Report

Block 8, The Heath Business and Technical Park, Runcorn

Air Quality Assessment for Environmental Permit

For Watercycle Technologies Ltd

26 May 2026

Air Quality Consultants | Part of Logika Group

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1 Introduction

1.1 This report describes the air quality assessment for the Watercycle Technologies facility in Block 8 of The Heath Business and Technical Park on Heath Road South in Runcorn. The assessment has been prepared to support the Environmental Permit application which is made in accordance with the Environmental Permitting (England and Wales) Regulations 2016, as amended (EPR). This report has been prepared by Air Quality Consultants Ltd | Part of Logika Group (AQC).

1.2 The facility will be used to recover lithium and other critical minerals from waste and non-waste product waters, and battery black mass. The detailed modelling of relevant emissions associated with each process line is described in this report. The model input files have been packaged as a zip file and sent alongside this report.

1.3 The assessment focuses on emissions of the following pollutants for human health:

- Particulate matter (PM_{10} and $PM_{2.5}$);
- Volatile Organic Compounds (VOCs);
- Heavy Metals (including nickel (Ni), copper (Cu), lead (Pb), zinc (Zn) and manganese (Mn));
- Sulphur dioxide (SO_2);
- Carbon monoxide (CO);
- Hydrogen fluoride (HF); and
- n-Hexane.

1.4 It also considers the impacts of emissions of SO_2 and HF on ecological receptors including, where relevant, the effects of acid deposition.

1.5 Table 1-1 summarises the site location, whilst Table 1-2 summarises the modelled scenarios and sensitivity tests that have been carried out.

Table 1-1: Site Location

Parameter	Entry
Site Name	Block 8 - The Heath Business and Technical Park
Site Address	Heath Road South, Weston, Runcorn, WA7 4QX
Grid Reference of Site Centre (O.S. X,Y)	351299, 380974

Table 1-2: Summary of Model Scenarios and Sensitivity Tests

Parameter	Entry
Scenarios Assessed	Normal operation of the facility at maximum design capacity.
Year for Baseline Conditions	Most recent year of available measurements/predictions – no improvement assumed into the future (see Section 5).
Meteorological Conditions	Five years of meteorological data used, with each year modelled separately. Receptor-specific maxima out of the five years are reported (see Section 6).

Parameter	Entry
Sensitivity Tests	Sensitivity testing has been undertaken with respect to building effects, terrain effects, surface roughness value and meteorological year. Therefore, the sensitivity of the model to input parameters used within this assessment is well understood.

2 Site Description

Nearby Sensitive Features

2.1 The Watercycle Technologies facility is located within the Heath Business and Technical Park, in the southwest of Runcorn. The area is a mixture of residential and commercial development, with industrial uses approximately 1 km to the west adjacent to the River Mersey.

2.2 Figure 2-1 shows the site location and identifies any European designations (including Special Protection Areas (SPAs) and Ramsar sites) within 10 km. Figure 2-2 presents the same information but focussing on the area within 2 km of the site only and identifies the extent of any nationally designated sites (including Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR)), and Local Wildlife Sites (LWS). Table 2-1 summarises the proximity of nearby sensitive features.

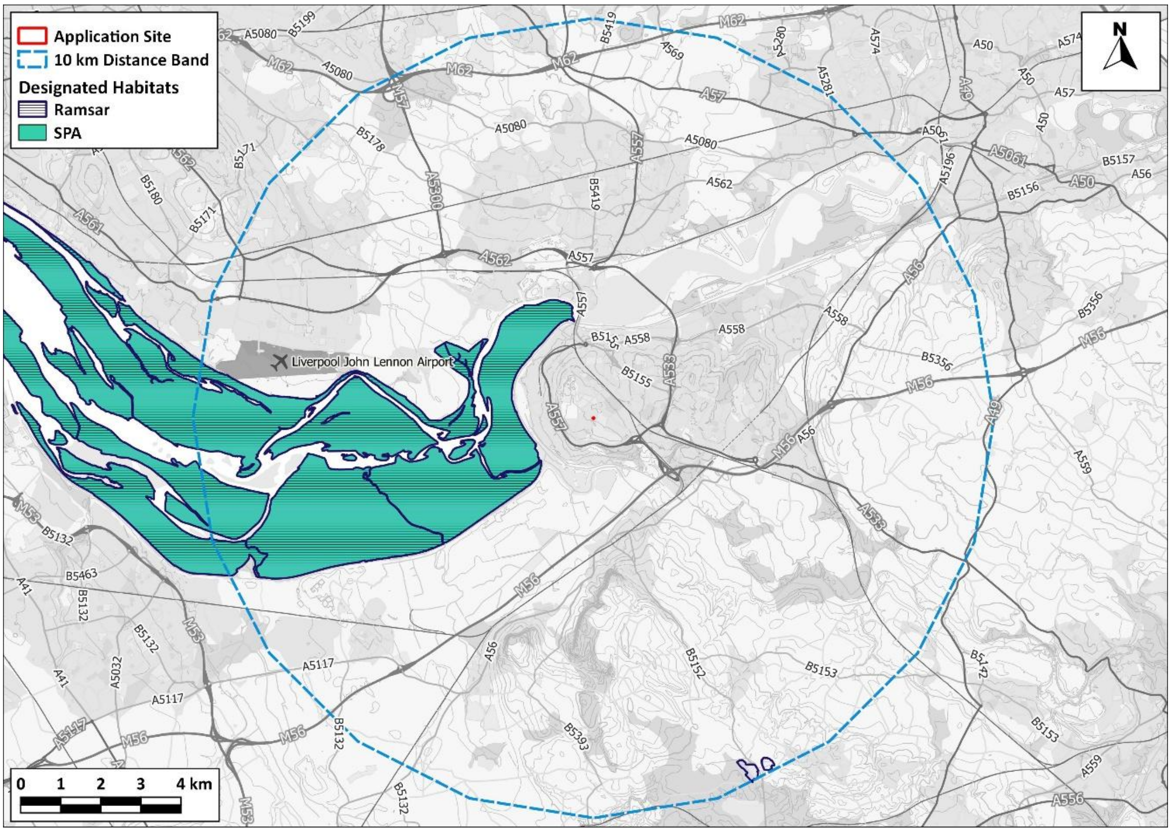

Figure 2-1: Site Location, SPAs, and Ramsar Sites within 10 km

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

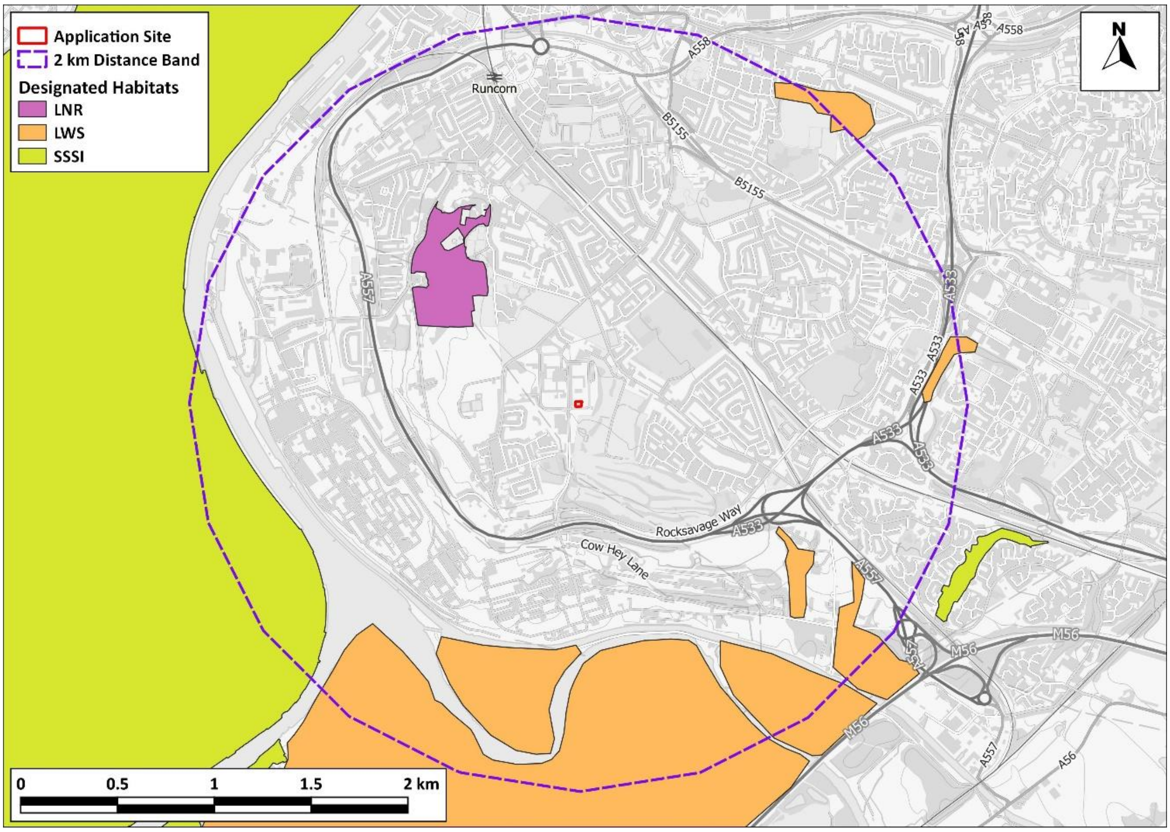

Figure 2-2: Site Location, SSSIs, LNRs and LWS within 2 km

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

Table 2-1: Summary of Nearby Sensitive Features

Feature	Description	Distance from Centre of Site
Nearest roadside human receptor	Residential property adjacent to Clifton Road, to the northeast of the facility	295 m
Nearest non-roadside human receptor	Runcorn Golf Club to the east of the facility	105 m
Nearest SAC, SPA, Ramsar site or SSSI	Mersey Estuary SPA and Ramsar	1,565 m
Nearest Local Wildlife Site	Runcorn Hill LNR	690 m
Receptors within the downwash cavity length from the nearest edge/side of the building?	There are no receptors downwind of the building within the region of potential downwash effects (75 m)	n/a
Sensitive receptor setting	Suburban	n/a
Sensitive receptors within an Air Quality Management Area (AQMA)?	No – the nearest AQMA, declared for exceedances of the 15-minute mean SO_2 objective, is in Thornton le Moors over 8 km from the site	n/a

Topography

2.3 Figure 2-3 shows the terrain across the modelled study area using Ordnance Survey (OS) Terrain 50 data.

2.4 The area immediately surrounding the site is broadly flat, such that facility buildings from which the plant exhaust are approximately at the same elevation as the nearest human health receptors. However, there are areas within the wider model domain where terrain elevations exceed the site elevation by approximately 100 m.

