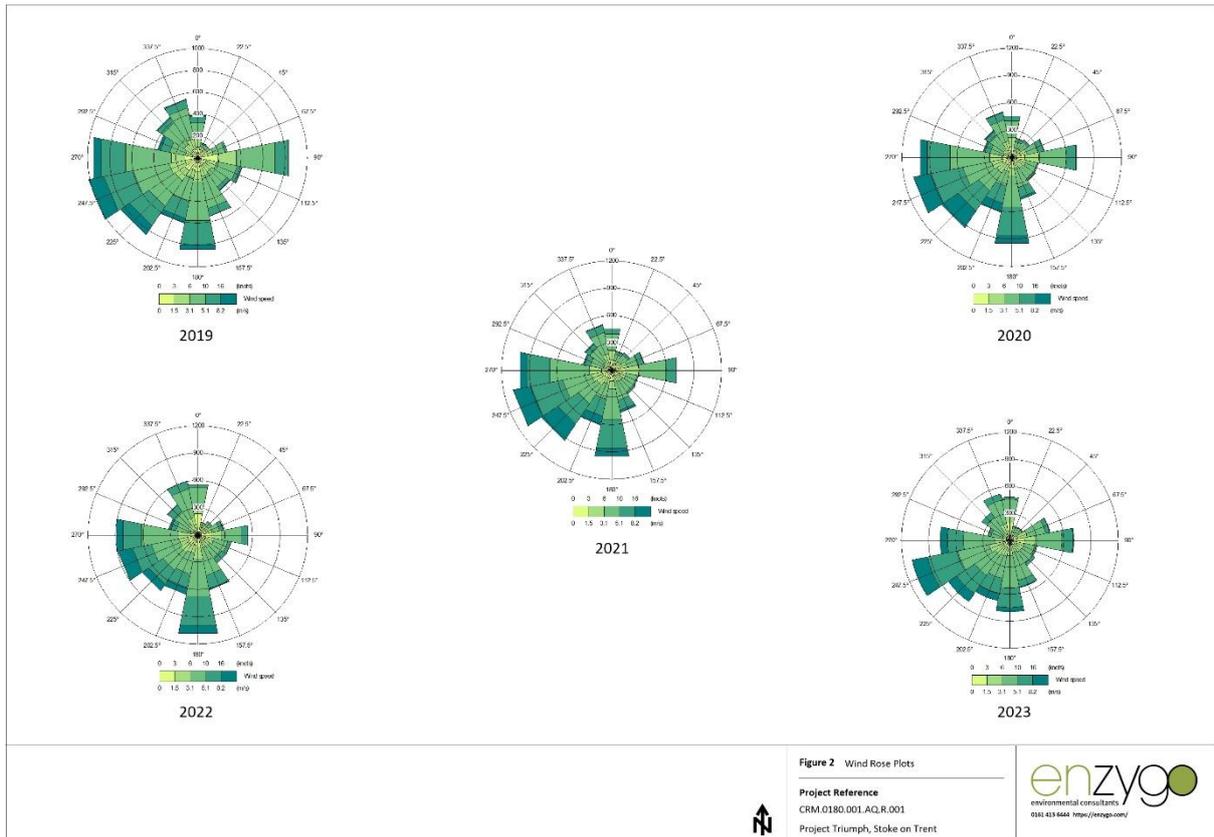
Roughness Length

3.2.27 The specific roughness length (z_0) values used to represent conditions in the vicinity of the application site, as well as conditions at the meteorological are summarised in Table 9.

Table 9: Utilised Roughness Length

Location	Roughness length (m)	ADMS Description
Application Site	0.5	Parkland, open suburbia
Meteorological Station	0.2	Agricultural (min)

3.2.28 Both values of z_0 are considered appropriate for the morphology of the assessment area.

Monin-Obukhov Length

3.2.29 The Monin-Obukhov length provides a measure of the stability of the atmosphere. The specific length values used to represent conditions in the vicinity of the application site, as well as conditions at the meteorological are summarised in Table 10

Table 10: Utilised Monin-Obukhov Lengths

Location	Monin-Obukhov length (m)	ADMS Description
Application Site	30	Mixed urban/industrial
Meteorological Station	10	Small Towns <50,000

3.2.30   The Monin-Obukhov values are considered appropriate for the morphology of the assessment area.

Surface Albedo and Priestley-Taylor Parameter

3.2.31   The surface albedo and Priestley-Taylor parameters used in the assessment were the model default values of 0.23 and 1 respectively.

Terrain Data

3.2.32   Ordnance Survey Landform Panorama terrain data was included 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.

3.2.33   This was pre-processed using the dedicated function within ADMS-6 and covers a 22 km x 22.5 km area extending from the centre of the proposed site.

Building Effects

3.2.34   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 base of buildings than would arise in the absence of the buildings.

3.2.35   Proposed building heights were provided by the project architect, with existing building heights approximated using the Google Earth Pro software. The heights are based on a proposed site finished floor level. The buildings included within the model are summarised in Table 11.

Table 11: Building Geometries

	Building	NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Pyrolysis Building	386975.4	343246.0	12.0	28.4	15.8	130.0
2	Transformer	386996.0	343274.1	8.0	24.1	33.2	130.0
3	ELT Reception & Processing	387026.6	343231.7	10.0	17.4	6.9	130.0
4	Michelin Manufacturing 1	387030.3	343308.8	8.5	54.3	21.1	127.9
5	Michelin Manufacturing 2	386968.9	343411.5	10.0	62.7	191.6	130.1
6	Michelin Manufacturing 3	387073.4	343360.8	11.0	80.1	98.9	128.0
7	Michelin Manufacturing 4	387110.2	343314.1	10.0	25.8	135.6	127.6
8	M&S Distribution	387156.5	343533.2	13.5	240.1	141.2	129.1
9	Michelin Hanford Warehouse 1	386891.8	343106.6	9.5	47.0	196.9	134.0
10	Michelin Hanford Warehouse 2	386848.9	343148.5	9.5	47.0	196.9	134.0
11	Michelin Hanford Warehouse 3	386804.8	343190.5	9.5	47.0	196.9	134.0
12	Michelin Hanford Warehouse 4	386761.7	343232.1	9.5	47.0	196.9	134.0
13	Michelin Hanford Warehouse 5	386753.1	343177.3	7.0	46.1	136.6	134.0
14	Michelin Hanford Warehouse 6	386734.2	343089.5	6.0	249.9	75.2	134.2

3.2.36 Figure 3 shows a graphical representation of the modelled building layout and the ADMS-6 model input.

Figure 3: Model Inputs

Figure 3   ADMS-6 Inputs
Project Reference
CRM.0180.001.AQ.R.001
Project Triumph, Stoke on Trent
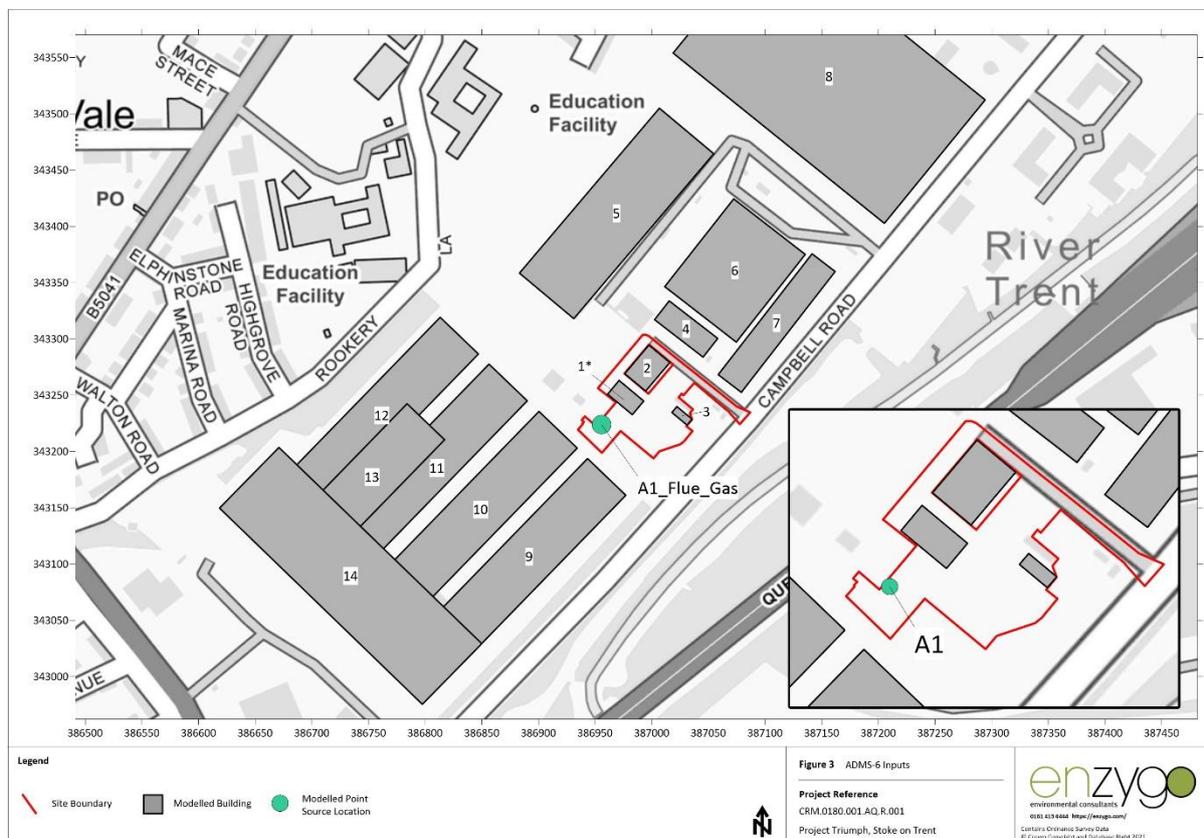
3.2.37 A 3-dimensional layout is shown in Figure 4.

Figure 4: 3D Model Layout
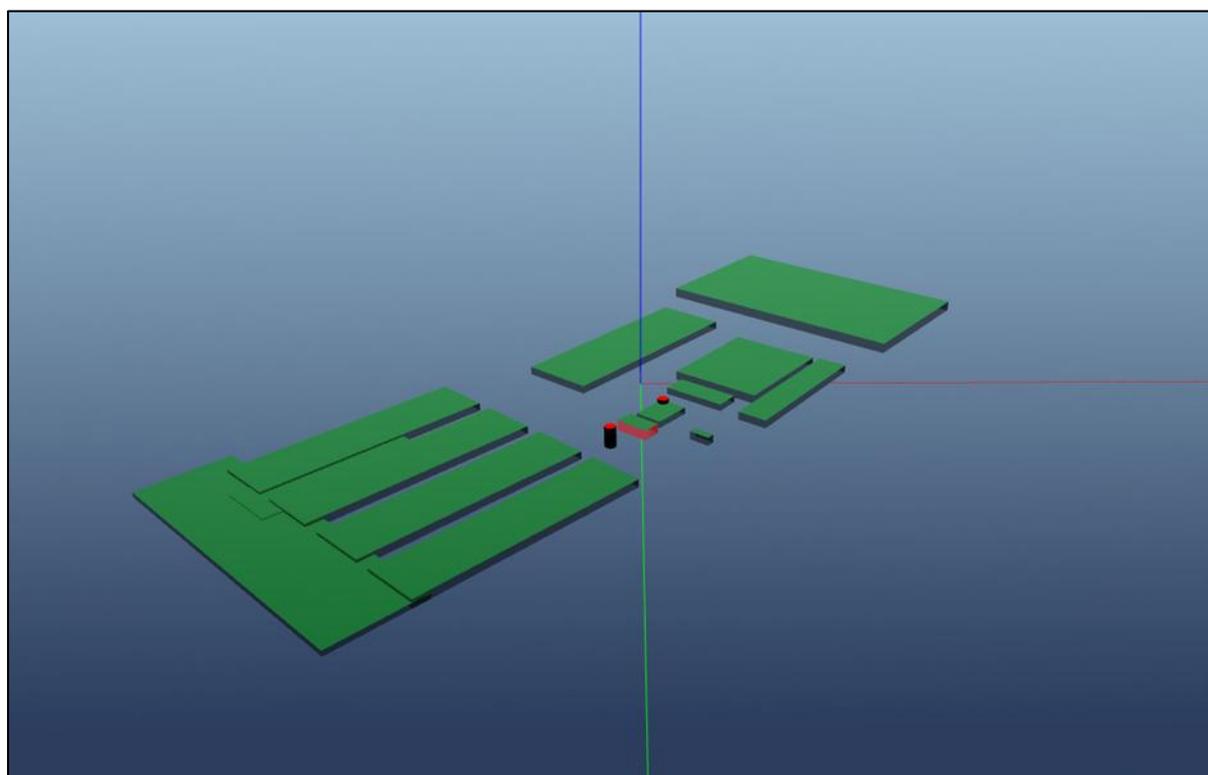
NOₓ to NO₂ Conversion

3.2.38 Emissions of NO_x from combustion processes are predominantly in the form of NO. Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO_2.

3.2.39 Ground level NO_x concentrations were predicted through dispersion modelling. NO_2 concentrations reported in the results section assume 100% conversion from NO_x to NO_2 for long term concentrations and 50% conversion for short-term concentrations, based upon EA guidance.

15-minute Sulphur Dioxide Concentration Predictions

Throughout the assessment, 15-minute mean SO_2 concentrations have been calculated using the following correction factor based upon empirical relationships with the 99.9th percentile of 1-hour means, as described in EA guidance :

99.9th percentile of 15-minute means = 1.34 x 99.9th percentile of 1-hour means

3.3 Assessment Extents

3.3.1 Ambient concentrations were predicted over the area grid NGR: 385580, 342460 to 388600, 344300 to allow pollutant contours where required.

3.3.2 Cartesian grid with a resolution of 20 m and a height of 1.5 m for human receptors was included in the model. Results were used to produce contour plots within the Surfer software package where necessary.

3.4 Baseline Conditions

3.4.1 A desktop study was undertaken to define the baseline air quality within the vicinity of the development. The baseline year will correspond with either the current year or the most recent year that monitoring data is available.

3.4.2 Pollutant background concentrations for the site, monitoring and human receptor locations have been sourced from the DEFRA background maps and national monitoring networks. Background depositions for ecological receptors have been derived from the APIS website[10].

3.4.3 All Baseline information is detailed in Section 4.0.

3.5 Sensitive Receptors

Human Sensitive Receptors

3.5.1 A desk-top study was undertaken in order to identify representative sensitive human receptor locations in the vicinity of the site that required specific consideration during the assessment. These include locations to represent the most sensitive residential and educational properties within assessment extents.

3.5.2 Emissions were modelled at the receptors at the minimum height of relevant exposure. The modelled receptors are summarised in Table 12.