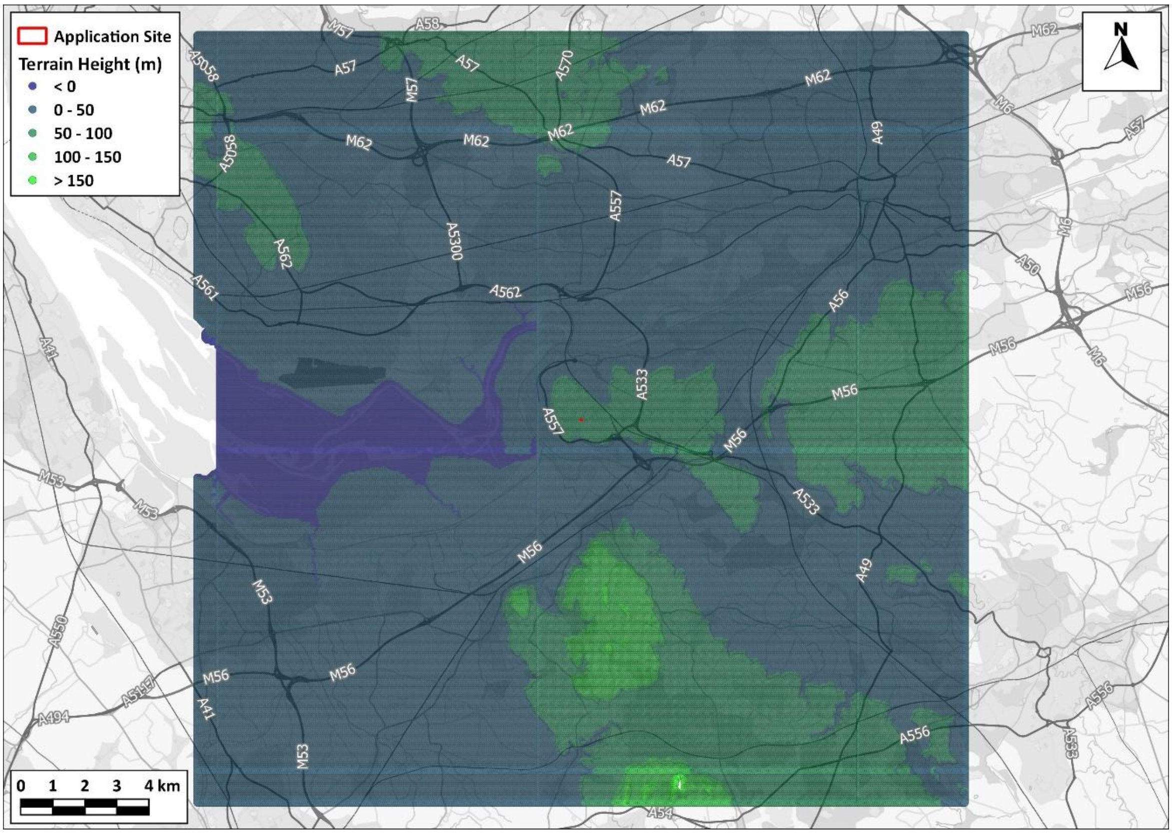

Figure 2-3: Terrain within the Modelled Area

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

3 Description of Process

Process Overview

3.1 The facility will be used by Watercycle Technologies to allow the recovery of lithium and other critical minerals from refined black mass and water (both product water and industrial wastewater) as metal salts and/or hydroxides. The processes occur in two lines, one for the black mass process and the other for the water process.

3.2 The black mass process involves the leaching of the black mass with sulphuric acid and hydrogen peroxide to precipitate out the relevant minerals at different stages. The materials are washed, concentrated, crystallised, processed via a filter press and dried to produce the required mineral products.

3.3 The water process includes the addition of solid inorganic materials to blend, filter, crystallise, precipitate and dry the finished product, producing metal salts e.g., lithium carbonate or lithium phosphate.

3.4 Emissions from the facility occur from a number of extraction systems on raw material and product handling areas, and extraction systems on the process reactors. The extraction systems are connected to abatement systems (combination of fabric filters, carbon filters and wet scrubbers dependent on nature of emission) which discharge treated flue gases through stacks on the roof of the Principal Block, namely:

- Stack C (in the northwest of the building);
- Stacks D, E and F (in the centre of the building); and
- Stack O (in the southeast of the building).

3.5 These stacks all exhaust at 7.6 m above ground level, approximately 3 m above the roof of the Principal Block. Figure 3-1 shows the site plan and layout, including a 3D representation (green building). In addition to the identified stacks, there are a number of other stacks present on the building; however, these represent either air inlets or are not functional in use.

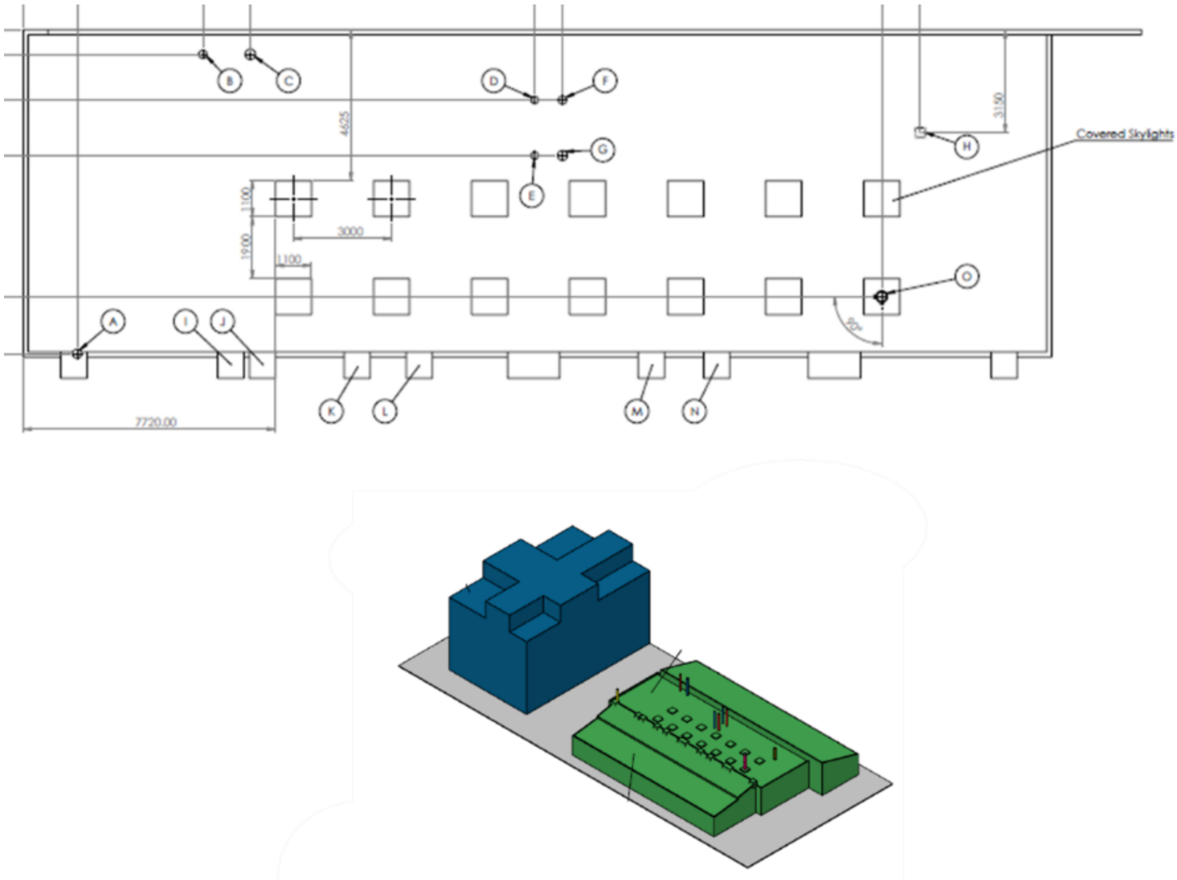

Figure 3-1: Site Layout (Top Image Shows 2D Layout, Bottom Image Shows 3D Layout)

Imagery provided by Watercycle Technologies (Drawing Numbers IP103BS-D1-01 and IP103BS-D1-02, Rev A01)

Operating Conditions

3.6 The processes taking place at the facility are batch processes, meaning there will not be continuous emissions from any of the sources; Watercycle Technologies anticipates that there will be two batches on the water process and two batches on the black mass process run each weekday. Extraction systems only operate, and hence emissions only occur, for a limited number of hours during each batch run. For example, off-gases from the acid leaching reactor only occur for two-hours of the batch run, meaning emissions from its associated extraction system only occur for four hours each day. As the site will not operate at weekends, and to allow scheduled maintenance, the total number of operational days will be 241 days per year.

3.7 This level of utilisation has been reflected in the long-term annual model outputs, whereby, based on the operational profile provided by Watercycle Technologies, the stacks have been modelled as emitting for between 362 hours and 1,928 hours per year dependent on the operational duration of the process associated with each emission point.

4 Environmental Standards for Air

Human Health

4.1 The relevant Air Quality Standards (AQS), Air Quality Objectives (AQO), Target Values and Environmental Assessment Levels (EALs) for human health impacts are set out in Table 4-1 (Environment Agency, 2026).

Table 4-1: Assessment Criteria for Human Health

Pollutant	Averaging Period	Designation	Metric ($\mu g/m^3$)	Acceptable Exceedance Criteria
PM_{10}	Annual	AQS / AQO	40	Zero exceedances
	24-hour	AQS / AQO	50	Not to be exceeded more than 35 times a year
$PM_{2.5}$	Annual	AQS	20	Zero exceedances
Sulphur dioxide	24-hour	AQS / AQO	125	Not to be exceeded more than 3 times a year
	1-hour	AQS / AQO	350	Not to be exceeded more than 24 times a year
	15-minute	AQO	266	Not to be exceeded more than 35 times a year
Carbon monoxide	8-hour (rolling)	AQS / AQO	10,000	Zero exceedances
	1-hour	EAL	30,000	Zero exceedances
Benzene	Annual	AQS / AQO	5	Zero exceedances
	24-hour	EAL	30	Zero exceedances
Methanol	Annual	EAL	2,660	Zero exceedances
	1-hour	EAL	33,300	Zero exceedances
Hexane	Annual	EAL	720	Zero exceedances
	1-hour	EAL	21,600	Zero exceedances
Hydrogen fluoride	Monthly	EAL	16	Zero exceedances
	1-hour	EAL	160	Zero exceedances
Nickel	Annual	Target Value	0.02	Zero exceedances
	1-hour	EAL	0.7	Zero exceedances
Copper	24-hour (Long-term)	EAL	0.05	Zero exceedances
Lead	Annual	AQO	0.25	Zero exceedances
Manganese	Annual	EAL	0.15	Zero exceedances

4.2 European Union (EU) Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets a limit value for annual mean concentrations of lead. However, this is less stringent (0.5 µg/m^3) than the AQO (0.25 µg/m^3) set within the Air Quality Standards (England) Regulations 2010, and therefore, in accordance with Environment Agency guidance where duplicate assessment levels exist, the lower concentration set as the AQO (0.25 µg/m^3) has been used throughout this report.

4.3 Whilst there are two guideline EALs for HF with different averaging periods, in its Addendum guidelines for halogen and hydrogen halides in ambient air for protecting human health against acute irritancy effects, Defra's Expert Panel on Air Quality Standards (EPAQS) states (Defra, 2009):

"It is unlikely that the ambient monthly mean would approach this value if the 1-hour guideline value for irritancy for hydrogen fluoride is not exceeded as an air pollutant emitted from a chimney stack."

4.4 Hence, an assessment against the monthly mean EAL for HF is only made if there is the risk of an exceedance of the hourly mean EAL.

4.5 Emissions of VOCs represent a group of individual organic compounds. Based on initial laboratory-scale testing, it is expected that most of the VOCs associated would be accounted for by dimethyl carbonate (and/or methanol as a degradation product) associated with its use as a solvent in the electrolyte of lithium-ion batteries. Speciation analysis of the VOCs liberated during acid leaching of the black mass indicated primarily C2 – C7 saturated and unsaturated aliphatic hydrocarbons e.g., n-hexane, with no aromatic compounds identified

4.6 The Environment Agency's "*Air emissions risk assessment for your environmental permit*" guidance (Environment Agency, 2026) suggests where the speciation of VOCs is not known, the process contribution of VOCs as a total group should first be assessed against the benzene AQS/EALs. Whilst this approach is likely to be overly conservative given the initial laboratory-scale results which suggest it is highly unlikely for aromatic compounds like benzene to be present in the emissions, it has nonetheless been adopted as an initial assessment stage as no test data is available from an MCERTS test team on a commercial-scale process. Additional comparisons of total VOCs against the EALs for methanol have also been made, which is considered a more representative proxy compound. An assessment of n-hexane emissions from the acid leaching reactor against the n-hexane EAL is also made due to its detection above LOD in the initial laboratory-scale testing.

4.7 The above AQOs, AQS and EALs (encompassing the Target Value for annual mean nickel concentrations) apply to concentrations of a particular pollutant in air. Additional health-based metrics are provided by the Environment Agency for the purposes of assessing the deposition of certain metal species to land (2026). These Maximum Deposition Rates (MDRs) are provided in Table 4-2 for the relevant metal species emitted by the facility.

Table 4-2: Maximum Deposition Rates

Pollutant	Maximum Deposition Rate (mg/m^2/day)
Nickel	0.11
Copper	0.25
Lead	1.10
Zinc	0.48
Fluoride	2.10

4.8 The AQS and AQOs are defined within the Air Quality Standards (England) Regulations 2010 and the Air Quality (England) Regulations 2000, as amended, respectively. These Regulations clarify the AQS and AQO apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the assessment criteria. Defra explains where these criteria apply in its Local Air Quality Management Technical Guidance (Defra, 2025). Although EALs are not defined in these Regulations, it is common to apply the same approach to assessing relevant exposure for EALs as AQS and AQOs.

4.9 Annual mean and long-term 24-hour (LT) mean assessment criteria are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The short-term 24-hour mean assessment criteria are considered to apply at the same locations as the annual mean criteria, as well as in gardens of residential properties and at hotels. The 1-hour mean and 15-minute mean assessment criteria apply wherever members of the public might regularly spend 1-hour or 15-minutes or more, including outdoor eating locations and pavements of busy shopping streets. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the AQS and specific monitor and receptor siting requirements apply. None of the AQS, AQO or EAL values apply in places of work where members of the public have no free access and where relevant provisions concerning health and safety at work apply (AQC, 2016), including at the adjacent Block 5 building (office and laboratory space).

Ecosystems

4.10 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets a limit value for annual and winter mean concentrations of sulphur dioxide for the protection of ecosystems. The same value has been set as a domestic AQS within the Air Quality Standards (England) Regulations 2010. The limit values and objectives only apply a) more than 20 km from an agglomeration (about 250,000 people), and b) more than 5 km from Part A industrial sources, motorways and built-up areas of more than 5,000 people.

4.11 Critical levels (CLe) and critical loads (CLo) are the ambient concentrations and deposition fluxes below which significant harmful effects to sensitive habitats and ecosystems are unlikely to occur. Some of the CLe are set at the same concentrations as the AQS but do not have the same spatial constraints on where they apply. Exceedances of the CLe and CLo are considered in the context of preventing harm to sites which are protected under the various designation frameworks.

4.12 Table 4-3 and Table 4-4 set out the relevant critical levels and critical loads for the designated ecological sites in the study area, taken from the Air Pollution Information System (APIS) website (2026) and the Environment Agency's guidance *"Air emissions risk assessment for your environmental permit"* (2026). There are no standards/guidelines that can be used to assess emissions of other pollutants from the facility, such as particulate matter or metal concentrations, in ambient air on designated habitats.

Table 4-3: Vegetation and Ecosystem Critical Levels

Pollutant	Averaging Period	Critical Level (µg/m^3)
Sulphur dioxide	Annual	20 (10 [a])
Hydrogen fluoride	Weekly	0.5
	24-hour	5

[a] The more stringent critical level only applies where lichens or bryophytes are present or form a key part of the ecosystem integrity.

Table 4-4: Critical Loads for Designated Ecological Sites

Site	Acid Deposition (keq/ha/yr) [a, b, c]	
	Forest Features	Grassland Features
Mersey Estuary SPA, Ramsar and SSSI / Upper Mersey Estuary LWS	– [d]	4.86
Midland Meres and Mosses – Phase 1 Ramsar	– [e]	– [e]
Runcorn Hill LNR and LWS	1.15	1.34
Clifton Cloughs LWS	1.77	1.29
Weston Marsh Lagoon LWS	11.11	4.55
Frodsham and Helsby and Ince Marshes LWS	11.11	4.55
Frodsham Field Studies Centre LWS	11.11	4.55
Clifton Lagoon LWS	1.77	1.29
Land North of Hallwood Park LWS	1.15	0.67
Stenhills Open Space LWS	1.78	1.29

[a] Critical load data obtained from APIS (2026).

[a] Above the critical load, additional deposition will lead to an exceedance.

[c] In the absence of information about the specific habitats present at each LWS designation, data for both grassland features and forest features are provided for each LWS. It has been assumed that grassland features will comprise either acid or calcareous grassland, whilst forest features are assumed to be broadleaved, mixed or yew woodlands.

[d] There are no forest features designated at the Mersey Estuary SPA, Ramsar or SSSI.

[e] The Ramsar is not sensitive to acid deposition.

5 Baseline Conditions

Local Air Quality Management

5.1 Under Part IV of the Environment Act 1995, Halton Borough Council (HBC) is required to periodically review and assess air quality within its area of jurisdiction. This process of Local Air Quality Management (LAQM) is an integral process for achieving the national AQOs.

5.2 Review and assessments of local air quality aim to identify areas where national policies to reduce vehicle and industrial emissions are unlikely to result in air quality meeting the Government's air quality objectives by the required dates.

5.3 Where the assessment indicates that some or all of the objectives may be potentially exceeded, the Local Authority has a duty to declare an AQMA. The declaration of an AQMA requires the Local Authority to implement an Air Quality Action Plan (AQAP) to reduce air pollution concentrations so that the required AQOs are met.

5.4 HBC does not currently measure any of the pollutants of concern in this assessment and has also not declared any AQMAs for these pollutants within its area.

National Monitoring

5.5 In the absence of local monitoring data, baseline conditions have been sourced from a combination of Defra's:

- Automatic Urban and Rural Network (AURN) (2026a);
- Hydrocarbon network (Automatic and Non-automatic) (2026b; 2026c);
- Heavy Metals network (2026d); and
- Published background maps for 2025 (2026e).