Table 12: Sensitive Human Receptors

Receptor		Land Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
HR1	50 Marina Road	Residential	386601	343215	400	1.5
HR2	St. Josephs College	Educational	386779	343355	257	1.5
HR3	Oakhill Primary School	Educational	386828	343460	291	1.5
HR4	109 Kensington Road	Residential	386951	343535	313	1.5
HR5	25 Kensington Road	Residential	387056	343780	557	1.5
HR6	2 Hollybank Crescent	Residential	387106	344016	797	1.5
HR7	65 Steeple Way	Residential	387281	344097	915	1.5
HR8	310 South Terrace	Residential	387418	343990	871	1.5
HR9	72 Judith Grove	Residential	388210	344023	1,448	1.5
HR10	33 Pine Road	Residential	388434	343846	1,562	1.5
HR11	87 Highfield Drive	Residential	389009	343599	2,042	1.5
HR12	85 Hollybush Road	Residential	388980	343180	1,980	1.5
HR13	12 Laurel Grove	Residential	388908	342825	1,949	1.5
HR14	2 Railway Cottages	Residential	388146	343082	1,154	1.5
HR15	84 Clermont Avenue	Residential	387399	342823	566	1.5
HR16	6 Ferrand Close	Residential	387196	342819	451	1.5
HR17	25 Church Lane	Residential	386899	342747	490	1.5
HR18	St. Theresa's Catholic Primary School	Educational	386603	342811	575	1.5
HR19	84 Stone Road	Residential	386601	342930	498	1.5
HR20	2 Stonewood Close	Residential	386487	343064	539	1.5

3.5.3 The modelled human receptor locations are displayed in Figure 5.

Figure 5: Modelled Human Receptor Locations

Figure 5 Human Receptor Locations
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Legend
Site Boundary
Human Receptor Location
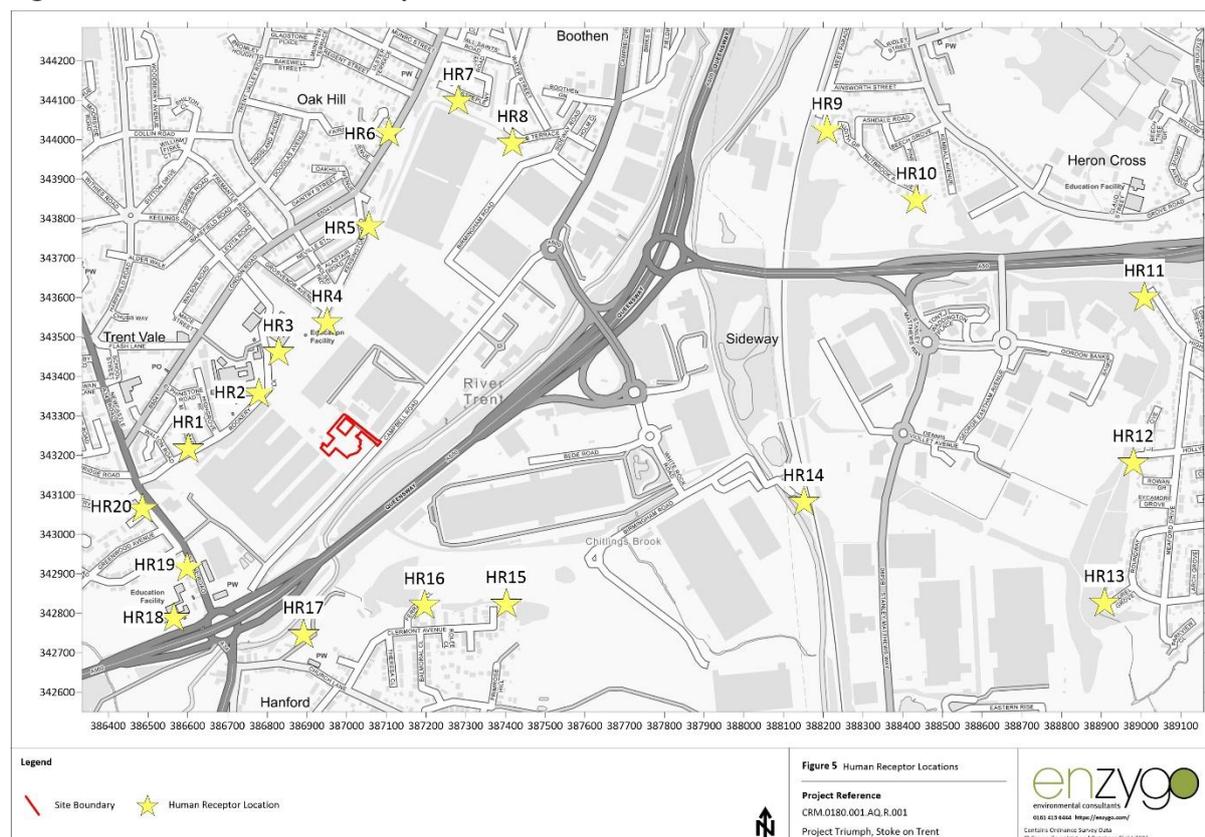
Ecological Sensitive Receptors

3.5.4 The EA guidance 'Air emissions risk assessment for your environmental permit' states:

"Note that conservation sites need only be considered where they fall within set distances of the activity:

- SPAs, SACs or Ramsar sites within 10 km of the facility;

- SSSIs within 5 km of the facility; and

- National Nature Reserves (NNRs), Local Nature Reserves (LNRs), Local Wildlife Sites (LWS) and Ancient Woodland (AW) within 2 km of the facility."

3.5.5 To comply with Natural England's requirements the SSSI search was extended to include designations within 10 km of the facility. There are no Special Protection Areas (SPAs) or Special Areas of Conservation (SACs) with 10 km of the facility.

3.5.6 A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the distances stated above. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service[13], which draws information on key environmental schemes and designations.

3.5.7 Staffordshire Ecological Records Centre provided locations and citations associated with LWS and LNR within 2 km of the proposed development site. Where a designation presents multiple designations or habits, such as where an AW or LNR overlap the most sensitive habitat was assessed.

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13 https://magic.defra.gov.uk/MagicMap.aspx

3.5.8 The receptor points were chosen to represent the closest points to the facility and are displayed in Table 13 and Figure 6.

Table 13: Ecological Sensitive Receptors

Ecological Receptor		Designation	NGR (m)		Distance from Centre of Site (m)
			X	Y	
ER1	Brigett's Pool	LNR	386010	343958	1,232
ER2	Ferndown	LNR	385599	342280	1,691
ER3	Smith's Pool	LNR	388770	344098	1,972
ER4	King's and Hargreaves Woods	SSSI	385821	341705	1,925
ER5	King's and Hargreaves Woods	SSSI	385930	340523	2,907
ER6	Ford Green Reedbed	SSSI	388624	350942	7,885
ER7	Metallic Tileries Parkhouse	SSSI	383973	349685	7,133
ER8	Hulme Quarry	SSSI	392509	344288	5,609
ER9	Maer Pool	SSSI	379044	338504	9,252
ER10	Wetley Moor	SSSI	392437	348095	7,297
ER11	Rakes Wood	AW	385630	343212	1,371
ER12	Dark Wood	AW	385731	343014	1,287
ER13	Leas Wood	AW	385686	342739	1,402
ER14	Ferrand Close	LWS	387140	342933	324

Figure 6: Modelled Ecological Receptor Locations

Figure 6   Ecological Receptor Locations

Project Reference
CRM.0180.001.AQ.R.001

Project Triumph, Stoke on Trent
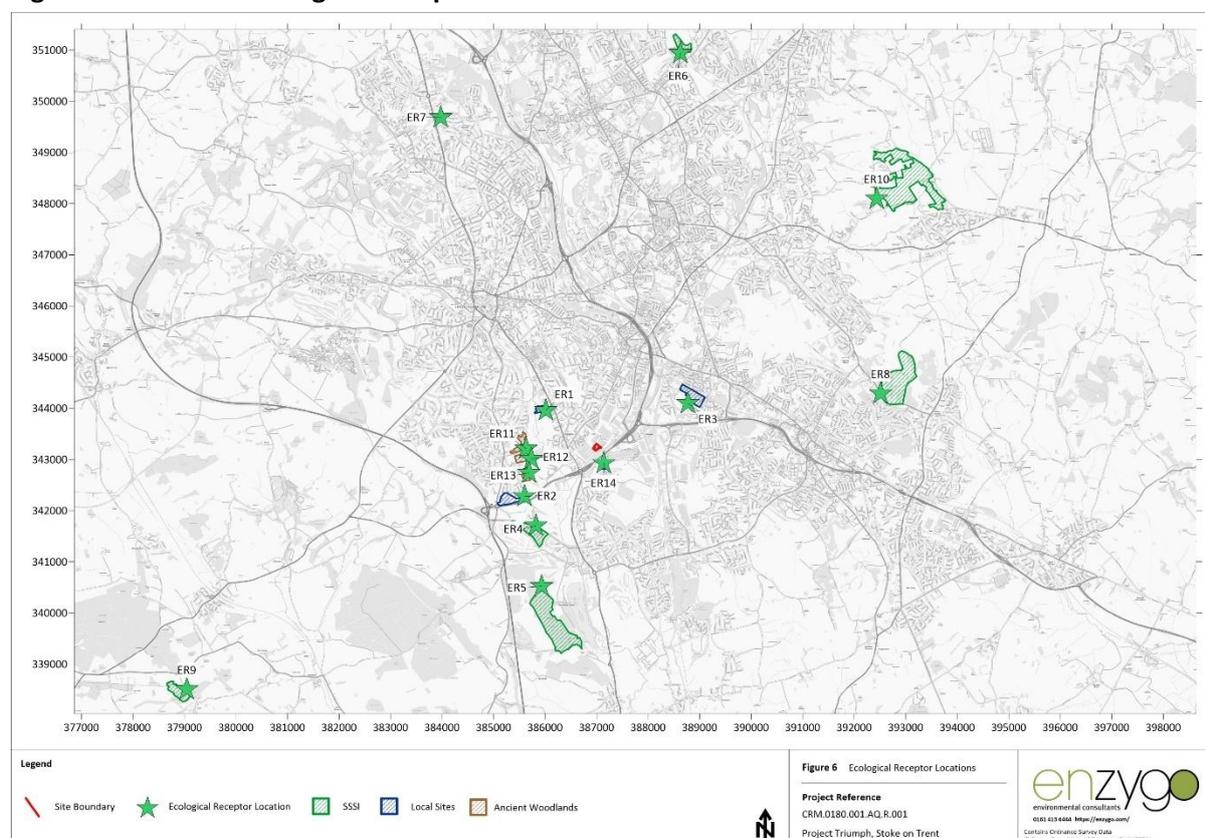
3.6 Deposition Rates

3.6.1 Deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06'[14]. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used are presented within Table 14.

Table 14: Conversion Factors to Determine Dry Deposition Flux

Pollutant	Grassland Deposition Velocity (m/s)	Forest Deposition Velocity (m/s)	Conversion Factor ($\mu g/m^2/s$ to kg/ha/yr of pollutant)
NO_2	0.0015	0.003	95.9
SO_2	0.012	0.024	157.7
HCl	0.025	0.06	306.7

3.6.2 Acid deposition occurs from chemical reactions arising from emissions of NO_2, SO_2 and HCl. Predicted ground level pollutant concentrations were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors.

3.6.3 The conversion to units of equivalents, a measure of the potential acidifying effect of a pollutant, was undertaken by multiplying the dry deposition flux by the standard conversion factors shown in Table 15.

Table 15: Conversion Factors to Units of Equivalents

Pollutant	Conversion Factor from kg/ha/yr to keq/ha/yr
N	Divide by 14
S	Divide by 16
HCl	Divide by 35.5

3.6.4 The total N proportion was calculated from NO_2 concentrations, whilst the HCl equivalent was added to the S proportion, in accordance with the methodology outlined in AQTAG 06[14]. The proportion of the EQS consisting of the process contribution (PC) and predicted environmental concentration (PEC) were then calculated using the tool available on the APIS website.

3.7 Assessment Criteria

3.7.1 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant AQOs identified within Table 1 to Table 5.

3.8 Significance of Impacts

EPUK and IAQM Guidance

3.8.1 The assessment considered the following scenarios in order to quantify impacts at sensitive receptors in the vicinity of the site:

- Do-minimum (DM) (predicted background concentrations without the proposed facility); and

- Do-something (DS) (predicted background concentrations including with the addition of emissions from the proposed facility).

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14 AQTAG 06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, EA, 2014

3.8.2 Receptors potentially sensitive to changes in pollutant concentrations were identified within the assessment extents. LAQM.TG22[2] provides the following examples of where annual mean AQOs should apply:

- Residential properties;

- Schools;

- Hospitals; and

- Care homes.

3.8.3 The impact of each receptor was defined in accordance with the criteria shown in

3.8.4 The impact of each receptor was defined in accordance with the criteria shown in Table 16. These are based upon the guidance provided within the EPUK and IAQM guidance[8].

Table 16: Impacts Descriptor – Long Term Concentrations

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	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

3.8.5 The criteria shown in Table 16 is adapted from the EPUK and IAQM guidance[8] with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance[8].

3.8.6 For short term impacts, the EPUK and IAQM guidance[8] suggests the following criteria, as shown in Table 17, based on EA guidance.

Table 17: Impacts Descriptor – Short Term Concentrations

% Change in Hourly Concentration Relative to AQO			
<10	10-20	20-50	>50
Negligible	Slight	Moderate	Substantial

3.8.7 Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 16 and Table 17, the EPUK and IAQM guidance states that this framework is to be used as a starting point to make a judgement on the significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;

- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;

- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;

- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and

- The extent to which an objective is exceeded e.g. an annual mean NO_2 concentration of 41 µg/m^3 should attract less significance than an annual mean of 51 µg/m^3.

3.8.8 These factors were considered, and an overall significance of impacts from the facility determined. This determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

EA Guidance Criteria

3.8.9 Guidance for assessing the significance of emissions impacts from point sources are also given in the EA's online guidance.

3.8.10 Predicted pollutant concentrations are summarised in the following formats:

- PC - Predicted pollutant concentration as a result of emissions from the site only; and

- PEC - Total predicted pollutant concentration as a result of emissions from the site and existing baseline levels.

First Screening Stage

3.8.11 The significance of predicted impact has been assessed in accordance with criteria in the EA guidance 'Air emissions risk assessment for your environmental permit' and through consideration of likely effects as a result of the proposals. The EA guidance states that process contributions can be considered insignificant if:

- the short-term PC is less than 10% of the short-term environmental standard; and

- the long-term PC is less than 1% of the long-term environmental standard.

3.8.12 If both criteria are met predicted impacts can be considered insignificant and no further analysis is required.

Second Screening Stage

3.8.13 If the above criteria are not met then a second stage of screening to determine the impact of the PEC is required:

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

- The long-term PEC is less than 70% of the long-term environmental standards.