5.6 Monitoring data have been downloaded from Defra's Air Information Resource (2026f),

5.7 Hydrogen fluoride and methanol are not routinely monitored in ambient air in the UK as they are specialist compounds primarily used/emitted from a limited number of industrial emission sources and there are no literature sources which provide typical representative ambient concentrations. Consequently, the assessment focuses on the Process Contribution (PC) only.

Automatic Urban and Rural Network

5.8 Data for 2025 from the nearest AURN monitor for particulate matter (PM_{10} and $PM_{2.5}$), CO and SO_2 are provided in Table 5-1. Data for particulate matter and SO_2 have been taken from Liverpool Speke, approximately 8 km to the northwest of the facility, whilst data for CO have been taken from Leeds Centre, approximately 95 km to the northeast of the facility. Measured concentrations are well below the relevant long-term AQS / AQO.

Table 5-1: Summary of Annual Mean Monitoring (µg/m^3) from the AURN for 2025

Site Name	Site Type	Pollutant	2025
Liverpool Speke	Urban Industrial	PM_{10}	15.9
		$PM_{2.5}$	8.9

Site Name	Site Type	Pollutant	2025
		SO_2	1.3
Leeds Centre	Urban Background	CO	145

Hydrocarbon Networks

5.9 Data for 2025 from the nearest monitor from the non-automatic hydrocarbon network for benzene (Liverpool Speke) and data for hexane from the automatic hydrocarbon network are provided in Table 5-2. Measured concentrations are well below the relevant long-term AQS / AQO / EAL.

Table 5-2: Summary of Annual Mean Hydrocarbon Monitoring (µg/m³) for 2025

Site Name	Site Type	Pollutant	2025
Liverpool Speke	Urban Industrial	Benzene	0.56
Chilbolton Observatory	Rural Background	Hexane	0.13
London Honor Oak Park	Urban Background		0.25
London Marylebone	Urban Traffic		0.35

Heavy Metals Network

5.10 Data for 2025 from the nearest monitors from the heavy metals network (urban background sites Chesterfield Loundsley Green, Sheffield Devonshire Green and Sheffield Tinsley, between 80 and 90 km to the east of the facility) are provided in Table 5-2. Measured concentrations are well below the relevant long-term AQO / EAL.

Table 5-3: Summary of Annual Mean Monitoring (ng/m³) from the Heavy Metals Network for 2025

Pollutant	Site Name	2025
Copper	Chesterfield Loundsley Green	3.5
	Sheffield Devonshire Green	6.3
	Sheffield Tinsley	15.7
Manganese	Chesterfield Loundsley Green	4.4
	Sheffield Devonshire Green	7.0
	Sheffield Tinsley	32.8
Nickel	Chesterfield Loundsley Green	1.0
	Sheffield Devonshire Green	1.8
	Sheffield Tinsley	19.5
Lead	Chesterfield Loundsley Green	5.6
	Sheffield Devonshire Green	6.2
	Sheffield Tinsley	13.7

Pollutant	Site Name	2025
Zinc	Chesterfield Loundsley Green	19.8
	Sheffield Devonshire Green	20.9
	Sheffield Tinsley	90.0

National Background Pollution Maps

5.11 Defra maintains a nationwide model (the Pollution Climate Mapping (PCM) model) of background concentrations of several pollutants at a 1 km grid square resolution. The PCM model is semi-empirical in nature; it uses data from the National Atmospheric Emissions Inventory (NAEI) to model the concentrations of pollutants at the centroid of each 1 km grid square but then calibrates these concentrations in relation to actual monitoring data.

5.12 Whilst the background maps are regularly updated for particulate matter (Defra, 2026e), the background maps for benzene have not been updated since 2010, whilst those for SO_2 and CO have not been updated since 2001. As such, given there are more recent monitoring data available for these pollutants, estimated background concentrations are not presented, and only those for PM_{10} and $PM_{2.5}$, covering the entirety of the HBC area, are set out in Table 5-4.

Table 5-4: Estimated Annual Mean Particulate Matter Background Concentrations (µg/m³)

Pollutant	Assessment Year	Value
PM_{10}	2025	9.9 – 14.9
$PM_{2.5}$	2025	5.9 – 9.4

Summary of Baseline Concentrations for Human Health Receptors

5.13 Table 5-5 sets out the baseline long-term (annual mean and 24-hour (LT) mean) concentrations used in this assessment.

5.14 It is not appropriate to add predicted short term or percentile concentrations from different emission sources, since peak contributions from different sources would not necessarily coincide in time or space. For the purposes of estimating short-term baseline concentrations (averaging periods of 24-hours (short-term) or less), a factor of two has been applied to the annual mean baseline concentration in Table 5-5 in accordance with the Environment Agency's "*Air emissions risk assessment for your environmental permit*" guidance (2026).

Table 5-5: Baseline Long-term Concentrations and Deposition Rates Used in the Assessment

Pollutant	Value		Derivation
	Concentration	Deposition (mg/m²/day) [a]	
PM_{10}	15.9 µg/m³	-	Highest value from either background maps or Liverpool Speke monitor in 2025

Pollutant	Value		Derivation
	Concentration	Deposition (mg/m²/day) [a]	
$PM_{2.5}$	9.4 µg/m³	-	Highest value from either background maps or Liverpool Speke monitor in 2025
SO_2	1.3 µg/m³	-	Value from Liverpool Speke in 2025
CO	145 µg/m³	-	Value from Leeds Centre in 2025
Benzene	0.56 µg/m³	-	Value from Liverpool Speke in 2025
Hexane	0.35 µg/m³	-	Highest value from any of the three monitors in 2025
Copper	15.7 ng/m³	0.04	Highest value from the three nearest monitors in 2025
Manganese	32.8 ng/m³	-	Highest value from the three nearest monitors in 2025
Nickel	19.5 ng/m³	0.05	Highest value from the three nearest monitors in 2025
Lead	13.7 ng/m³	0.04	Highest value from the three nearest monitors in 2025
Zinc	90 ng/m³	0.23	Highest value from the three nearest monitors in 2025

[a] Calculated from the long-term concentration by applying the same methodology described in paragraph 6.32.

Designated Ecological Sites

5.15 Background concentrations of SO_2 and acid deposition fluxes have been taken from the APIS website (2026). These data represent three-year mean 1 km x 1 km averages centred on the calendar year of 2021. For SO_2, the maximum concentration across the study area has been applied at all locations irrespective of the habitat or designation, whilst baseline acid deposition fluxes corresponding to the specific location have been taken for each habitat; the acid deposition fluxes include the contribution from both sulphur deposition and nitrogen deposition. Table 5-5 sets out the baseline values used in this assessment.

5.16 The maximum SO_2 concentration across the study area is well below the most stringent critical level of 10 µg/m³. Baseline acid deposition fluxes are above the critical loads at the majority of sites, which is the case for very many designated ecological sites across the UK; the exceptions are at Mersey Estuary and three of the LWS (the Weston Marsh Lagoon, Frodsham and Helsby and Ince Marshes and Frodsham Field Studies Centre), where baselines for both grassland and forest features, where applicable, are well below the critical loads.

Table 5-6: Background Concentrations and Deposition Fluxes at Designated Ecological Sites

Designation	SO_2 (µg/m³)		Acid Deposition (keq/ha/yr)			
			Grassland		Forest	
	Baseline	CLe	Baseline	CLo	Baseline	CLo
Mersey Estuary SPA, Ramsar and SSSI / Upper Mersey LWS	5.6	10	1.83	4.86	- [a]	
Midland Meres and Mosses – Phase 1 Ramsar			- [b]			
Runcorn Hill LNR and LWS			1.60	1.34	2.77	1.15
Clifton Cloughs LWS			1.61	1.29	2.80	1.77
Weston Marsh Lagoon LWS			1.65	4.55	2.88	11.11
Frodsham and Helsby and Ince Marshes LWS			1.65	4.55	2.88	11.11
Frodsham Field Studies Centre LWS			1.65	4.55	2.81	11.11
Clifton Lagoon LWS			1.61	1.29	2.80	1.77
Land North of Hallwood Park LWS			1.60	0.67	2.78	1.15
Stenhills Open Space LWS			1.61	1.29	2.78	1.78

[a] There are no forest features designated at the Mersey Estuary SPA, Ramsar or SSSI.

[b] The Ramsar is not sensitive to acid deposition.

6 Modelling Methodology

6.1 Modelling has been carried out using the following Environment Agency guidance:

- Air emissions risk assessment for your environmental permit (2026); and
- Environmental permitting: air dispersion modelling reports (2024).

Dispersion Model

6.2 There are two primary dispersion models which are used extensively throughout the UK for assessments of this nature and accepted as appropriate air quality modelling tools by the Regulators and local planning authorities alike:

- The ADMS model, developed in the UK by Cambridge Environmental Research Consultants (CERC) in collaboration with the Met Office, National Power and the University of Surrey; and
- The AERMOD model, developed in the United States by the American Meteorological Society (AMS)/United States Environmental Protection Agency (EPA) Regulatory Model Improvement Committee (AERMIC).

6.3 Both models are termed 'new generation' Gaussian plume models, parameterising stability and turbulence in the Planetary Boundary Layer (PBL) by the Monin-Obukhov length and the boundary layer depth. This approach allows the vertical structure of the PBL to be more accurately defined than by the stability classification methods of earlier dispersion models. Like these earlier models, ADMS and AERMOD adopt a symmetrical Gaussian profile of the concentration distribution in the vertical and crosswind directions in neutral and stable conditions. However, unlike earlier models, the ADMS and AERMOD vertical concentration profile in convective conditions adopts a skewed Gaussian distribution to take account of the heterogeneous nature of the vertical velocity distribution in the Convective Boundary Layer (CBL).

6.4 Numerous model inter-comparison studies have demonstrated little difference between the output of ADMS and AERMOD, except in certain scenarios, such as in areas of complex terrain (Carruthers et al., 2011). For the purposes of this study, the use of the ADMS model (version 6) is adopted. ADMS is widely used for assessments of this type and has been extensively validated. Consequently, it is considered suitable for the current assessment.

Emission Scenarios

6.5 A single model scenario has been developed to assess the impact of the facility's operations. This assumes that each stack emits constantly throughout the year, with the long-term outputs scaled according to their annual hours of operation as described in Section 3 to reflect the batch nature of the processes. This approach assumes worst-case short-term process contributions are considered.

Stack and Emission Parameters

6.6 Figure 6-1 presents the locations of all emission sources modelled. The associated stack physical parameters and emission parameters for each modelled stack are presented in Table 6-1 and Table 6-2, respectively.

6.7 Stack physical parameters and emission parameters, including volumetric flow rates and discharge temperatures, have been provided by Watercycle Technologies. The precise emissions are likely to vary depending on the specific stage of the batch processes being undertaken within the facility.

The assessment assumes that the facility is operating with emission concentrations representing the upper range of the Best Available Techniques – Associated Emission Levels (BAT-AELs) set out in the draft UK BAT Conclusions for Common Waste Gas Management and Treatment Systems in the Chemical Sector (Defra, 2026f), BAT-AELs in the BAT Conclusions for the Non-Ferrous Metals sector, or for pollutants with no BAT-AELs (i.e., Cu, Zn, Mn, CO and hexane), at the estimated levels post abatement based on the results of the initial laboratory scale testing provided by Watercycle Technologies. Actual emission levels will be confirmed during commissioning.

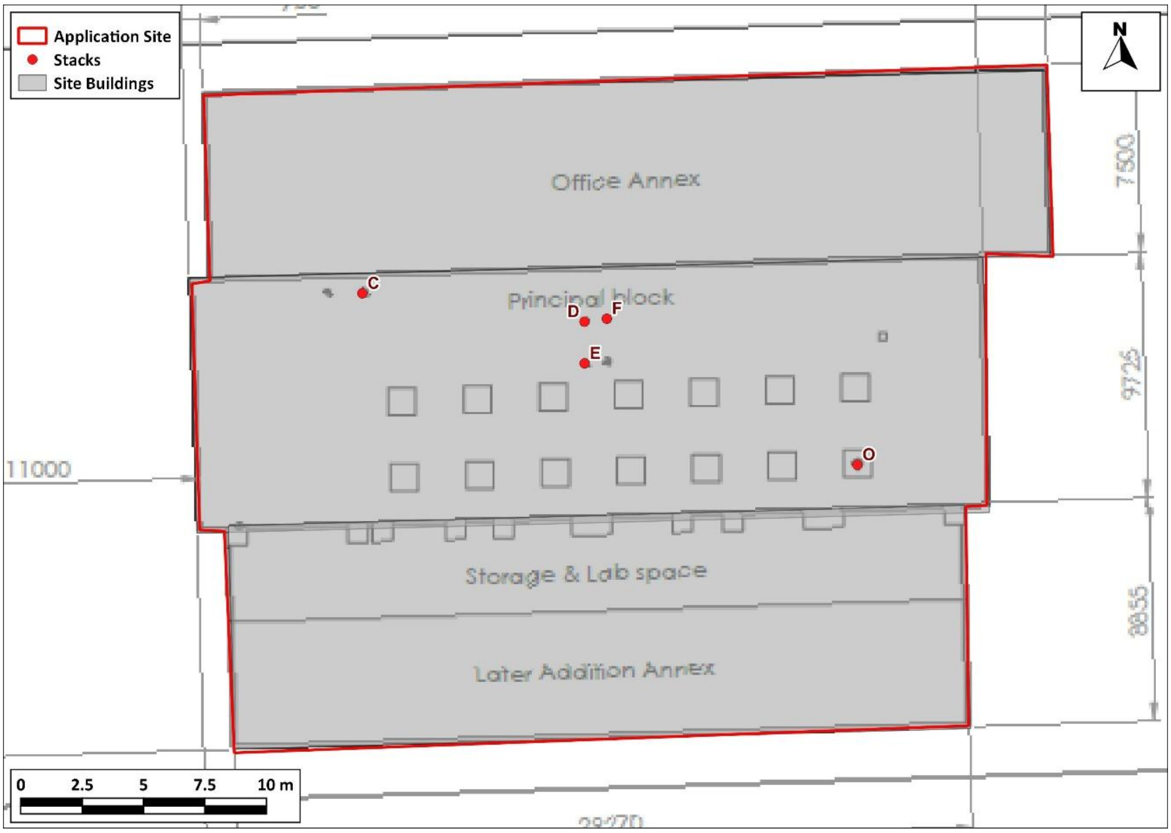

Figure 6-1: Location of Emission Points

Imagery provided by Watercycle Technologies (Drawing Number IP103BS-D1-02, Rev A01)

Table 6-1: Modelled Physical Release Parameters for the Facility

Parameter	Stack ID (as Referenced in Figure 6-1)				
	C	D	E	F	O
Source Name	Li_2CO_3/Li_3PO_4 Pan Dryer	Extraction system for Li_2CO_3/Li_3PO_4 Crystallisation Reactor	MHP Reactor Extraction	Black Mass Dust Extraction	Black Mass Sulphuric Acid Leaching Reactor
Permit Emission Point Reference Number	A1	A2	A3	A4	A5
Source Type	Point	Point	Point	Point	Point
X-Coordinate	351289	351298	351298	351299	351309

Parameter	Stack ID (as Referenced in Figure 6-1)				
	C	D	E	F	O
Y-Coordinate	380978	380977	380975	380977	380971
Discharge Height Above Ground (m)	7.6	7.6	7.6	7.6	7.6
Discharge Diameter (m)	0.315	0.225	0.225	0.315	0.350

Table 6-2: Modelled Emission Parameters for the Facility [a]

Parameter	Stack ID (as Referenced in Figure 6-1)				
	C	D	E	F	O
Discharge Temperature (°C)	25	Ambient	33	Ambient	25
Discharge Velocity (m/s)	2.1	11.4	11.4	14.3	8.9
Volumetric Flowrate at Discharge Conditions (Am^3/s)	0.17	0.45	0.45	1.11	0.86
Volumetric Flowrate at Normalised Conditions (Nm^3/s)	0.15	0.43	0.40	1.05	0.79
PM Emission Concentration (mg/Nm^3)	5	5	- [b]	5	5
PM Emission Rate (g/s)	0.0008	0.002	- [b]	0.005	0.004
VOC Emission Concentration (mg/Nm^3)	20	20	20	20	20
VOC Emission Rate (g/s)	0.003	0.009	0.008	0.02	0.02
Copper Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	0.17	- [b]
Copper Emission Rate (g/s)	- [b]	- [b]	- [b]	0.0002	- [b]
Nickel Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	0.10	- [b]
Nickel Emission Rate (g/s)	- [b]	- [b]	- [b]	0.0001	- [b]
Lead Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	0.10	- [b]
Lead Emission Rate (g/s)	- [b]	- [b]	- [b]	0.0001	- [b]
Zinc Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	0.21	- [b]
Zinc Emission Rate (g/s)	- [b]	- [b]	- [b]	0.0002	- [b]
Manganese Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	0.27	- [b]

Parameter	Stack ID (as Referenced in Figure 6-1)				
	C	D	E	F	O
Manganese Emission Rate (g/s)	- [b]	- [b]	- [b]	0.0003	- [b]
SO_2 Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	- [b]	100
SO_2 Emission Rate (g/s)	- [b]	- [b]	- [b]	- [b]	0.08
CO Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	- [b]	21
CO Emission Rate (g/s)	- [b]	- [b]	- [b]	- [b]	0.02
HF Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	- [b]	1
HF Emission Rate (g/s)	- [b]	- [b]	- [b]	- [b]	0.001
Hexane Emission Concentration (mg/Nm^3)	- [b]	- [b]	- [b]	- [b]	0.36
Hexane Emission Rate (g/s)	- [b]	- [b]	- [b]	- [b]	0.0003

[a] For non-combustion sources, reference (normalised) conditions are 273 K, 101.3 kPa with no oxygen or moisture correction applied.

[b] Stack does not emit this pollutant.

Receptors and Study Area

6.8 Human health impacts have been predicted over a 10 km x 10 km model domain, with the facility at the centre. Concentrations have been predicted over this area using nested Cartesian grids (see Figure 6-2). These grids have a spacing of:

- 5 m x 5 m within 200 m of the centre of the facility;
- 25 m x 25 m within 400 m of the centre of the facility;
- 50 m x 50 m within 1,000 m of the centre of the facility;
- 250 m x 250 m within 2,000 m of the centre of the facility; and
- 500 m x 500 m within 5,000 m of the centre of the facility.

6.9 This grid is considered to provide a sufficiently high resolution to enable the identification of worst-case impacts throughout the study area. The receptor grid has been modelled at a height of 1.5 m above ground level.