3.8.14 If both of these criteria are met during the second stage of screening then predicted impacts can be considered insignificant. Should these criteria be exceeded then the PEC should be checked against the EQS.

Group 3 Metals

3.8.15   The EA have issued a document 'Guidance on assessing group 3 metal stack emissions from incinerators'[15] for the modelling of group 3 metal (Sb, As, Pb, Cr, Ni and V) emissions from waste incinerators. This was reviewed for the purpose of the assessment with the methodology outlined below:

- Step 1 - Worst case screening: Make predictions assuming each metal is being emitted at 100% of the group ELV. Where the PC of any metal exceeds 1% of a long-term or 10% of a short-term EQS then the PEC is compared against the relevant EQS. If the PEC is greater than 100% of the EQS then proceed to Step 2;

- Step 2 - Case specific screening: Use the maximum emissions data listed within Appendix A of the EA guidance. Where the PC of any metal exceeds 1% of a long-term or 10% of a short-term EQS then the PEC is compared against the relevant EQS. This can be screened out where the PEC is less than 100% of the relevant EQS.

3.8.16   The EA guidance[15] provides measured emissions data obtained from 18 municipal waste incinerators and waste wood co-incinerators between 2007 and 2015. It should be noted that the measured data relates to facilities subject to Industrial Emission Directives and therefore provide capacities >50 MW. The proposed facility has a capacity of 5 MW and therefore emissions from the proposed facility are likely to be significantly lower than those used in the assessment.

Ecological Receptors – EA Guidance

3.8.17   If emissions that affect SPAs, SACs, RAMSAR sites or SSSIs meet both of the following criteria outlined within the EA guidance 'Air emissions risk assessment for your environmental permit', they can be considered insignificant:

- the short-term PC is less than 10% of the short-term environmental standard for protected conservation areas; and

- the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas.

3.8.18   If the predicted long-term PC is greater than 1% and the PEC is less than 70% of the long-term environmental standard, the emissions can be considered insignificant. Should the predicted PEC be greater than 70% of the long-term environmental standard, the PEC should be checked against the EQS for the ecological receptor.

3.8.19   Emissions impacts at local nature sites can be considered insignificant if both the following criteria are met:

- The short-term PC is less than 100% of the short-term environmental standard; and

- The long-term PC is less than 100% of the long-term environmental standard.

3.8.20   In addition, the EA guidance also states that the APIS site relevant critical load tool should be used to determine whether there is an exceedance of deposition of nutrient nitrogen or acidity, as the standard of exceedance is site-specific.

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15 'Guidance on assessing group 3 metal stack emissions from incinerators', Environment Agency, Undated.

3.9 In Combination Effects

3.9.1 In-combination effects are defined as those that occur as a result of current and future activities that may impact collectively over time. In-combination effects from any current or recently permitted development which, when considered in combination with the impacts of proposed development site, could cause additional impacts at modelled receptor locations.

3.9.2 The site is located within a large industrial area and there are existing emissions associated with the various activities impacting upon the surrounding environment most notably the North Midlands Operations energy from waste plant. This is a long established emissions source and therefore its contribution can be assumed to be included in local background monitoring and estimates.

3.9.3 PM impacts from the proposed adjacent building were also included with in the baseline model.

3.9.4 A review of the STCC planning portals did not identify any other existing, recently approved or proposed developments which are likely to combine with the facility.

3.10 Modelling Uncertainties

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

- Model uncertainty - due to model limitations;

- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and

- Variability - randomness of measurements used.

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

- Choice of model – ADMS-6 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;

- Meteorological data - Modelling was undertaken using five meteorological data sets (2019 - 2023) from the most appropriate observation site to the facility to take account of variable worst-case conditions;

- Plant operating conditions - Operational parameters were supplied by Murfitts Industries Ltd. As such, these are considered to be representative of likely operating conditions;

- Emission rates – based on maximum standard emission limits for a co-incineration plant as obtained from the EC's BREF document[5] and EA SWIP guidance[7]. These are considered to be worst case emissions and actual emissions are likely to be considerably less than this. As an additional worst case consideration, the facility was modelled to be operational continuously;

- Background concentrations - Obtained from the DEFRA mapping study for human receptors and national monitoring networks. A review of various location across the UK was undertaken to provide a representative estimate of background across the assessment extents;

- Receptor locations - Specified Receptor points were included at sensitive locations to provide additional consideration of these areas; and

- Variability - All model inputs are as accurate as possible and worst-case conditions have been considered where necessary in order to ensure a robust assessment of potential pollutant concentrations.

3.10.3 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.

3.11 Construction Phase Risk Assessment

3.11.1 It is understood the construction phase will not include any major ground works, site traffic or dust generating construction activities. Works will involve the addition of the associated flue stack and the construction of storage and process buildings. It is understood the majority of construction materials will have a low dust potential and buildings structures would be predominantly constructed of metal cladding.

3.11.2 An assessment in accordance with the IAQM guidance[9] was undertaken to identify best practice control techniques to reduce fugitive releases during the construction phase. The construction phase dust risk assessment is provided as a standalone technical report. (ref: CRM.0180.001.AQ.R.002.P01).

4.0 Baseline Conditions

Existing air quality conditions in the vicinity of the facility was identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.1 Local Air Quality Management

4.1.1 As required by the Environment Act (1995), local authorities have undertaken Review and Assessment of air quality within their area of administration. This process has indicated that there is currently one Air Quality Management Areas (AQMAs) across STCC, which has been declared due to exceedances of the annual and hourly mean AQO for NO_2. The AQMA encompasses the whole of the city of Stoke-on-Trent.

4.2 Local Air Quality Monitoring

4.2.1 Monitoring of pollutant concentrations is undertaken by STCC and NLBC throughout their areas of administration using continuous and passive techniques. A review of the most recent Air Quality Status Reports [16 & 17] indicated there are no automatic analysers close to the site. However, various passive monitors were identified within the assessment extents as presented in Table 18.

Table 18: Local Authority NO_2 Monitoring Results

Site ID and Name	Type	Distance (m)	2023 Annual Mean Concentration (μg/m³)
8 - A500 Northwood Lane[a]	Kerbside	1,660	35.9
N109 - Clayton Road[b]	Roadside	1,813	21.3
TR - Park Drive[a]	Kerbside	2,071	20.0
N110 - Clayton Road Holiday Inn[b]	Roadside	2,099	21.5
M6 3 - Newcastle Road - A500[a]	Other	2,234	17.3
M6.2 - Newcastle Road[a]	Other	2,259	22.5
M6 - Newcastle Road[a]	Kerbside	2,267	26.7
M6.4 - Newcastle Road[a]	Kerbside	2,389	35.2
40 - Hanchurch Lane[a]	Other	2,691	17.4
N114 - 9 Sneyd Avenue[b]	Roadside	3,445	17.5
DTUB2 - 4 Sneyd Crescent[b]	Kerbside	3,588	9.9
N115 - Newcastle Community School[b]	Roadside	3,978	14.0

a) STCC Data
b) NLBC Data

4.2.2 NO_2 diffusion tube monitoring data from recent years does not indicate any exceedances of the annual mean AQO at monitoring sites surrounding the facility.

4.2.3 To account for road vehicle exhaust emissions associated with the local road network, which have not been included in the modelling inputs, worse case assumptions on background concentration were applied. The use of roadside monitors as background concentrations ensures that conservative baseline conditions were considered at receptor locations close or adjacent to the local road network. Details are provided in Section 4.5.

4.2.4 Figure 7 provides a graphical representation the diffusion tube monitoring locations.

Figure 7: Diffusion Tube Locations

Figure 7   Diffusion Tube Locations
Project Reference
CRM.0180.001.AQ.R.001
Project Triumph, Stoke on Trent
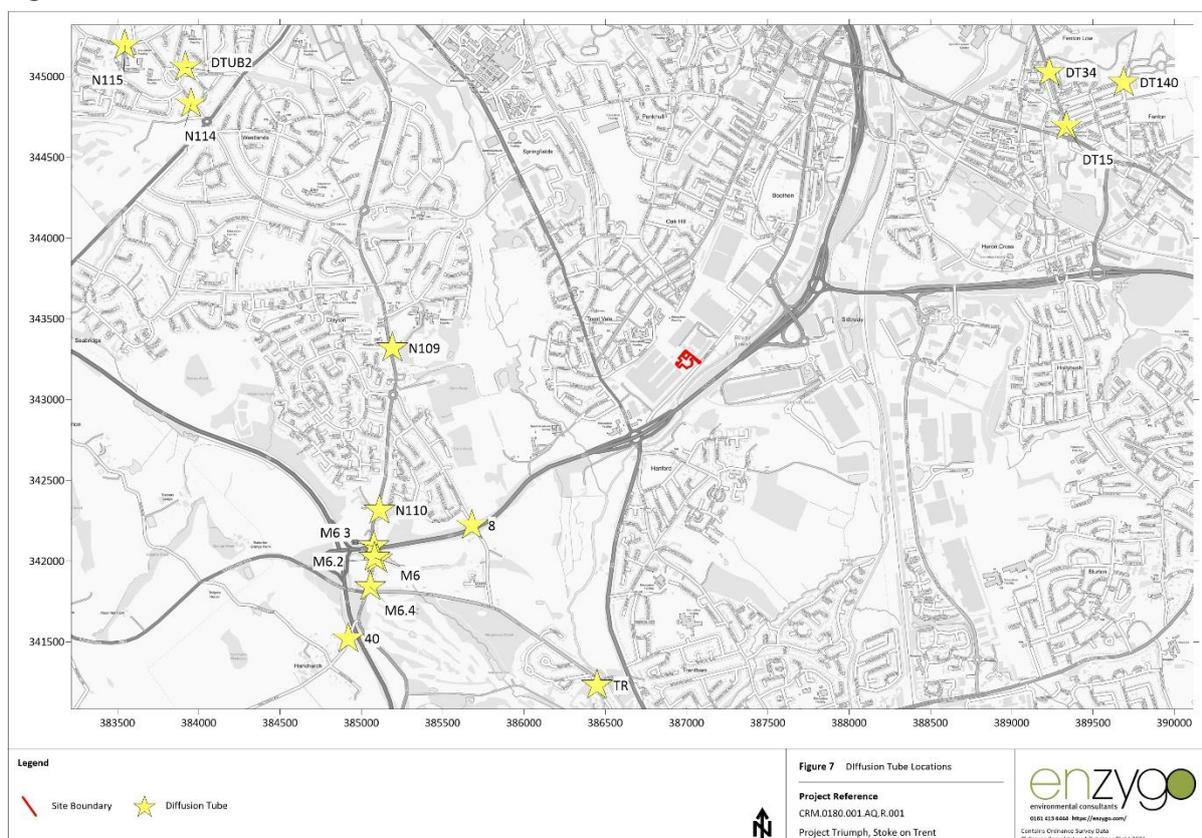
4.3 DEFRA Background Concentrations

4.3.1 DEFRA has produced predictions of background pollutant concentrations on a 1 km by 1 km grid for the entire of the UK. The assessment extents, including human sensitive receptors, are located across numerous NGR squares. Data for these locations was downloaded from the DEFRA and summarised in Table 19.

Table 19: Predicted DEFRA Background Pollutant Concentrations

DEFRA Grid Square	2024 Predicted Background Concentration (µg/m³)						
	NO_2	NO_x	PM_{10}	$PM_{2.5}$	CO	TOC	SO_2
386500, 343500	10.2	13.4	11.7	6.8	415.0	0.5	4.6
387500, 343500	16.3	22.5	15.4	8.9	422.0	0.5	4.5
387500, 344500	14.3	19.4	12.7	7.4	444.0	0.6	5.3
388500, 344500	14.3	19.4	12.7	7.4	444.0	0.6	5.3
388500, 343500	16.3	22.5	15.4	8.9	422.0	0.5	4.5
389500, 343500	14.2	19.3	13.0	7.4	454.0	0.6	5.4

4.3.2 Background concentrations for NO_x, NO_2, PM_{10} and $PM_{2.5}$ are predicted for 2024, whilst TOC was predicted for 2010 and CO and SO_2 are predicted for 2001. These are the most recent predictions available via the DEFRA website[18].

4.3.3 It was assumed that the short-term background concentration is twice its long-term concentration to provide a worse case approach.

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

4.4 National Air Quality Monitoring Network

Polychlorinated Biphenyls

4.4.1 Monitoring of PCBs is undertaken throughout the UK through the Toxic Organic Micro-Pollutants (TOMPs) network. Baseline data was obtained from the closest site at Manchester Law Courts (UKA00185) for the most recently available year (2018). Data is summarised in Table 20.

Table 20: Polychlorinated Biphenyls Monitoring Results

Site Name	2010 Annual Mean PCB Concentration (pg/m^3)
Manchester Law Courts	40.05

Polyaromatic Hydrocarbons (as Benzo(a)pyrene)

4.4.2 Monitoring of B[a]P is undertaken throughout the UK through the PAH network. Baseline data was obtained from the closest site, the urban background location, at Birmingham Ladywood (UKA00655). Data is summarised in Table 21.

Table 21: Benzo(a)pyrene Monitoring Results

Site Name	2023 Annual Mean B[a]P Concentration (ng/m^3)
Birmingham Ladywood	0.103

Dioxide and Furans

4.4.3 Monitoring of dioxins and furans is undertaken throughout the UK through the TOMPs network. Throughout this report, the term 'dioxins' is taken to mean the family of 210 compounds or congeners comprising polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). If both PCDDs and PCDFs are present, these have been referred to as PCDD/Fs. The summation of the concentrations of 17 toxic PCDD and PCDF congeners, weighted relative to the toxicity of 2,3,7,8-TCDD, is given in the form of Toxic Equivalents (TEQ).

4.4.4 The closest and most representative TOMPs monitoring site is Manchester Law Courts (UKA00185). The most recent data available from this site is from 2015 and is summarised in Table 22.

Table 22: Dioxins and Furans Monitoring Results

Pollutant	Unit	2015 Annual Mean Concentration
Total PCDD/Fs	TEQ fg/m^3	12.25

Acid Gas

4.4.5 Concentrations of HCl and SO$_2$ are monitored in the UK through the UK Eutrophying and Acidifying Pollutants (UKEAP): acid gas and aerosol network. Baseline data was obtained from the background site at Ladybower (UKA00171). Data is summarised in Table 23.

Table 23: Gas Monitoring Results

Pollutant	Annual Mean Concentration (µg/m^3)
HCl	0.23[a]
SO$_2$	1.88[b]

a) 2023 Baseline year
b) 2015 Baseline year

4.4.6 Baseline concentrations of HF are not measured locally or nationally since these are not generally of concern in terms of local air quality. However, the Expert Panel on Air Quality Standards (EPAQS) report 'Guidelines for halogens and hydrogen halides in ambient air for protecting human health against acute irritancy effects' contains some estimates of baseline levels. This indicates that typical exposure concentrations in heavily polluted areas have been in the range of 0.5 $\mu g/m^3$ to 2 $\mu g/m^3$.