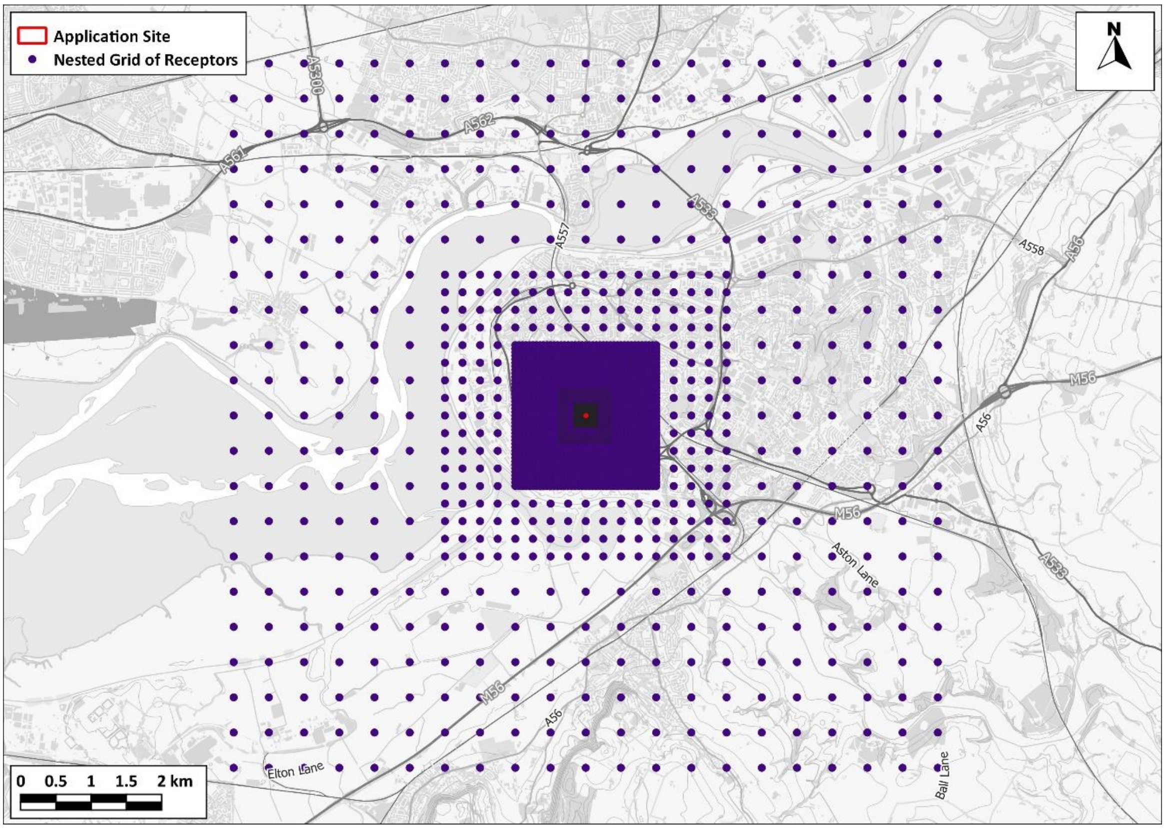

Figure 6-2: Modelled Nested Grid of Receptors

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

6.10 Specific receptors have also been selected to determine impacts at locations where the assessment criteria apply. The specific receptors identified are detailed in Table 6-3 and shown in Figure 6-3. All receptors have been modelled at a height of 1.5 m above ground level.

Table 6-3: Specific Human Health Receptor Description and Coordinates

Receptor ID	Description	X Coordinate	Y Coordinate	Approx. Distance to Site Boundary (m)
1	Residential property on Heath Drive	351226	381287	305
2	Residential property on Clifton Road	351362	381266	280
3	Residential property on Beaufort Close	351517	381192	285
4	Residential property on Clifton Road	351558	381076	255
5	Residential property on Ashbourne Avenue	351638	380844	345
6	Residential property on Hamlin Close	351184	380780	205

Receptor ID	Description	X Coordinate	Y Coordinate	Approx. Distance to Site Boundary (m)
7	Residential property on Weston Crescent	351027	380917	260
8	Weston Primary School	351181	380687	290
9	Heathside Nursery	350872	381080	420
10	Runcorn Golf Course	351349	380881	85
11	Runcorn Golf Course	351402	380942	90
12	Runcorn Golf Course	351426	381043	120
13	Runcorn Golf Course	351439	381139	195
14	Runcorn Golf Course	351499	380953	185

Figure 6-3: Specific Human Health Receptor Locations

Imagery ©2026 Airbus, Bluesky, Infoterra Ltd & COWI A/S, Maxar Technologies

6.11 In addition, specific receptors have been modelled at the boundaries of the designated ecological sites closest to the facility; their locations are shown in Figure 6-4. The grid references for these specific locations are presented in Table 6-4. Receptors have been modelled at 1.5 m above ground level to be consistent with Defra's national modelling of ecosystem impacts.

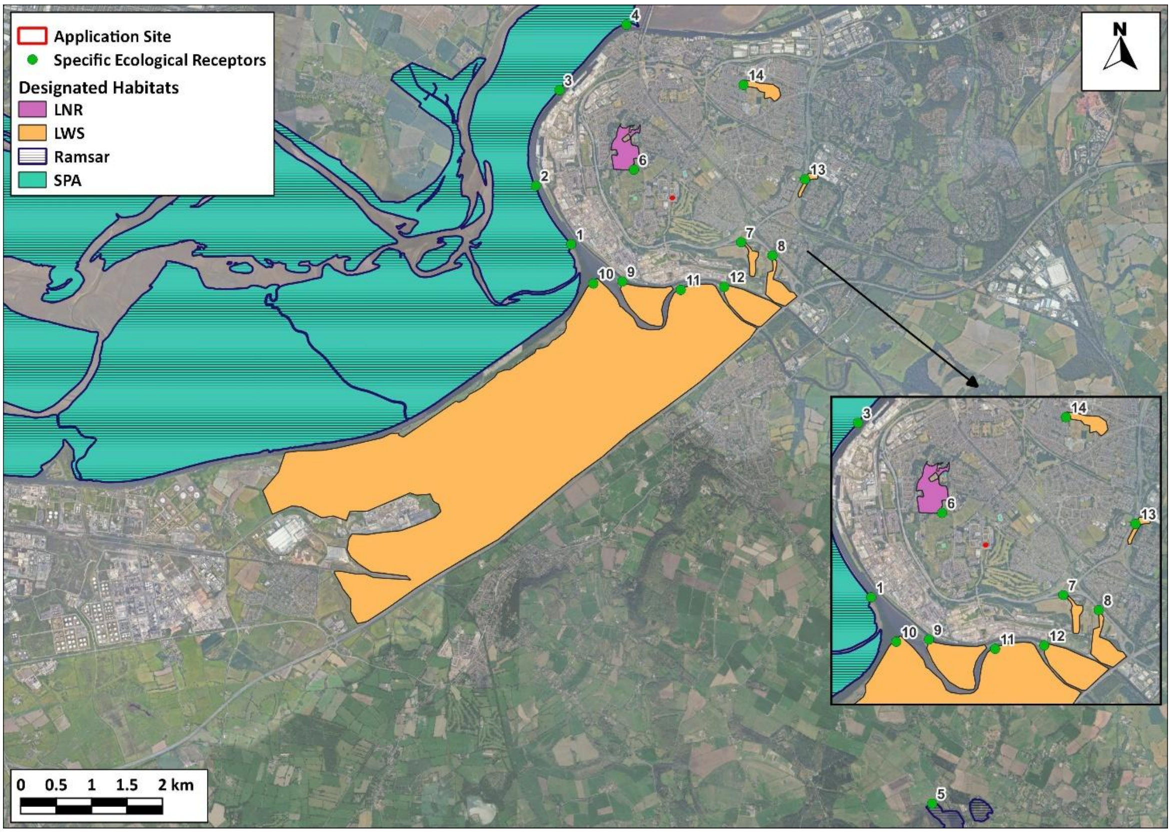

Figure 6-4: Modelled Ecological Receptors

Imagery ©2026 Airbus, Bluesky, Infoterra Ltd & COWI A/S, Maxar Technologies

Table 6-4: Specific Ecological Receptor Coordinates

Receptor ID	Designated Ecological Site	X Coordinate	Y Coordinate
1	Mersey Estuary SPA / Ramsar / LWS	349869	380321
2	Mersey Estuary SPA / Ramsar / LWS	349371	381149
3	Mersey Estuary SPA / Ramsar / LWS	349703	382500
4	Mersey Estuary SPA / Ramsar / LWS	350650	383422
5	Midland Meres and Mosses Phase 1 Ramsar	354969	372418
6	Runcorn Hill LNR / LWS	350755	381374
7	Clifton Cloughs LWS	352270	380350
8	Clifton Lagoon LWS	352713	380160
9	Weston Marsh Lagoon LWS	350591	379794
10	Frodsham Helsby and Ince LWS	350182	379765
11	Frodsham Helsby and Ince LWS	351418	379676
12	Frodsham Field Studies Centre LWS	352032	379719

Receptor ID	Designated Ecological Site	X Coordinate	Y Coordinate
13	Land North of Hallwood Park LWS	353174	381239
14	Stenhills Open Space LWS	352304	382572

Meteorological Data

6.12 To allow for uncertainties in local and future-year conditions, the dispersion model has been run five times, with each run using a different full year of hour-by-hour meteorological data from the nearest appropriate meteorological site.

6.13 Hourly sequential meteorological data from Liverpool Airport have been used for the years 2020 - 2024 inclusive. The Liverpool Airport meteorological monitoring station is located approximately 8 km to the west of the facility. It is considered to be the nearest monitoring station representative of meteorological conditions at the site. The Liverpool Airport meteorological station is operated by the UK Meteorological Office. Raw data were provided by the Met Office, and processed by AQC for use in ADMS.

6.14 The meteorological parameters entered into the model are shown in Table 6-5. Wind roses for each year are presented in Appendix A1.

Table 6-5: Meteorological Parameters Entered into the ADMS Model

Parameter	Modelled Receptors	Meteorological Site
Surface Roughness	Variable Surface Roughness File	0.2 m
Minimum MO Length	30 m	30 m
Surface Albedo	0.23 [a]	0.23 [a]
Priestly-Taylor Parameter	1 [a]	1 [a]

[a] Model default value. An analysis of the effects of surface characteristics on ground level concentrations by the UK Atmospheric Dispersion Modelling Liaison Committee (Auld et al., 2003) concluded surface energy budget parameters such as albedo and the Priestly-Taylor parameter have "*relatively little impact on model uncertainty*". Consequently, it is considered appropriate to retain the model default values which are applicable for moist ground that is not snow covered (representative of typical UK conditions).

Terrain Effects

6.15 Figure 2-3 shows the terrain across the modelled study area using OS Terrain 50 data. The ADMS User Guide recommends terrain data should be included in the model set up where terrain gradients exceed 1 in 10. Terrain gradients do not exceed this criterion and, consequently, terrain data have not been included in the core model set up.

6.16 However, sensitivity analysis with respect to the treatment of terrain is provided in Table 6-9.

Surface Roughness

6.17 The roughness length represents the aerodynamic effects of surface friction and is defined as the height at which the extrapolated surface layer wind profile tends to zero. This value is an important parameter used by meteorological pre-processors to interpret the vertical profile of wind speed and estimate friction velocities which are, in turn, used to define heat and momentum fluxes and, consequently, the degree of turbulent mixing in the boundary layer.

6.18 The surface roughness length is related to the height of surface elements; typically, the surface roughness length is approximately 10% of the height of the main surface features. Consequently, it follows that surface roughness is greater in urban, congested areas than in rural, open areas.

6.19 CERC (2023) and Oke (1987) suggest typical roughness lengths for various land use categories as summarised in Table 6-6.

Table 6-6: Typical Surface Roughness Lengths of Different Land Use Types

Type of Surface	Surface Roughness Length (m)
Ice	0.00001
Smooth snow	0.00005
Calm sea / water	0.0001 - 0.0002
Lawn grass	0.01
Pasture	0.2
Isolated settlement (farms, trees, hedges)	0.4
Parkland, woodlands, villages, open suburbia	0.5-1.0
Forests/cities/industrialised areas	1.0-1.5
Heavily industrialised areas	1.5-2.0

6.20 The study area encompasses a range of land types. Consequently, a variable surface roughness file has been used to represent the spatial variation of the surface roughness over each land type as shown in Figure 6-5. The following parameters have been used to define the surface roughness length and land type:

- forest – 1 m;
- built-up area – 0.5 m;
- grassland – 0.2 m; and
- water – 0.0001 m.

6.21 The variable surface roughness file was generated for a 50 m resolution gridded area covering the model domain by assigning appropriate representative surface roughness values based on the underlying land use categories. The land use categories were derived by combining those defined in the Meridian 2 and VectorMap District datasets available from Ordnance Survey.

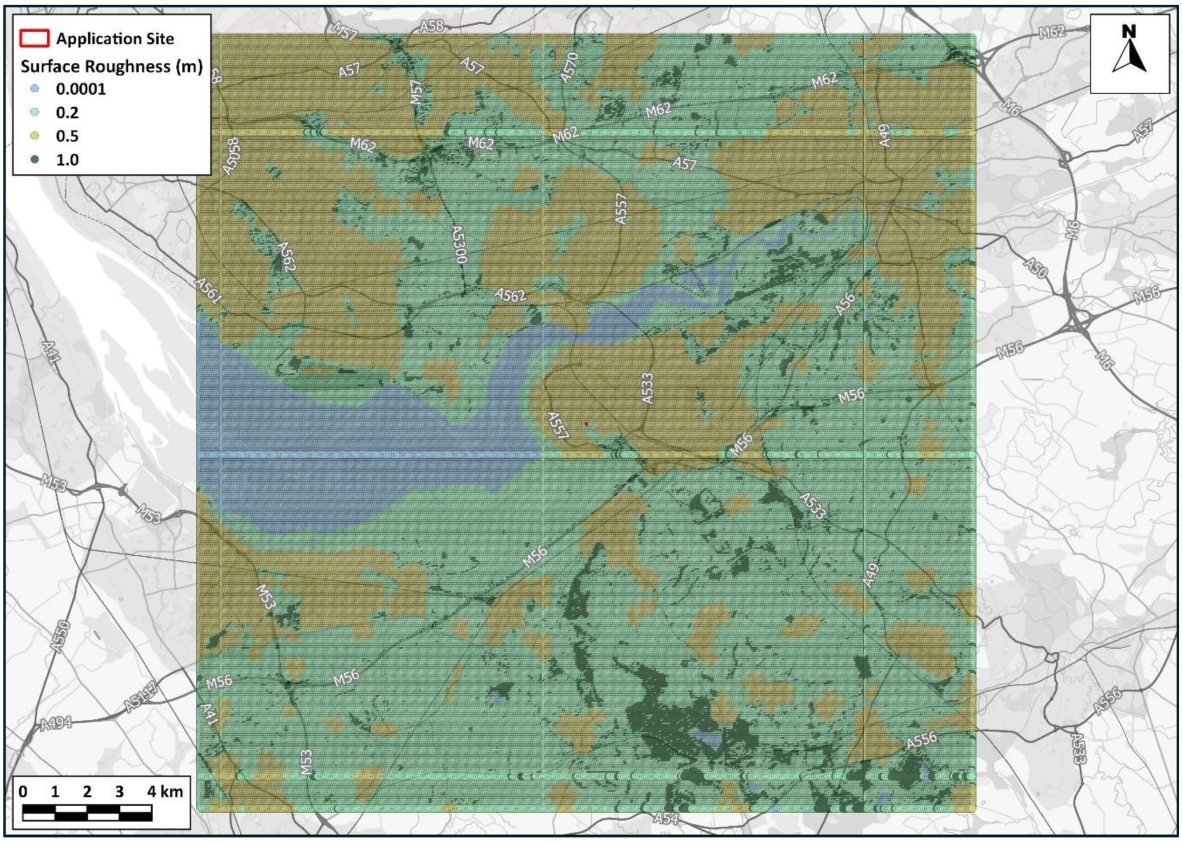

Figure 6-5: Surface Roughness across Modelled Area

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

Buildings

6.22 Atmospheric flow is disrupted by aerodynamic forces in the immediate vicinity of structures. These disruptions generate an area of stagnation behind the structure known as the cavity region. The flow within this region is highly turbulent and can be visualised as circulating eddies of air. The area beyond the cavity region is known as the building wake, where turbulence generated by the structure gradually decays to background levels. The entire area covered by the cavity region and turbulent wake is known as the 'building envelope'.

6.23 The above phenomena can cause a plume to be drawn downwards towards the ground in the building envelope, resulting in elevated ground level concentrations; this effect is known as building induced downwash. The building envelope is generally regarded as extending to a height of three times the height of the structure in the vertical plane, and a distance of 5L (where L is the lesser of the building width or height) from the foot of the building in the horizontal plane. Consequently, stacks within these extents should be identified and the corresponding building included in the dispersion model. The location of the modelled buildings relative to the stacks are shown in Figure 6-6 with their dimensions provided in Table 6-7. Building heights have been provided by Watercycle Technologies.

6.24 Sensitivity analysis to understand the effects of assumptions related to the treatment of buildings within the model is provided in Table 6-9.

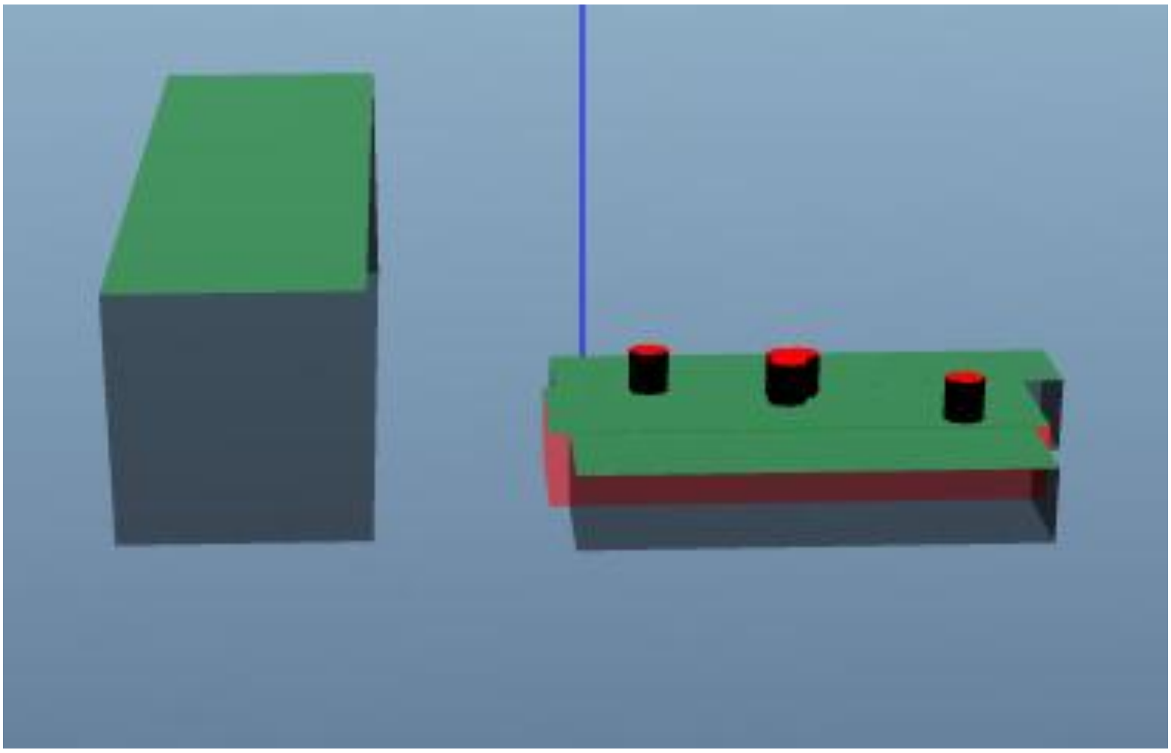

Figure 6-6: Buildings Included in the Model (Green-topped Objects) and Modelled Stacks (Red-topped Cylinders)

Table 6-7: Modelled Building Dimensions

Building	X (m)	Y (m)	Width (m)	Rotation (°)	Height (m)	Length (m)	Main Building?
Block 8 Principal Building (Block 8)	351299	380974	32.3	178.5	4.9 [a]	10.4	No
Block 8 Office Annex	351300	380983	34.3	178.5	4.9 [a]	7.5	No
Block 8 Storage	351299	380965	9.1	88.4	4.9 [a]	30.0	No
Block 5	351262	380995	67.1	88.4	16.0	16.1	Yes

[a] Corresponding to the height of the parapet wall on the Principal Block.