4.4.7 In the absence of local monitoring data, the maximum typical baseline HF concentration has been used for the purpose of this assessment.

Heavy Metals

4.4.8 Monitoring of heavy metals is carried out by DEFRA at 24 industrial sites and 10 rural sites throughout the UK. The closest and most representative monitoring location to the site is Walsall Pleck (UKA00820). Walsall Pleck does not monitor Hg and Sb concentrations and, as such, background concentrations for these pollutants were taken from Detling (UKA00481) and Runcorn Weston Point (UKA00473). Data is summarised in Table 24.

Table 24: Metals Monitoring Results

Pollutant	Annual Mean Concentration ($\mu g/m^3$)
As	0.001
Cd	0.0002
Cr	0.002
Cr (VI)	0.0004
Cu	0.014
Mn	0.007
Ni	0.001
Pb	0.008
V	0.001
Hg	0.001
Sb	0.015

4.4.9 In line with the EA document 'Guidance on assessing group 3 metal stack emissions from incinerators', the Cr (VI) background concentration comprises 20% of the total background Cr concentration.

Live Development Emissions

4.4.10 A proposed adjacent facility would include a single ventilation stack. Modelled contributions were added to the PM_{10} and $PM_{2.5}$ background concentrations. Table 25 provides the modelled parameters.

Table 25: Modelled Background ELT Ventilation Emissions

Source	Location (NGR)		Stack Height (m)	Stack diameter (m)	Temp (oC)	Exit Velocity (m/s)	PM Emission (g/s)
	X	Y					
Proposed Adjacent Process	386998.1	343289.6	13.0	0.69	20	15.0	0.056

4.5 Summary of Background Data

4.5.1 A review of available background concentrations for each pollutant is provided in Table 26, where local data was not available, given the existing industrial sources, robust assumptions have been applied from industrial or worst case locations where possible.

Table 26: Review of Background Concentrations

Pollutant	Unit	Annual Mean Concentration	Source
NO_2	µg/m³	22.5	Roadside monitoring location M6.2
PM_{10}	µg/m³	15.4	Maximum predicted DEFRA background concentration (see Table 19) plus modelled adjacent proposed vents (receptor specific)
$PM_{2.5}$	µg/m³	8.9	
SO_2	µg/m³	6.0	Maximum predicted DEFRA background concentration (see Table 19)
CO	µg/m³	454.0	
TOC	µg/m³	0.6	
HCl	µg/m³	0.3	Maximum monitoring result from EPAQS report
HF	µg/m³	3.0	
As	µg/m³	0.0008	5-year Average 2018-2022 monitored annual mean concentration from Sheffield Tinsley Station
Cd	µg/m³	0.0002	
Cr (total)	µg/m³	0.0023	
Cr (VI)	µg/m³	0.0005	
Cu	µg/m³	0.0143	
Mn	µg/m³	0.0071	
Pb	µg/m³	0.0077	
Ni	µg/m³	0.0008	
Se	µg/m³	0.0006	
V	µg/m³	0.0007	
Sb	ug/m³	0.0013	2013 monitored annual mean concentration from Detling Station
Hg	µg/m³	0.015	2018 monitored annual mean concentration from Runcorn Weston Point Station
PAH as B[a]P	µg /m³	0.0001	2023 monitored annual mean from Birmingham Ladywood Station
PCBs	pg/m³	40.05	2018 monitored annual mean concentration from Manchester Crown Court Station
PCDD/Fs	TEQ fg/m³	12.25	2016 monitored annual mean concentration from Manchester Crown Court Station

4.6 Ecological Impacts Baselines

4.6.1 CLd have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website was undertaken in order to identify the most suitable habitat description and associated CLd for the designations considered within the model. For the LWSs and LNRs the APIS 'Search by Location Function' has been used to determine baseline levels for these sites.

4.6.2 Where designations have multiple habitats, the most sensitive habitat has been used for both nitrogen and acid deposition for the purpose of this assessment. The critical loads for nitrogen deposition are presented in Table 27.

Table 27: Nitrogen Critical Load

Ecological Receptor		Sensitivity Class	Nitrogen Critical Load (kgN/ha/yr)	
			Min	Max
ER1	Brigett's Pool	Broadleafed unmanaged woodland	10	15
ER2	Ferndown	Broadleafed unmanaged woodland	10	15
ER3	Smith's Pool	Broadleafed unmanaged woodland	10	15
ER4	King's and Hargreaves Woods	Broadleafed unmanaged woodland	10	15
ER5	King's and Hargreaves Woods	Broadleafed unmanaged woodland	10	15
ER6	Ford Green Reedbed	Fen, marsh and swamp	5	15
ER7	Metallic Tileries Parkhouse	Geological Interest Only		
ER8	Hulme Quarry	Geological Interest Only		
ER9	Maer Pool	Standing Water – Site Specific Advice Sought		
ER10	Wetley Moor	Bogs	5	15
ER11	Rakes Wood	Broadleafed unmanaged woodland	10	15
ER12	Dark Wood	Broadleafed unmanaged woodland	10	15
ER13	Leas Wood	Broadleafed unmanaged woodland	10	15
ER14	Ferrand Close	Broadleafed unmanaged woodland	10	15

4.6.3 Table 28 shows the relevant critical loads for acid deposition.

Table 28: Acid Critical Load

Ecological Receptor		APIS Feature	Critical Load (ke/ha/yr)		
			CLmax S	CLmin N	CLmax N
ER1	Brigett's Pool	Broadleaved deciduous woodland	2.865	0.357	3.222
ER2	Ferndown	Broadleaved deciduous woodland	1.337	0.142	1.479
ER3	Smith's Pool	Broadleaved deciduous woodland	2.866	0.357	3.223
ER4	King's and Hargreaves Woods	Quercus Spp.-Betula Spp.-Deschampsia Flexuosa Woodland	1.284	0.142	1.426
ER5	King's and Hargreaves Woods	Quercus Spp.-Betula Spp.-Deschampsia Flexuosa Woodland	1.284	0.142	1.426
ER6	Ford Green Reedbed	Habitat not sensitive to acidity			
ER7	Metallic Tileries Parkhouse	Geological Interest Only			
ER8	Hulme Quarry	Geological Interest Only			
ER9	Maer Pool	Standing Water – Site Specific Advice Sought			
ER10	Wetley Moor	Carex Echinata - Sphagnum	0.389	0.321	0.71
ER11	Rakes Wood	Broadleaved deciduous woodland	2.619	0.357	2.976
ER12	Dark Wood	Broadleaved deciduous woodland	2.619	0.357	2.976
ER13	Leas Wood	Broadleaved deciduous woodland	1.337	0.142	1.479
ER14	Ferrand Close	Broadleaved deciduous woodland	2.834	0.142	2.976

4.6.4 Background deposition rates at the ecological receptor location were downloaded from the APIS website and are summarised in Table 29.

Table 29: Background Deposition Rates

Ecological Receptor		Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)		
			N	S	HCL
ER1	Brigett's Pool	37.35	2.79	0.21	0.10
ER2	Ferndown	38.17	2.73	0.19	0.10
ER3	Smith's Pool	36.42	2.60	0.22	0.10
ER4	King's and Hargreaves Woods	39.10	2.75	0.19	0.10
ER5	King's and Hargreaves Woods	39.10	2.75	0.19	0.10
ER6	Ford Green Reedbed	N/A	N/A	N/A	N/A
ER7	Metallic Tileries Parkhouse	Geological Interest Only			
ER8	Hulme Quarry	Geological Interest Only			
ER9	Maer Pool	N/A	N/A	N/A	N/A
ER10	Wetley Moor	20.54	1.45	0.18	0.10
ER11	Rakes Wood	38.02	2.84	0.20	0.10
ER12	Dark Wood	38.02	2.72	0.20	0.10
ER13	Leas Wood	38.17	2.73	0.19	0.10
ER14	Ferrand Close	36.77	2.63	0.20	0.10

(b) Based on converted $\mu g/m^3$ background concentration detailed in Table 26

4.6.5 Background pollutant concentrations are summarised in Table 30 and represent the maximum predicted concentrations at each designation as provided by APIS, with the exception of HF which are informed via a review of the EPAQS report.

Table 30: Background Concentrations

Ecological Receptor		Background Concentration ($\mu g/m^3$)		
		NO_X	SO_2	HF
ER1	Brigett's Pool	14.60	1.62	3.00
ER2	Ferndown	13.09	1.26	3.00
ER3	Smith's Pool	20.71	3.57	3.00
ER4	King's and Hargreaves Woods	12.80	1.30	3.00
ER5	King's and Hargreaves Woods	12.80	1.30	3.00
ER6	Ford Green Reedbed	15.39	1.89	3.00
ER7	Metallic Tileries Parkhouse	Geological Interest Only		
ER8	Hulme Quarry	Geological Interest Only		
ER9	Maer Pool	6.52	0.76	3.00
ER10	Wetley Moor	11.62	1.59	3.00
ER11	Rakes Wood	12.29	1.31	3.00
ER12	Dark Wood	12.29	1.31	3.00
ER13	Leas Wood	13.09	1.26	3.00
ER14	Ferrand Close	12.52	1.45	3.00

4.6.6 Results of the dispersion modelling exercise are detailed in Section 5.0.

5.0 Results

5.1 Long Term Emission Limits – Human Receptors

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 3. Contour plots have been provided for pollutants where impact significance has determined using the secondary stage of the EA's screening criteria.

5.1.2 Predicted pollutant concentrations were predicted separately for 5 assessment years and the maximum concentration reported in the following sections for each relevant substance and metric. Concentrations were assessed in the following sections against IAQM/EPUK[8] and EA guidance criteria[3].

Nitrogen Dioxide

Annual Mean

5.1.3 Predicted annual mean NO_2 process concentrations at sensitive receptors are summarised in Table 31: .

Table 31: Predicted Annual Mean NO_2 Concentrations

Receptor	Concentration ($\mu g/m^3$)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.2	22.7	0.5	56.8
HR2	0.2	22.7	0.5	56.8
HR3	0.4	22.9	0.9	57.2
HR4	0.4	22.9	0.9	57.2
HR5	0.2	22.7	0.5	56.7
HR6	0.1	22.6	0.3	56.6
HR7	0.1	22.6	0.3	56.5
HR8	0.1	22.6	0.3	56.6
HR9	0.1	22.6	0.2	56.4
HR10	0.1	22.6	0.2	56.4
HR11	0.0	22.5	0.1	56.4
HR12	0.0	22.5	0.1	56.3
HR13	0.0	22.5	0.1	56.3
HR14	0.1	22.6	0.1	56.4
HR15	0.1	22.6	0.3	56.6
HR16	0.2	22.7	0.5	56.7
HR17	0.1	22.6	0.2	56.5
HR18	0.1	22.6	0.2	56.5
HR19	0.1	22.6	0.2	56.5
HR20	0.1	22.6	0.3	56.6

Predicted concentrations were assessed against the relevant annual mean EQS of 40 $\mu g/m^3$.

5.1.4 Predicted annual mean concentrations are below the EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.5 PC proportions are less than 1% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.6 As such, impacts on annual mean NO_2 concentrations are not significant.

1-hour Mean

5.1.7 Predicted 99.79%ile 1-hour mean NO_2 process concentrations are summarised in Table 31.

Table 32: 1-Hour Mean NO₂ Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	1.9	46.9	0.9	1.2
HR2	2.9	47.9	1.4	1.8
HR3	2.7	47.7	1.4	1.8
HR4	2.1	47.1	1.1	1.4
HR5	1.5	46.5	0.8	1.0
HR6	1.4	46.4	0.7	0.9
HR7	1.1	46.1	0.6	0.7
HR8	1.2	46.2	0.6	0.8
HR9	0.7	45.7	0.4	0.5
HR10	0.7	45.7	0.3	0.5
HR11	0.6	45.6	0.3	0.4
HR12	0.5	45.5	0.3	0.3
HR13	0.5	45.5	0.2	0.3
HR14	0.8	45.8	0.4	0.5
HR15	1.2	46.2	0.6	0.8
HR16	1.4	46.4	0.7	0.9
HR17	1.3	46.3	0.7	0.9
HR18	1.3	46.3	0.6	0.8
HR19	1.5	46.5	0.7	0.9
HR20	1.4	46.4	0.7	0.9

Predicted concentrations were assessed against the relevant 99.79%ile 1-hour mean EQS of 200µg/m³.
(a) PEC proportion of the EQS minus twice the long-term background.

5.1.8 Predicted 1-hour mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set and the application of robust background concentrations.

5.1.9 PC proportions are less than 10% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.10 As such, impacts on 1-hour mean NO_2 concentrations are not significant.

Particulate Matter

Annual Mean PM₁₀

5.1.11 Predicted annual mean PM_{10} process concentrations are summarised in Table 33.

Table 33: Annual Mean PM$_{10}$ Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.011	15.5	<0.1	38.7
HR2	0.011	15.6	<0.1	39.0
HR3	0.019	15.5	<0.1	38.9
HR4	0.019	15.7	<0.1	39.2
HR5	0.009	15.5	<0.1	38.7
HR6	0.006	15.4	<0.1	38.6
HR7	0.005	15.4	<0.1	38.5
HR8	0.006	15.4	<0.1	38.6
HR9	0.004	15.4	<0.1	38.5
HR10	0.003	15.4	<0.1	38.5
HR11	0.002	15.4	<0.1	38.5
HR12	0.002	15.4	<0.1	38.4
HR13	0.001	15.4	<0.1	38.4
HR14	0.003	15.4	<0.1	38.5
HR15	0.007	15.4	<0.1	38.6
HR16	0.010	15.5	<0.1	38.7
HR17	0.005	15.4	<0.1	38.5
HR18	0.004	15.4	<0.1	38.5
HR19	0.005	15.4	<0.1	38.5
HR20	0.007	15.4	<0.1	38.6

Predicted concentrations were assessed against the annual mean EQS of 40 µg/m³.

5.1.12 Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.13 PC proportions are less than 1% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.14 As such, impacts on annual mean PM$_{10}$ concentrations are not significant.

24-Hour Mean PM$_{10}$

5.1.15 Predicted 90.41%ile 24-hour mean PM$_{10}$ concentrations are summarised in Table 34.

Table 34: 24-Hour Mean PM$_{10}$ Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	0.05	31.2	0.1	0.3
HR2	0.04	31.5	0.1	0.2
HR3	0.07	31.3	0.1	0.4
HR4	0.06	31.7	0.1	0.3
HR5	0.03	31.0	0.1	0.1
HR6	0.02	30.9	<0.1	0.1
HR7	0.01	30.9	<0.1	0.1

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC(a)
HR8	0.02	30.9	<0.1	0.1
HR9	0.01	30.8	<0.1	0.1
HR10	0.01	30.8	<0.1	<0.1
HR11	0.01	30.8	<0.1	<0.1
HR12	0.01	30.8	<0.1	<0.1
HR13	0.00	30.8	<0.1	<0.1
HR14	0.01	30.8	<0.1	<0.1
HR15	0.02	31.0	<0.1	0.1
HR16	0.04	31.1	0.1	0.2
HR17	0.02	30.9	<0.1	0.1
HR18	0.01	30.9	<0.1	0.1
HR19	0.02	30.9	<0.1	0.1
HR20	0.03	31.0	0.1	0.1

Predicted concentrations were assessed against the 90.41%ile 24-hour mean EQS of 50 µg/m³
(a) PC proportion of the EQS minus twice the long-term background.

5.1.16 Predicted 24-hour mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.17 PC proportions are less than 10% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.18 As such, impacts on 24-hour mean PM_{10} concentrations are not significant.

Annual Mean $PM_{2.5}$

5.1.19 Predicted annual mean $PM_{2.5}$ process concentrations are summarised in Table 35.

Table 35: Predicted Annual Mean $PM_{2.5}$ Concentrations.

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.011	9.0	0.1	45.1
HR2	0.011	9.1	0.1	45.7
HR3	0.019	9.1	0.1	45.4
HR4	0.019	9.2	0.1	46.1
HR5	0.009	9.0	<0.1	45.1
HR6	0.006	9.0	<0.1	44.9
HR7	0.005	9.0	<0.1	44.8
HR8	0.006	9.0	<0.1	44.9
HR9	0.004	8.9	<0.1	44.7
HR10	0.003	8.9	<0.1	44.7
HR11	0.002	8.9	<0.1	44.6
HR12	0.002	8.9	<0.1	44.6
HR13	0.001	8.9	<0.1	44.6
HR14	0.003	8.9	<0.1	44.7

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR15	0.007	9.0	<0.1	45.0
HR16	0.010	9.0	0.1	45.1
HR17	0.005	9.0	<0.1	44.8
HR18	0.004	9.0	<0.1	44.8
HR19	0.005	9.0	<0.1	44.8
HR20	0.007	9.0	<0.1	44.9

Predicted concentrations were assessed against the annual mean EQS of 20 µg/m³.

5.1.20 Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.21 PC proportions are less than 1% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.22 As such, impacts on annual mean $PM_{2.5}$ concentrations are not significant

Carbon Monoxide - Rolling 8-hour Mean

5.1.23 Predicted 8-hour rolling mean CO concentrations are summarised in Table 36.

Table 36: Predicted 8-Hour Rolling Mean CO Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC(a)
HR1	0.8	908.8	<0.1	<0.1
HR2	1.2	909.2	<0.1	<0.1
HR3	1.1	909.1	<0.1	<0.1
HR4	0.9	908.9	<0.1	<0.1
HR5	0.5	908.5	<0.1	<0.1
HR6	0.4	908.4	<0.1	<0.1
HR7	0.3	908.3	<0.1	<0.1
HR8	0.3	908.3	<0.1	<0.1
HR9	0.3	908.3	<0.1	<0.1
HR10	0.2	908.2	<0.1	<0.1
HR11	0.2	908.2	<0.1	<0.1
HR12	0.1	908.1	<0.1	<0.1
HR13	0.1	908.1	<0.1	<0.1
HR14	0.3	908.3	<0.1	<0.1
HR15	0.5	908.5	<0.1	<0.1
HR16	0.6	908.6	<0.1	<0.1
HR17	0.7	908.7	<0.1	<0.1
HR18	0.5	908.5	<0.1	<0.1
HR19	0.6	908.6	<0.1	<0.1
HR20	0.6	908.6	<0.1	<0.1

Predicted concentrations were assessed against the 8-hour rolling mean EQS of 10,000 µg/m³.
(a) PC proportion of the EQS minus twice the long-term background.

5.1.24 Predicted 8-hour rolling mean CO concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.25 PC proportions are less than 10% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.26 As such, overall impacts on CO concentrations are not significant.

Total Organic Carbon

5.1.27 It was assumed that the entire TOC emission consisted of only benzene, which allowed maximum ground level impacts to be assessed with respect to the EQS. Actual plant emissions of TOCs are unlikely to only consist of one compound, and the analysis below is considered a worst-case assessment based on expected overestimations.

Annual Mean

5.1.28 Predicted annual mean TOC concentrations (as benzene) are summarised in Table 37.

Table 37: Annual Mean TOC Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.011	0.61	0.2	12.2
HR2	0.011	0.61	0.2	12.2
HR3	0.019	0.62	0.4	12.4
HR4	0.019	0.62	0.4	12.4
HR5	0.009	0.61	0.2	12.2
HR6	0.006	0.61	0.1	12.1
HR7	0.005	0.60	0.1	12.1
HR8	0.006	0.61	0.1	12.1
HR9	0.004	0.60	0.1	12.1
HR10	0.003	0.60	0.1	12.0
HR11	0.002	0.60	<0.1	12.0
HR12	0.002	0.60	<0.1	12.0
HR13	0.001	0.60	<0.1	12.0
HR14	0.003	0.60	0.1	12.0
HR15	0.007	0.61	0.1	12.1
HR16	0.010	0.61	0.2	12.2
HR17	0.005	0.60	0.1	12.1
HR18	0.004	0.60	0.1	12.1
HR19	0.005	0.60	0.1	12.1
HR20	0.007	0.61	0.1	12.1

Predicted concentrations were assessed against the annual mean EQS of 5 µg/m³.

5.1.29 Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set. In addition, all TOC emissions are assumed to be benzene.

5.1.30 PC proportions are less than 1% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.31 As such, impacts on annual mean TOC concentrations are not significant.

24-hour Mean

5.1.32 Predicted 24-hour mean TOC concentrations (as benzene) are summarised in Table 38.

Table 38: 24-hour Mean TOC Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC(a)
HR1	0.13	1.3	0.4	0.4
HR2	0.13	1.3	0.4	0.4
HR3	0.15	1.4	0.5	0.5
HR4	0.12	1.3	0.4	0.4
HR5	0.06	1.3	0.2	0.2
HR6	0.04	1.2	0.1	0.1
HR7	0.04	1.2	0.1	0.1
HR8	0.03	1.2	0.1	0.1
HR9	0.03	1.2	0.1	0.1
HR10	0.02	1.2	0.1	0.1
HR11	0.02	1.2	0.1	0.1
HR12	0.01	1.2	0.0	0.0
HR13	0.02	1.2	0.1	0.1
HR14	0.03	1.2	0.1	0.1
HR15	0.07	1.3	0.2	0.2
HR16	0.09	1.3	0.3	0.3
HR17	0.09	1.3	0.3	0.3
HR18	0.07	1.3	0.2	0.3
HR19	0.08	1.3	0.3	0.3
HR20	0.09	1.3	0.3	0.3

Predicted concentrations were assessed against the 24 hour mean EQS of 30 µg/m³.
(a) PC proportion of the EQS minus twice the long-term background.

5.1.33 Predicted 24-hour mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.34 PC proportions are less than 10% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.35 As such, impacts on 24-hour mean TOC concentrations are not significant.

Hydrogen Fluoride

Monthly Mean

5.1.36 Predicted monthly mean HF concentrations are summarised in Table 39.

Table 39: Monthly HF Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.03	6.03	0.2	0.3
HR2	0.05	6.05	0.3	0.5
HR3	0.04	6.04	0.3	0.4
HR4	0.06	6.06	0.4	0.6
HR5	0.03	6.03	0.2	0.3
HR6	0.02	6.02	0.1	0.2
HR7	0.01	6.01	0.1	0.1
HR8	0.01	6.01	0.1	0.1
HR9	0.01	6.01	0.1	0.1
HR10	0.01	6.01	0.1	0.1
HR11	0.01	6.01	<0.1	0.1
HR12	0.01	6.01	<0.1	0.1
HR13	0.01	6.01	<0.1	0.1
HR14	0.01	6.01	0.1	0.1
HR15	0.02	6.02	0.1	0.2
HR16	0.02	6.02	0.1	0.2
HR17	0.02	6.02	0.1	0.2
HR18	0.02	6.02	0.1	0.2
HR19	0.03	6.03	0.2	0.3
HR20	0.04	6.04	0.2	0.4

Predicted concentrations were assessed against the relevant monthly mean EQS of 160 µg/m³.

5.1.37 Predicted monthly mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.38 PC proportions are less than 10% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.39 As such, impacts on monthly mean HF concentrations are not significant.

1-hour Mean

5.1.40 Predicted 1-hour mean HF concentrations are summarised in Table 40.

Table 40: 1-Hour Mean HF Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	0.03	6.03	<0.1	<0.1
HR2	0.05	6.05	<0.1	<0.1
HR3	0.04	6.04	<0.1	<0.1
HR4	0.06	6.06	<0.1	<0.1
HR5	0.03	6.03	<0.1	<0.1
HR6	0.02	6.02	<0.1	<0.1

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR7	0.01	6.01	<0.1	<0.1
HR8	0.01	6.01	<0.1	<0.1
HR9	0.01	6.01	<0.1	<0.1
HR10	0.01	6.01	<0.1	<0.1
HR11	0.01	6.01	<0.1	<0.1
HR12	0.01	6.01	<0.1	<0.1
HR13	0.01	6.01	<0.1	<0.1
HR14	0.01	6.01	<0.1	<0.1
HR15	0.02	6.02	<0.1	<0.1
HR16	0.02	6.02	<0.1	<0.1
HR17	0.02	6.02	<0.1	<0.1
HR18	0.02	6.02	<0.1	<0.1
HR19	0.03	6.03	<0.1	<0.1
HR20	0.04	6.04	<0.1	<0.1

Predicted concentrations were assessed against the annual mean EQS of 16 µg/m³ (monthly average).
a) Short term environmental standard minus twice the long term background concentration.

5.1.41 Predicted 1-hour mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.42 PC proportions are less than 10% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.43 As such, impacts on 1-hour mean HF concentrations are not significant.

Sulphur Dioxide

24-hour Mean

5.1.44 Predicted 99.18%ile 24-hour mean SO_2 concentrations are summarised in Table 41.

Table 41: 24-Hour Mean SO₂ Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	0.5	9.7	0.4	0.4
HR2	0.4	9.6	0.3	0.4
HR3	0.6	9.8	0.5	0.5
HR4	0.5	9.7	0.4	0.4
HR5	0.2	9.4	0.2	0.2
HR6	0.2	9.3	0.1	0.1
HR7	0.1	9.3	0.1	0.1
HR8	0.1	9.3	0.1	0.1
HR9	0.1	9.3	0.1	0.1
HR10	0.1	9.3	0.1	0.1
HR11	0.1	9.2	<0.1	<0.1
HR12	0.1	9.2	<0.1	<0.1

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR13	0.1	9.2	<0.1	<0.1
HR14	0.1	9.3	0.1	0.1
HR15	0.2	9.4	0.2	0.2
HR16	0.3	9.5	0.3	0.3
HR17	0.3	9.5	0.2	0.3
HR18	0.3	9.5	0.2	0.3
HR19	0.3	9.5	0.2	0.2
HR20	0.4	9.5	0.3	0.3

Predicted concentrations were assessed against 99.18%ile 24-hour mean EQS of 125 µg/m³.
a) Short term environmental standard minus twice the long term background concentration.

5.1.45 Predicted 24-hour mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.46 PC proportions are less than 10% at all receptor locations. Based on EA screening criteria, impacts on concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.47   As such, impacts on 24-hour mean SO_2 concentrations are not significant.

1-hour Mean

5.1.48 Predicted 99.73%ile 1-hour mean SO_2 concentrations are summarised in Table 42.

Table 42: 1-Hour Mean SO₂ Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	0.9	10.1	0.3	0.3
HR2	1.4	10.6	0.4	0.4
HR3	1.3	10.5	0.4	0.4
HR4	1.1	10.2	0.3	0.3
HR5	0.7	9.9	0.2	0.2
HR6	0.7	9.9	0.2	0.2
HR7	0.6	9.7	0.2	0.2
HR8	0.6	9.8	0.2	0.2
HR9	0.4	9.6	0.1	0.1
HR10	0.3	9.5	0.1	0.1
HR11	0.2	9.4	0.1	0.1
HR12	0.3	9.4	0.1	0.1
HR13	0.2	9.4	0.1	0.1
HR14	0.4	9.6	0.1	0.1
HR15	0.6	9.8	0.2	0.2
HR16	0.7	9.9	0.2	0.2
HR17	0.7	9.8	0.2	0.2
HR18	0.6	9.8	0.2	0.2
HR19	0.7	9.9	0.2	0.2

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR20	0.7	9.9	0.2	0.2

Predicted concentrations were assessed against 99.73%ile 1-hour mean EQS of 350 µg/m³.
a) Short term environmental standard minus twice the long term background concentration.

5.1.49   Predicted 1-hour mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.50   PC proportions are less than 10% at all receptor locations. Based on EA screening criteria, impacts on concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.51   As such, impacts on 1-hour mean SO_2 concentrations are not significant.

15-minute Mean

5.1.52   Predicted 99.9%ile 15-minute mean SO_2 concentrations are summarised in Table 43.

Table 43: 15-minute Mean SO_2 Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	1.3	10.5	0.5	0.5
HR2	2.1	11.3	0.8	0.8
HR3	2.2	11.4	0.8	0.8
HR4	1.8	10.9	0.7	0.7
HR5	1.1	10.3	0.4	0.4
HR6	1.0	10.2	0.4	0.4
HR7	0.8	10.0	0.3	0.3
HR8	0.8	10.0	0.3	0.3
HR9	0.6	9.7	0.2	0.2
HR10	0.5	9.7	0.2	0.2
HR11	0.4	9.6	0.1	0.2
HR12	0.4	9.6	0.1	0.1
HR13	0.3	9.5	0.1	0.1
HR14	0.6	9.8	0.2	0.2
HR15	0.9	10.0	0.3	0.3
HR16	1.0	10.1	0.4	0.4
HR17	1.0	10.1	0.4	0.4
HR18	0.9	10.1	0.3	0.4
HR19	1.1	10.2	0.4	0.4
HR20	1.0	10.2	0.4	0.4

Predicted concentrations were assessed against 99.9%ile 15-minute mean EQS of 266 µg/m³.
a) Short term environmental standard minus twice the long term background concentration.

5.1.53   Predicted 15-minute mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.54 PC proportions are less than 10% at all receptor locations. Based on EA screening criteria, impacts on concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.55 As such, overall impacts on 15-minute mean SO_2 concentrations are not significant.

Hydrogen Chloride

1-hour Mean

5.1.56 Predicted 1-hour mean HCl concentrations are summarised in Table 44.

Table 44: 1-Hour Mean HCl Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	0.4	0.7	0.1	0.1
HR2	0.6	0.9	0.1	0.1
HR3	0.5	0.8	0.1	0.1
HR4	0.7	1.0	0.1	0.1
HR5	0.4	0.7	<0.1	<0.1
HR6	0.3	0.6	<0.1	<0.1
HR7	0.2	0.5	<0.1	<0.1
HR8	0.2	0.5	<0.1	<0.1
HR9	0.1	0.4	<0.1	<0.1
HR10	0.1	0.4	<0.1	<0.1
HR11	0.1	0.4	<0.1	<0.1
HR12	0.1	0.4	<0.1	<0.1
HR13	0.1	0.4	<0.1	<0.1
HR14	0.1	0.4	<0.1	<0.1
HR15	0.3	0.6	<0.1	<0.1
HR16	0.3	0.6	<0.1	<0.1
HR17	0.3	0.6	<0.1	<0.1
HR18	0.2	0.5	<0.1	<0.1
HR19	0.3	0.6	<0.1	<0.1
HR20	0.4	0.7	0.1	0.1

Predicted concentrations were assessed against the 1-hour mean EQS of 750 µg/m³.
a) Short term environmental standard minus twice the long term background concentration.

5.1.57 Predicted 1-hour concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.58 PC proportions are less than 10% at all receptor locations. Based on EA screening criteria, impacts on concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.59 As such, overall impacts on annual mean HCL concentrations are not significant.

Polychlorinated biphenyls

Annual Mean

5.1.60 Predicted annual mean PCB concentrations are summarised in Table 45.

Table 45: Annual Mean PCB Concentrations

Receptor	Concentration ($\mu g/m^3$)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	5.38×10^{-06}	4.54×10^{-05}	<0.1	<0.1
HR2	5.50×10^{-06}	4.56×10^{-05}	<0.1	<0.1
HR3	9.67×10^{-06}	4.97×10^{-05}	<0.1	<0.1
HR4	9.73×10^{-06}	4.98×10^{-05}	<0.1	<0.1
HR5	4.65×10^{-06}	4.47×10^{-05}	<0.1	<0.1
HR6	3.12×10^{-06}	4.32×10^{-05}	<0.1	<0.1
HR7	2.63×10^{-06}	4.27×10^{-05}	<0.1	<0.1
HR8	3.11×10^{-06}	4.32×10^{-05}	<0.1	<0.1
HR9	1.88×10^{-06}	4.19×10^{-05}	<0.1	<0.1
HR10	1.64×10^{-06}	4.17×10^{-05}	<0.1	<0.1
HR11	1.04×10^{-06}	4.11×10^{-05}	<0.1	<0.1
HR12	7.88×10^{-07}	4.08×10^{-05}	<0.1	<0.1
HR13	5.91×10^{-07}	4.06×10^{-05}	<0.1	<0.1
HR14	1.41×10^{-06}	4.15×10^{-05}	<0.1	<0.1
HR15	3.26×10^{-06}	4.33×10^{-05}	<0.1	<0.1
HR16	5.03×10^{-06}	4.51×10^{-05}	<0.1	<0.1
HR17	2.53×10^{-06}	4.26×10^{-05}	<0.1	<0.1
HR18	2.18×10^{-06}	4.22×10^{-05}	<0.1	<0.1
HR19	2.31×10^{-06}	4.24×10^{-05}	<0.1	<0.1
HR20	3.47×10^{-06}	4.35×10^{-05}	<0.1	<0.1

Predicted concentrations were assessed against the annual mean EQS of 0.2 μg/m3

5.1.61 Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.62 PC proportions are less than 1% at all receptor locations. Based on EA screening criteria, impacts on concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.63 As such, impacts on annual mean PCB concentrations are not significant.

1-hour Mean

5.1.64 Predicted 1-hour mean PCB concentrations are summarised in Table 46.

Table 46: 1-Hour Mean PCB Concentrations

Receptor	Concentration ($\mu g/m^3$)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	2.04×10^{-04}	2.84×10^{-04}	<0.1	<0.1
HR2	1.54×10^{-03}	1.62×10^{-03}	<0.1	<0.1
HR3	1.07×10^{-03}	1.15×10^{-03}	<0.1	<0.1

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC(a)
HR4	1.82 x 10⁻⁰³	1.90 x 10⁻⁰³	<0.1	<0.1
HR5	8.68 x 10⁻⁰⁴	9.48 x 10⁻⁰⁴	<0.1	<0.1
HR6	6.13 x 10⁻⁰⁴	6.93 x 10⁻⁰⁴	<0.1	<0.1
HR7	3.91 x 10⁻⁰⁴	4.71 x 10⁻⁰⁴	<0.1	<0.1
HR8	3.21 x 10⁻⁰⁴	4.01 x 10⁻⁰⁴	<0.1	<0.1
HR9	3.28 x 10⁻⁰⁴	4.08 x 10⁻⁰⁴	<0.1	<0.1
HR10	2.87 x 10⁻⁰⁴	3.67 x 10⁻⁰⁴	<0.1	<0.1
HR11	1.80 x 10⁻⁰⁴	2.60 x 10⁻⁰⁴	<0.1	<0.1
HR12	1.74 x 10⁻⁰⁴	2.55 x 10⁻⁰⁴	<0.1	<0.1
HR13	1.50 x 10⁻⁰⁴	2.30 x 10⁻⁰⁴	<0.1	<0.1
HR14	2.55 x 10⁻⁰⁴	3.35 x 10⁻⁰⁴	<0.1	<0.1
HR15	3.53 x 10⁻⁰⁴	4.33 x 10⁻⁰⁴	<0.1	<0.1
HR16	3.93 x 10⁻⁰⁴	4.73 x 10⁻⁰⁴	<0.1	<0.1
HR17	5.11 x 10⁻⁰⁴	5.91 x 10⁻⁰⁴	<0.1	<0.1
HR18	6.08 x 10⁻⁰⁴	6.88 x 10⁻⁰⁴	<0.1	<0.1
HR19	6.84 x 10⁻⁰⁴	7.64 x 10⁻⁰⁴	<0.1	<0.1
HR20	1.06 x 10⁻⁰³	1.14 x 10⁻⁰³	<0.1	<0.1

Predicted concentrations were assessed against the relevant 1-hour mean EQS of 6 µg/m³.
a) Short term environmental standard minus twice the long term background concentration.

5.1.65 Predicted 1-hour mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.66 PC proportions are less than 10% at all receptor locations. Based on EA screening criteria, impacts on concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.67 As such, impacts on 1-hour mean PCB concentrations are not significant.

Polyaromatic hydrocarbons as benzo(a)pyrene

Annual Mean

5.1.68 Predicted annual mean PAHs as B[a]P concentrations are summarised in Table 47.

Table 47: Annual Mean B[a]P Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	8.97 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.4	40.4
HR2	9.17 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.4	40.4
HR3	1.61 x 10⁻⁰⁶	1.02 x 10⁻⁰⁴	0.6	40.6
HR4	1.62 x 10⁻⁰⁶	1.02 x 10⁻⁰⁴	0.6	40.6
HR5	7.74 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.3	40.3
HR6	5.20 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.2	40.2
HR7	4.38 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.2	40.2
HR8	5.19 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.2	40.2
HR9	3.13 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.1	40.1

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR10	2.74 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.1	40.1
HR11	1.73 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.1	40.1
HR12	1.31 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.1	40.1
HR13	9.85 x 10⁻⁰⁸	1.00 x 10⁻⁰⁴	<0.1	40.0
HR14	2.35 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.1	40.1
HR15	5.43 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.2	40.2
HR16	8.39 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.3	40.3
HR17	4.22 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.2	40.2
HR18	3.63 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.1	40.1
HR19	3.84 x 10⁻⁰⁷	1.00 x 10⁻⁰⁴	0.2	40.2
HR20	5.79 x 10⁻⁰⁷	1.01 x 10⁻⁰⁴	0.2	40.2

Predicted concentrations were assessed against the annual mean EQS of 0.0025 µg/m³

5.1.69 Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.70 PC proportions are less than 1% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.71 As such, impacts on annual mean B[a]P concentrations are not significant.

Dioxins and Furans

5.1.72 Predicted PCDD/F concentrations are summarised in Table 48. Impacts on PCDD/F are assessed against the tolerable daily intake of 2000 fg recommended by the COT.

Table 48: PCDD/F Concentrations

Receptor	Annual Mean Concentration (fg/m³)		1-hour Mean Concentration (fg/m³)	
	PC	PEC	PC	PEC
HR1	0.10	12.35	4.0	28.5
HR2	0.11	12.36	6.1	30.6
HR3	0.19	12.44	5.0	29.5
HR4	0.19	12.44	7.3	31.8
HR5	0.09	12.34	3.5	28.0
HR6	0.06	12.31	2.4	26.9
HR7	0.05	12.30	1.6	26.1
HR8	0.06	12.31	1.5	26.0
HR9	0.04	12.29	1.3	25.8
HR10	0.03	12.28	1.1	25.6
HR11	0.02	12.27	0.7	25.2
HR12	0.02	12.27	0.7	25.2
HR13	0.01	12.26	0.6	25.1
HR14	0.03	12.28	1.0	25.5
HR15	0.06	12.31	2.5	27.0
HR16	0.10	12.35	2.5	27.0

Receptor	Annual Mean Concentration (fg/m³)		1-hour Mean Concentration (fg/m³)	
	PC	PEC	PC	PEC
HR17	0.05	12.30	2.6	27.1
HR18	0.04	12.29	2.4	26.9
HR19	0.04	12.29	3.1	27.6
HR20	0.07	12.32	4.2	28.7

5.1.73 As indicated in Table 48, the maximum modelled annual mean PC for PCDD/Fs associated with the operation of the proposed development was 0.2 fg/m³ and maximum 1-hour mean PC for PCDD/Fs concentration is 12.4 fg/m³. This is not expected to significantly increase the airborne concentration or deposition rate of PCDD/Fs above that already experienced in the area.

5.1.74 As stated, the maximum predicted 1-hour mean PC for PCDD/Fs concentration is 12.4 fg/m³. This means that assuming the maximum hourly PC throughout the whole day, an average body weight (bw) of 70 kg, a breathing rate of 20 m³/day and assuming that all PCDD/Fs inhaled are absorbed by the individual (i.e. none are exhaled), the uptake of PCDD/Fs via inhalation is estimated to be 2.08 fg WHO-TEQ/kg bw per day. This is equivalent to 0.10% of the tolerable daily intake of 2000 fg recommended by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT).

5.1.75 The potential air inhalation effects of dioxins and furans released by the proposed development can therefore be considered negligible and therefore an insignificant risk to human health.

Cadmium

Annual Mean

5.1.76 Predicted annual mean Cd concentrations are summarised in Table 49.

Table 49: Annual Mean Cd Concentrations

Receptor	Concentration (ng/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.00005	0.00025	**1.1**	5.1
HR2	0.00006	0.00026	**1.1**	5.1
HR3	0.00010	0.00030	**1.9**	5.9
HR4	0.00010	0.00030	**1.9**	5.9
HR5	0.00005	0.00025	0.9	4.9
HR6	0.00003	0.00023	0.6	4.6
HR7	0.00003	0.00023	0.5	4.5
HR8	0.00003	0.00023	0.6	4.6
HR9	0.00002	0.00022	0.4	4.4
HR10	0.00002	0.00022	0.3	4.3
HR11	0.00001	0.00021	0.2	4.2
HR12	0.00001	0.00021	0.2	4.2
HR13	0.00001	0.00021	0.1	4.1
HR14	0.00001	0.00021	0.3	4.3
HR15	0.00003	0.00023	0.7	4.7
HR16	0.00005	0.00025	**1.0**	5.0
HR17	0.00003	0.00023	0.5	4.5

Receptor	Concentration (ng/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR18	0.00002	0.00022	0.4	4.4
HR19	0.00002	0.00022	0.5	4.5
HR20	0.00003	0.00023	0.7	4.7

Predicted concentrations were assessed against the annual mean EQS of 0.005 µg/m³

5.1.77   Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.78   PC proportions of the annual mean EQS are greater than 1% at five receptor locations however as the annual mean PEC is below 70% of the EQS impacts can be screened as insignificant in line with EA criteria[3]. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.79   Figure 8 provides a graphical representation of annual mean Cd PECs across the assessment extents.

Figure 8: Maximum Annual Mean Cd PECs
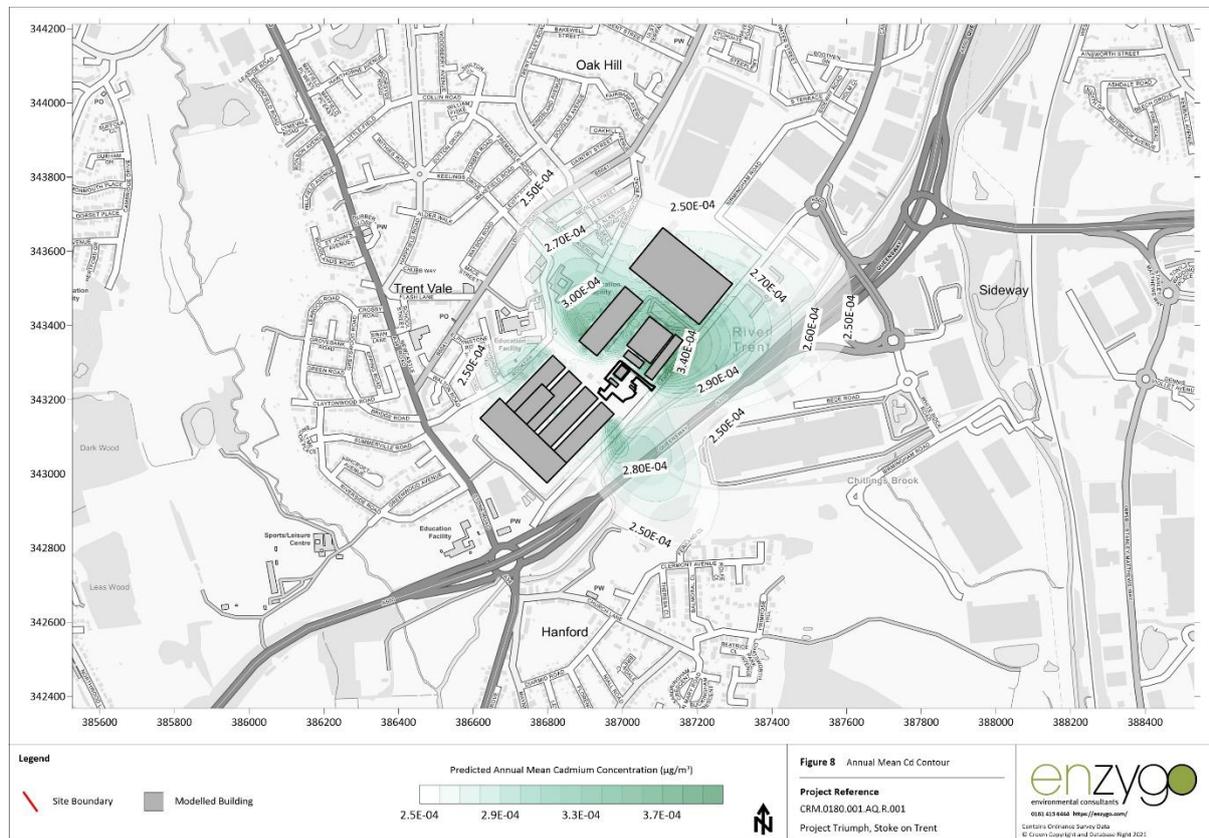
5.1.80   As shown in Figure 8, maximum 5-year annual mean Cd concentrations do not exceed the EQS of 0.005 µg/m³ at any location across the modelling extents, with worse case concentrations less than 70% of the EQS.

5.1.81   As such, impacts on annual mean Cd concentrations are not significant.

24-Hour Mean

5.1.82   Predicted 24-hour mean Cd concentrations are summarised in Table 50.

Table 50: Predicted 24-Hour Mean Cd Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	0.0006	0.0010	2.1	17.2
HR2	0.0006	0.0010	2.1	17.4
HR3	0.0008	0.0012	2.6	19.5
HR4	0.0006	0.0010	2.0	16.7
HR5	0.0003	0.0007	1.0	11.8
HR6	0.0002	0.0006	0.6	9.9
HR7	0.0002	0.0006	0.6	9.8
HR8	0.0002	0.0006	0.6	9.5
HR9	0.0001	0.0005	0.5	9.0
HR10	0.0001	0.0005	0.4	8.5
HR11	0.0001	0.0005	0.3	8.0
HR12	0.0001	0.0005	0.2	7.8
HR13	0.0001	0.0005	0.3	8.0
HR14	0.0002	0.0006	0.5	9.3
HR15	0.0003	0.0007	1.1	12.2
HR16	0.0005	0.0009	1.5	14.4
HR17	0.0004	0.0008	1.5	14.0
HR18	0.0004	0.0008	1.2	12.9
HR19	0.0004	0.0008	1.4	13.7
HR20	0.0004	0.0008	1.5	13.9

Predicted concentrations were assessed against the 24-hour mean EQS of 0.03 µg/m³
(a) PC proportion of the EQS minus twice the long-term background

5.1.83   Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.84   PC proportions are less than 10% of the EQS at all receptor locations and based on the EA screening criteria, impacts can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.85   As such, overall impacts on 24-hour Cd concentrations are not significant.

Mercury

1-Hour Mean

5.1.86   Predicted 1-hour mean Hg concentrations are summarised in Table 51.

Table 51: Predicted 1-Hour Mean Hg Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	0.0020	0.032	0.3	0.4
HR2	0.0031	0.033	0.5	0.6
HR3	0.0026	0.033	0.4	0.4
HR4	0.0037	0.034	0.6	0.7
HR5	0.0018	0.032	0.3	0.3

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR6	0.0013	0.031	0.2	0.2
HR7	0.0008	0.031	0.1	0.1
HR8	0.0008	0.031	0.1	0.1
HR9	0.0007	0.031	0.1	0.1
HR10	0.0006	0.031	0.1	0.1
HR11	0.0004	0.030	0.1	0.1
HR12	0.0004	0.030	0.1	0.1
HR13	0.0003	0.030	0.1	0.1
HR14	0.0005	0.031	0.1	0.1
HR15	0.0013	0.031	0.2	0.2
HR16	0.0013	0.031	0.2	0.2
HR17	0.0013	0.031	0.2	0.2
HR18	0.0012	0.031	0.2	0.2
HR19	0.0016	0.032	0.3	0.3
HR20	0.0022	0.032	0.4	0.4

Predicted concentrations were assessed against the annual mean EQS of 0.6 µg/m³
(a) PC proportion of the EQS minus twice the long-term background.

5.1.87 Predicted annual mean concentrations are well below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.88 PC proportions are less than 10% at all receptor locations. Based on EA screening criteria, impacts on concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.89 As such, impacts on 24-hour mean Hg concentrations are not significant.

24-hour Mean (Long term)

5.1.90 Predicted 24-hour mean Hg concentrations are summarised in Table 52.

Table 52: Predicted 24-Hour Mean Hg Concentrations (Long Term)

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.0006	0.031	**1.1**	51.1
HR2	0.0006	0.031	**1.1**	51.1
HR3	0.0008	0.031	**1.3**	51.3
HR4	0.0006	0.031	1.0	51.0
HR5	0.0003	0.030	0.5	50.5
HR6	0.0002	0.030	0.3	50.3
HR7	0.0002	0.030	0.3	50.3
HR8	0.0002	0.030	0.3	50.3
HR9	0.0001	0.030	0.2	50.2
HR10	0.0001	0.030	0.2	50.2
HR11	0.0001	0.030	0.1	50.1
HR12	0.0001	0.030	0.1	50.1

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR13	0.0001	0.030	0.1	50.1
HR14	0.0002	0.030	0.3	50.3
HR15	0.0003	0.030	0.6	50.6
HR16	0.0005	0.030	0.8	50.8
HR17	0.0004	0.030	0.7	50.7
HR18	0.0004	0.030	0.6	50.6
HR19	0.0004	0.030	0.7	50.7
HR20	0.0004	0.030	0.7	50.7

Predicted concentrations were assessed against the annual mean EQS of 0.06 µg/m³

5.1.91 Predicted 24-hour mean concentrations are below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.1.92 PC proportions of the annual mean EQS are greater than 1% at three receptor locations however as the annual mean PEC is below 70% of the EQS impacts can be screened as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.1.93 Figure 9 provides a graphical representation of 24-hour mean Hg PECs across the assessment extents.

Figure 9: Maximum 24-Hour Mean Hg PECs
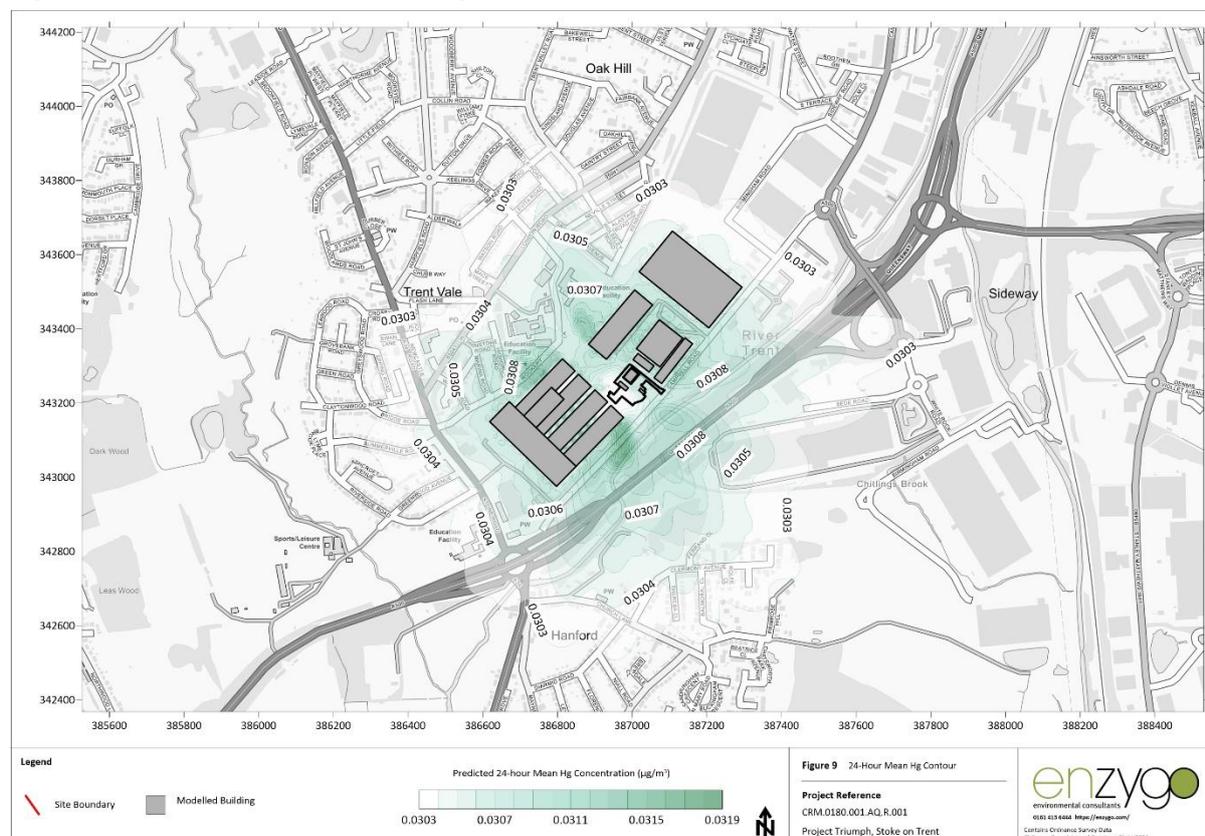
5.1.94 As shown in Figure 9, maximum 5-year annual mean Hg concentrations do not exceed the EQS of 0.06 µg/m³ at any location across the modelling extents, with worse case concentrations less than 70% of the EQS.

5.1.95 As such, impacts on 24-hour mean Hg concentrations are not significant.

Group 3 Metals

5.1.96 Predicted long and short term trace metal impacts based on maximum ELVs detailed in Table 8 are summarised in Table 53. For the group 3 metals if both the long and short term PECs meet the relevant EQSs, then the impact is considered insignificant in accordance with the EA's metals guidance[6].

Table 53: Maximum Group 3 Metal Concentrations

Metal	Period	Unit	Receptor	Predicted Concentration		Proportion of EQS (%)	
				PC	PEC	PC	PEC
As	Annual Mean	µg/m³	HR4	0.001	0.002	16.2	29.6
Cr	Annual Mean	µg/m³	HR4	0.001	0.003	389.4	1309
	24-Hour Mean	µg/m³	HR3	0.008	0.012	0.4	0.4
Cu	24-Hour Mean	µg/m³	HR3	0.008	0.036	15.4	36.0
Mn	Annual Mean	µg/m³	HR4	0.001	0.008	0.6	5.4
	1-Hour Mean	µg/m³	HR4	0.037	0.051	<0.1	<0.1
Ni	Annual Mean	µg/m³	HR4	0.001	0.002	4.9	8.9
	1-Hour Mean	µg/m³	HR4	0.037	0.039	5.3	5.3
Pb	Annual Mean	µg/m³	HR4	0.001	0.009	0.4	3.5
Sb	Annual Mean	µg/m³	HR4	0.001	0.002	<0.1	9.0
	1-Hour Mean	µg/m³	HR4	0.037	0.040	<0.1	<0.1
V	24-Hour Mean	µg/m³	HR3	0.008	0.009	0.8	0.8

5.1.97 The PC proportion exceeded 1% of the long term EQS for As, Cr and Ni and 10% of short term EQS for Cu following analysis of worse case meteorological conditions across the 5-year data set.

5.1.98 PECs exceeded the EQS for annual mean Cr (Cr VI) and 24-hour mean Cu. As such, further analysis is required for these metals. This initial assessment assumed a worst case where each metal is being emitted at 100% of the maximum ELV (i.e. 0.5 mg/m³) for total Group 3 metals.

5.1.99 The EA guidance[6] states if second stage analysis is required individual metals should be assessed on the basis of maximum measured concentrations obtained from various IED installations with capacities of >50 MW. This is therefore a robust screening exercise.

5.1.100 Emissions data listed within Appendix A of the EA guidance[6] was used to assess the impacts of Cu and Cr VI. This is given as 5.8% and 0.03%, respectively of the group 3 metal maximum ELV. These emissions data are based upon monitoring data at 18 municipal Waste Incinerators and Waste Wood Co-incinerators within England and Wales.

5.1.101 The results of the second stage screening predictions for Cu and Cr(VI) are shown in Table 54.

Table 54: Second Stage Screening Maximum Group 3 Metal Concentrations

Metal	Period	Unit	Receptor	Predicted Concentration		Proportion of EQS (%)	
				PC	PEC	PC	PEC
Cu	24-Hour Mean	µg/m³	HR4	0.0004	0.029	0.9	2.0
Cr(VI)	Annual Mean	µg/m³	HR4	0.0000002	0.00046	0.1	184.1

5.1.102 At the second stage of screening PC proportion of the EQS for 24-hour Cu concentrations and annual mean Cr(VI) are less than 1% and impacts can be screened out. As such, impacts on all group 3 metal concentrations are considered acceptable. The Cr(VI) PEC is above the EQS however this is due to the application of robust baseline concentrations and not due to the development emissions.

5.2 Short-Term Emission Limits – Human Receptors

5.2.1 The impacts of half hourly emissions limits have been predicted for all short term EQS (less than 24 hours). The results for the maximum impact at a sensitive receptor are summarised in Table 55.

Table 55: Maximum Short-Term Emissions Impacts

Pollutant	Period	Receptor	Predicted Concentration ($\mu g/m^3$)		Proportion of EQS (%)		
			PC	PEC	PC	PEC[a]	PEC[b]
NO_x	1-hour mean	HR2	11.49	56.49	5.75	7.41	28.25
CO	8-hour rolling mean	HR2	2.43	910.43	0.02	0.03	9.10
PM_{10}	24-hour mean	HR3	0.20	33.56	0.40	1.12	67.13
HCl	1 hour mean	HR4	4.35	4.95	0.58	0.58	0.66
HF	1 hour mean	HR4	0.31	6.31	0.19	0.20	3.94
SO_2	24-hour mean	HR2	8.64	17.82	3.25	3.36	6.70
	15-minute mean	HR3	5.51	14.69	1.57	1.62	4.20
	1 hour mean	HR3	2.40	11.58	1.92	2.08	9.27

a) Short term environmental standard minus twice the long term background concentration
b) Proportion of total EQS

5.2.2 Short term PC proportions of all assessed pollutants are less than 10% of the EQS at all receptor locations. As such, impacts on short term concentrations can be screened out as insignificant. In line with the EPUK and IAQM guidance impacts are considered as negligible at all receptor locations.

5.2.3 As such, all short term emission impacts are not significant.

5.3 Long Term Emission Limits – Ecological Receptors

Oxides of Nitrogen

Annual Mean

5.3.1 Predicted annual mean NO_x concentrations at sensitive ecological receptors are summarised in Table 56.

Table 56: Annual Mean NO_x Concentrations

Receptor	Concentration ($\mu g/m^3$)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.042	14.6	0.1	48.8
ER2	0.024	13.1	0.1	43.7
ER3	0.045	20.8	0.2	69.2
ER4	0.024	12.8	0.1	42.7
ER5	0.013	12.8	<0.1	42.7
ER6	0.005	15.4	<0.1	51.3

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER9	0.003	6.5	<0.1	21.8
ER10	0.006	11.6	<0.1	38.8
ER11	0.055	12.3	0.2	41.1
ER12	0.051	12.3	0.2	41.1
ER13	0.042	13.1	0.1	43.8
ER14	0.267	12.8	0.9	42.6

Predicted concentrations were assessed against the annual mean EQS of 30 µg/m³

5.3.2 Predicted annual mean NO_x concentrations were below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year data set.

5.3.3 The PC proportions of the annual mean EQS are less than 1% and 100% at all statutory and local designations, respectively. Based on EA screening criteria, impacts on annual mean NO_x concentrations can be screened out as insignificant and no further analysis is required for this substance.

5.3.4 Impacts on annual mean NO_x concentrations were determined to be acceptable.

24-hour Mean

5.3.5 Predicted 24-hour mean NO_x concentrations are summarised in Table 57.

Table 57: 24-Hour Mean NO_x Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.48	29.7	0.6	39.6
ER2	0.27	26.4	0.4	35.3
ER3	0.31	41.7	0.4	55.6
ER4	0.32	25.9	0.4	34.6
ER5	0.17	25.8	0.2	34.4
ER6	0.05	30.8	0.1	41.1
ER9	0.03	13.1	0.0	17.4
ER10	0.06	23.3	0.1	31.1
ER11	0.54	25.1	0.7	33.5
ER12	0.49	25.1	0.7	33.4
ER13	0.46	26.6	0.6	35.5
ER14	2.63	27.7	3.5	36.9

Predicted concentrations were assessed against the 24-hour mean EQS of 75 µg/m³

5.3.6 Predicted 24-hour mean NO_x concentrations were below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year dataset.

5.3.7 The PC proportions of the 24-hour mean EQS are less than 10% and 100% at all statutory and local designations, respectively. Based on EA screening criteria, impacts on 24-hour mean NO_x concentrations can be screened out as insignificant and no further analysis is required for this substance.

5.3.8 Impacts on 24-hour NO_x concentrations were determined to be acceptable.

Sulphur Dioxide

Annual Mean

5.3.9   Predicted annual mean SO_2 concentrations are summarised in Table 58.

Table 58: Annual Mean SO_2 Concentrations

Receptor	Concentration (μg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.010	1.6	0.1	16.3
ER2	0.006	1.3	0.1	12.7
ER3	0.011	3.6	0.1	35.8
ER4	0.006	1.3	0.1	13.1
ER5	0.003	1.3	0.0	13.0
ER6	0.001	1.9	0.0	18.9
ER9	0.001	0.8	0.0	7.6
ER10	0.001	1.6	0.0	15.9
ER11	0.014	1.3	0.1	13.2
ER12	0.013	1.3	0.1	13.2
ER13	0.011	1.3	0.1	12.7
ER14	0.067	1.5	0.7	15.2

Predicted concentrations were assessed against the annual mean EQS of 10 μg/m³

5.3.10   Predicted annual mean SO_2 concentrations were below the relevant EQS at all sensitive receptor locations following analysis of worse case meteorological conditions across the 5-year dataset.

5.3.11   The PC proportions of the annul mean EQS are less than 1% and 100% at all statutory and local designations, respectively. Based on the initial EA screening criteria, impacts on annual mean SO_2 concentrations can be screened out as insignificant and no further analysis is required for this substance.

5.3.12   Impacts on annual mean SO_2 concentrations were determined to be acceptable.

Hydrogen Fluoride

Weekly Mean

5.3.13   Predicted weekly mean HF concentrations are summarised in Table 59.

Table 59: Weekly Mean HF Concentrations

Receptor	Concentration (μg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.0009	6.0	0.2	**1200.2**
ER2	0.0007	6.0	0.1	**1200.1**
ER3	0.0007	6.0	0.1	**1200.1**
ER4	0.0006	6.0	0.1	**1200.1**
ER5	0.0004	6.0	0.1	**1200.1**
ER6	0.0001	6.0	0.0	**1200.0**
ER9	0.0001	6.0	0.0	**1200.0**
ER10	0.0001	6.0	0.0	**1200.0**

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER11	0.0011	6.0	0.2	**1200.2**
ER12	0.0013	6.0	0.3	**1200.3**
ER13	0.0011	6.0	0.2	**1200.2**
ER14	0.0051	6.0	1.0	**1201.0**

Predicted concentrations were assessed against the weekly mean EQS of 0.5 µg/m³

5.3.14 Predicted weekly mean HF concentrations were above the relevant EQS at all receptor locations, as a result of applying a highly conservative background concentration which is unlikely to reflect actual conditions in the study area; as well as analysis of worse case meteorological conditions across the 5-year dataset.

5.3.15 However, the PC proportions of the annual mean EQS are less than 1% and 100% at all statutory and local designations, respectively. Based on EA screening criteria, impacts on weekly mean HF concentrations can be screened out as insignificant and no further analysis is required for this substance.

5.3.16 Considering the EA guidance impacts on weekly mean HF were determined to be acceptable.

24-hour Mean

5.3.17 24-hour mean HF concentrations are summarised in Table 60.

Table 60: 24-Hour Mean HF Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.0021	6.0	<0.1	**120.0**
ER2	0.0011	6.0	<0.1	**120.0**
ER3	0.0013	6.0	<0.1	**120.0**
ER4	0.0013	6.0	<0.1	**120.0**
ER5	0.0007	6.0	<0.1	**120.0**
ER6	0.0002	6.0	<0.1	**120.0**
ER9	0.0001	6.0	<0.1	**120.0**
ER10	0.0003	6.0	<0.1	**120.0**
ER11	0.0023	6.0	<0.1	**120.0**
ER12	0.0021	6.0	<0.1	**120.0**
ER13	0.0020	6.0	<0.1	**120.0**
ER14	0.0112	6.0	0.2	**120.2**

Predicted concentrations were assessed against the 24-hour mean EQS of 5 µg/m³

5.3.18 Predicted 24-hour mean HF concentrations were above the relevant EQS at all sensitive receptor locations, as a result of applying a highly conservative background concentration which is unlikely to reflect actual conditions in the study area; as well as analysis of worse case meteorological conditions across the 5-year dataset.

5.3.19 The PC proportions of the 24-hour mean EQS are less than 1% and 100% at all statutory and local designations, respectively. Based on EA screening criteria, impacts on 24-hour mean HF concentrations can be screened out as insignificant and no further analysis is required for this substance.

5.3.20 Considering the EA guidance impacts on 24-hour mean HF concentrations were determined to be acceptable.

Nitrogen Deposition

5.3.21 Predicted annual mean nitrogen deposition rates are summarised in Table 61.

Table 61: Annual Mean Nitrogen Deposition Rates

| Receptor | Predicted Annual Mean Nitrogen Deposition Rate (kgN/ha/yr) | | Proportion of EQS (%) | | | |
| | | | Low EQS | | High EQS | |
	PC	PEC	PC	PEC	PC	PEC
ER1	0.012	37.4	0.1	**373.6**	0.1	**249.1**
ER2	0.007	38.2	0.1	**381.8**	<0.1	**254.5**
ER3	0.013	36.4	0.1	**364.3**	0.1	**242.9**
ER4	0.007	39.1	0.1	**391.1**	<0.1	**260.7**
ER5	0.004	39.1	<0.1	**391.0**	<0.1	**260.7**
ER6	0.001	20.6	<0.1	**411.4**	<0.1	**137.1**
ER7	0.001	22.1	No critical load			
ER8	0.003	20.7	No critical load			
ER9	0.001	24.3	No critical load			
ER10	0.002	20.5	<0.1	**410.8**	<0.1	**136.9**
ER11	0.016	38.0	0.2	**380.4**	0.1	**253.6**
ER12	0.015	38.0	0.1	**380.3**	0.1	**253.6**
ER13	0.012	38.2	0.1	**381.8**	0.1	**254.5**
ER14	0.077	36.8	0.8	**368.5**	0.5	**245.6**

5.3.22 Annual mean PEC for nitrogen deposition were above both the low and high EQSs at all sensitive receptor locations. This is due to the high background deposition rates, which exceed the EQSs as a base condition.

5.3.23 The PC proportion of the EQS is less than 100% at all local designations. Based on EA screening criteria, nitrogen deposition rates can be screened out as insignificant.

5.3.24 At Maer Pool SSSI (ER9) no N critical is given however a review of available conditions at the site reported by NE[19] does not indicate any existing adverse impact from air pollution. In addition, the most recent site check carried out by NE on 27/4/2021 reported that the "*SSSI looked to be in very good condition. The large area of reedbed to the north-west was notable in how good it looked. Recent surveys have shown there to be a healthy population of aquatic invertebrates.*"

5.3.25 Furthermore, the predicted N deposition from the facility is minimal (0.001 kgN/ha/yr – the lowest at any sensitive location) and therefore unlikely to cause any adverse effects at this designation.

5.3.26 Impacts on nitrogen deposition impacts were determined to be acceptable.

Acid Deposition

5.3.27 Predicted annual mean acid deposition rates are summarised in Table 62. In accordance with the EA guidance the APIS site relevant CLd tool was used to determine whether there is an exceedance of the CL function for acid deposition.

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19 https://designatedsites.naturalengland.org.uk/PDFsForWeb/VAM/1000283.pdf

Table 62: Predicted Annual Mean Acid Deposition Rates

Receptor	Predicted Annual Mean Acid Deposition Rate (keq/ha/yr)	Proportion of EQS (%)	
		PC	PEC
ER1	0.0044	0.1	92.7
ER2	0.0025	0.2	204.6
ER3	0.0048	0.1	90.9
ER4	0.0026	0.2	213.6
ER5	0.0013	0.1	213.5
ER6	0.0005	Habitat not sensitive	
ER7	0.0005	No critical load	
ER8	0.0010	No critical load	
ER9	0.0003	No critical load	
ER10	0.0006	0.1	244.3
ER11	0.0059	0.2	105.8
ER12	0.0054	0.2	101.8
ER13	0.0045	0.3	204.8
ER14	0.0285	1.0	99.5

5.3.28 Annual mean PEC for acid deposition were above the EQSs at all but three sensitive receptor locations. This is due to the high background deposition rates, which exceed the EQSs as a base condition.

5.3.29 PC proportion of the EQS is less than 1% at all statutory designations and less than 100% at all local designations. Based on the initial EA screening criteria, acid deposition rates can be screened out as insignificant.

5.3.30 Similar to nitrogen deposition at Maer Pool SSSI no critical load is provided acid deposition however review of available conditions at the site reported by NE does not indicate any existing adverse impact from air pollution. In addition, the most recent site check carried out by NE on 27/4/2021 reported that the "*SSSI looked to be in very good condition. The large area of reedbed to the north-west was notable in how good it looked. Recent surveys have shown there to be a healthy population of aquatic invertebrates.*"

5.3.31 Furthermore, the predicted total acid deposition from the facility is minimal (<0.001 keq/ha/yr, the lowest at any sensitive location) and therefore unlikely to cause any adverse effects at this designation.

5.3.32 Impacts on acid deposition impacts were determined to be acceptable.

6.0 Conclusions

6.1.1 Enzygo Limited was commissioned by Murfitts Industries Ltd to undertake an air quality impact assessment to support a planning application for the construction and operations of an ELT pyrolysis facility at Campbell Road, Oakhill, Stoke-on-Trent, ST4 4EW.

6.1.2 Emissions from the operation of the facility have the potential to increase air pollutant concentrations in the vicinity of the site and an assessment is required to quantify the significance of impacts upon sensitive human and ecological receptors.

6.1.3 Dispersion modelling of pollutants using maximum emission limits outlined within the IED and EP Technical Guidance Note PG13/1(21) was undertaken with ADMS-6 modelling software. Impacts at human and ecological sensitive receptors were predicted and results compared with the relevant EQSs, and significance criteria provided by the IAQM and the EA guidance documents.

6.1.4 Impacts were based on the proposed development emitting the maximum permitted pollutant concentration for a full calendar year, as well the use of the maximum predicted concentrations over the 5-year meteorological data set. Subsequently, the predicted concentrations are considered a significant overestimation of actual impacts.

6.1.5 Predicted impacts on existing pollutant concentrations at human receptor locations could be screened out as insignificant in accordance with the IAQM methodology with impacts deemed as not significant at all modelled receptor locations. EA screening criteria deemed impacts as insignificant for all pollutants and averaging periods. The EQS were not exceeded at any sensitive human location within the assessment extents.

6.1.6 Emission impacts were also screened out as insignificant for all group 3 metals.

6.1.7 At all ecological designations, predicted impacts on nitrogen, acid gas concentrations and deposition rates could be screened out as insignificant in accordance with the initial EA screening criteria.

6.1.8 Based on the predictions and the use of worst-case emissions and robust background concentrations, it is considered that the overall air quality impacts associated with the operation of proposed development would be not significant and acceptable in line with air quality planning guidance and policies.

7.0 Abbreviations

%ile	Percentile
AAD	Ambient Air Directive
AADT	Annual Average Daily Traffic
ADM	Atmospheric Dispersion Modelling
ADMS	Atmospheric Dispersion Modelling Software
APIS	Atmospheric Pollution Information System
AQA	Air Quality Assessment
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
AQTAG	Air Quality Technical Advisory. Group
As	Arsenic
AW	Ancient Woodland
BAT	Best Available Techniques
B[a]P	Benzo(a)pyrene
BREF	Best Available Techniques Reference Document
C_6H_6	Benzene
Cd	Cadmium
CERC	Cambridge Environmental Research Consultants
CLd	Critical Load
CLv	Critical Level
CO	Carbon Monoxide
Co	Cobalt
Cr	Chromium
Cu	Copper
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EAL	Environment Assessment Level
EC	European Commission
ELT	End of Life Tyres
ELV	Emission Limit Values
EP	Environmental Permitting
EPUK	Environmental Protection UK
EPAQS	Expert Panel on Air Quality Standards
EQS	Environmental Quality Standard
EU	European Union
HCl	Hydrogen Chloride
HDV	Heavy Duty Vehicle
HF	Hydrogen Fluoride
Hg	Mercury
IAQM	Institute of Air Quality Management
IED	Industrial Emission Directive
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
Mn	Manganese
N	Nitrogen
NGR	National Grid Reference

NH$_3$	Ammonia
Ni	Nickel
NNR	National Nature Reserve
NO$_2$	Nitrogen Dioxide
NO$_x$	Oxides of Nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PC	Process Contribution
PCB	Polychlorinated Biphenyl
PCDD/Fs	Dioxins and Furans
PEC	Predicted Environmental Concentration
PM	Particulate Matter
PM$_{10}$	Particulate matter with an aerodynamic diameter of less than 10 μm
PM$_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 μm
SAC	Special Area of Conservation
Sb	Antimony
SO$_2$	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
STCC	Stoke on Trent City Council
SWIP	Small Waste Incineration Plant
Ti	Thallium
TEQ	Toxic Equivalent
TOC	Total Organic Compounds
TOMPs	Toxic Organic Micro-Pollutants
TPO	Tyre Pyrolysis Oil
UKEAP	UK Eutrophying and Acidifying Pollutants
V	Vanadium
VOC	Volatile Organic Compounds
z$_0$	Roughness Length

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