Model Post-Processing

6.25 For each individual receptor point, the maximum predicted concentration across any of the five meteorological datasets has been determined. It is these maxima which are presented.

Long-term PCs

6.26 The model has been run assuming constant operation. The processes that result in emissions from the stacks operate on a batch basis and do not occur continuously. Watercycle Technologies advised that the annual operation of each stack is as follows:

- Stack C: 1,928 hours (equivalent to 22% of the year);
- Stack D: 964 hours (equivalent to 11% of the year);
- Stack E: 964 hours (equivalent to 11% of the year);
- Stack F: 362 hours (equivalent to 4% of the year);
- Stack O: 964 hours (equivalent to 11% of the year);

6.27 Consequently, in line with the Environment Agency's "*Air emissions risk assessment for your environmental permit*" guidance (2026), temporal adjustment factors have been applied to the raw modelled annual mean process contributions, i.e., a factor of 0.22 has been applied to contributions from Stack C, whilst a factor of 0.11 has been applied to contributions from Stacks D, E and O, and a factor of 0.04 applied to contributions from Stack F.

6.28 No adjustment has been made to contributions corresponding to 24-hour mean (long-term) outputs.

Short-term PCs

6.29 Short-term PCs have been predicted assuming continuous operation with the model configured to produce an output for the relevant averaging period and percentile based on the acceptable number of exceedances as defined by the AQS / AQO / EAL. This provides a worst-case assessment.

Deposition

6.30 Deposition has not been calculated within the dispersion model. Instead, deposition has been calculated from the predicted ambient concentrations using prescribed deposition velocities. This means that depletion effects are ignored, resulting in a worst-case assessment.

6.31 Deposition velocities refer to a height above ground, typically 1 or 2 m, although in practice the precise height makes little difference and here they have been applied to concentrations predicted at a height of 1.5 m above ground, which is the average height of the monitors which underpin the Concentration Based Estimated Deposition (CBED) model which generates predictions used by UK Government.

Heavy Metals

6.32 Deposition of metals has been calculated using the methodology within the Environment Agency's "*Air emissions risk assessment for your environmental permit*" guidance (2026). In accordance with this guidance, a deposition velocity of 0.01 m/s has been applied to the modelled long-term concentration of each metal species to obtain a dry deposition rate.

6.33 The dry deposition rate is then multiplied by a factor of three to derive a total deposition rate that incorporates both dry and wet deposition. This factor will be conservative for receptors in the near vicinity of the facility where dry deposition dominates due to there being insufficient time for in-cloud and below cloud scavenging of the metal particles that contributes towards wet deposition.

6.34 This produces a deposition rate in µg/m^2/s, which is then converted to a mg/m^2/day figure for comparison with the maximum deposition rates.

Other Pollutants (HF / SO_2)

6.35 Predicted concentrations (in µg/m^3) have been multiplied by the dry deposition velocity (m/s) to predict a deposition flux (µg/m^2/s). Subsequent calculations required to present the data as keq/ha/yr for acidity follow basic chemical and mathematical rules[1].

Table 6-8: Deposition Velocities used in this Assessment

Pollutant	Deposition Velocity	Reference
Sulphur Dioxide	0.012 m/s (Grassland)	AQTAG06 (2014)
	0.024 m/s (Forest)	
Hydrogen Fluoride	0.031 m/s (Grassland)	Literature values presented in Cheng (2017)
	0.060 m/s (Forest)	Based on the grassland velocity, and these species all being reactive acidic species, this value is deemed appropriate for all species at forest locations. The value is consistent with that for HCl in forest areas in AQTAG06

6.36 Wet deposition of emissions of SO_2 from the facility has been discounted. Wet deposition of SO_2 this close to the emission source will be restricted to wash-out, or below cloud scavenging. For this to occur, rain droplets must come into contact with the gas molecules before they hit the ground. Falling raindrops displace the air around them, effectively pushing gasses away. The low solubility of SO_2 means that any scavenging of the gases will be a negligible factor. As a result, AQTAG06 (2014) advises wet deposition of SO_2 is not significant within a short range.

6.37 However, due to the increased solubility of HF, wet deposition of HF has been considered. Wet deposition of HF has been calculated by applying a factor of three to the dry deposition rate per the method in the Environment Agency's "*Air emissions risk assessment for your environmental permit*" guidance (2026).

Special Model Treatments

6.38 Special model treatments for e.g., short-term (puff) releases, coastal effects, fluctuations or photochemistry have not been used in this assessment.

Model Uncertainty

6.39 The point source dispersion model used in the assessment is dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each source, all of which are both variable and uncertain. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms. These uncertainties cannot be easily quantified, and it is not possible to verify the point-source model outputs. Where these parameters have been estimated the approach has been to use reasonable worst-case assumptions.

6.40 On balance, when taking into account the assumption that emissions occur at the relevant emission limit value (where applicable), the approach taken to meteorological conditions and the sensitivity

[1] i.e. 1 kg S/ha/yr = 0.063 keq/ha/yr

testing, the assessment can be expected to robustly predict the impacts of the facility. The approach has been designed to provide a robust and conservative assessment.

6.41 The use of dispersion models has been widely used in the UK for both regulatory and compliance purposes for many years and is an accepted approach for this type of assessment. The model used has also undergone extensive validation.

Sensitivity Analysis

6.42 As discussed at Paragraph 6.39, the point source dispersion model used in this assessment is required to simplify real-world conditions into a series of algorithms. Consequently, sensitivity analysis is an important component of any model assessment, since it helps to identify the potential magnitude of uncertainty in model predictions and the associated impacts on the conclusions of the assessment. Various sensitivity analyses have been undertaken in relation to the following inputs:

- meteorological data;
- buildings;
- terrain; and
- surface roughness.

6.43 The aim of the sensitivity analysis is not necessarily to find a model setup that obtains the maximum possible prediction from the model, but to provide greater understanding of how assumptions on key input variables may affect the assessment, so that these factors can be considered when evaluating the significance of potential effects and determining the conclusions of the assessment.

6.44 Sensitivity tests have been undertaken by establishing a 'core' model that is considered to best represent the actual site characteristics and emission scenarios. This is the model from which the results in Section 8 are obtained. This model is then run in different configurations to quantify the impact certain model options or assumptions may have on predicted concentrations. For buildings and terrain, this is simply a case of running one version of the model with these aspects included, and a second version with them excluded. In the case of the surface roughness sensitivity, the model has been run with a variable surface roughness file and a fixed surface roughness value (0.5 m) across the model domain.

6.45 The results of the sensitivity test at the worst-case specific receptor location have been compared and presented as a ratio to the 'core' model. For example, a value of 0.8 indicates the maximum result from the sensitivity test is 20% smaller than the 'core' model, whilst a value of 1.2 indicates the maximum result from the sensitivity test is 20% greater than the 'core' model.

6.46 Table 6-9 presents the sensitivity tests for the different averaging periods considered in this assessment at the specific receptor of maximum concentration for each run.

Table 6-9: Model Sensitivity Results

Averaging Period	Core model [a]	With Terrain [b]	No Buildings [c]	Uniform Surface Roughness Length [d]
Annual Mean	1.00	0.95	0.37	1.01
Weekly Mean	1.00	0.96	0.45	1.01
24-hour (LT) Mean	1.00	0.95	0.37	1.01
100th Percentile of 24-hour (ST) Mean	1.00	0.98	0.70	1.02
99.18th Percentile of 24-hour (ST) Mean	1.00	0.91	0.72	0.95
90.4th Percentile of 24-hour (ST) Mean	1.00	0.88	0.72	0.94
100th Percentile of 8-hour Mean	1.00	0.98	0.87	0.99
100th Percentile of 1-hour Mean	1.00	1.03	0.78	0.98
99.73rd Percentile of 1-hour Mean	1.00	1.07	0.82	1.00
99.9th Percentile of 15-minute Mean	1.00	1.11	0.84	0.99

[a] Buildings included, no terrain, variable surface roughness file.

[b] As per Core model but with terrain file included in the model set up.

[c] As per Core model but buildings excluded from model set up.

[d] As per Core model but with an uniform roughness length of 0.5 m rather than a variable roughness file.

The sensitivity analysis indicates that the model predictions are relatively insensitive to the assumptions on surface roughness length, with a fixed surface roughness leading to predictions that are up to +/- 6% of the core scenario. There is greater variation with respect to the treatment of terrain, with predictions up to +/- 12% of the core scenario; although gradients are generally less than 1:10 across the model domain, there is some variation in terrain elevation across the wider model domain, particularly to the west and south of the facility. For most averaging periods, inclusion of terrain reduces the predicted process contribution.

6.47 The greatest sensitivity is observed in the treatment of buildings, particularly for long-term averaging periods, which reflects the presence of the large adjacent building and the associated downwash effects.

6.48 Table 6-10 presents normalised results (ratio of the maximum impact at any specific receptor for a given year to the maximum impact at any specific receptor from any year) from the meteorological year sensitivity test and displays the typical range in outcomes that could be expected for any given year. There is typically more variation in annual mean predictions where changes in the prevailing wind direction (i.e., the frequency of winds dispersing material directly towards a receptor) have more impact at a specific receptor location than other variables. There is generally a more uniform radial distribution to shorter-term impacts.

Table 6-10: Meteorological Year Sensitivity Results (Core Model Scenario)

Averaging Period	2020	2021	2022	2023	2024
Annual Mean	0.86	1.00	0.92	0.99	0.94
Weekly Mean	0.83	0.95	0.95	1.00	0.90
24-hour (LT) Mean	0.86	1.00	0.92	0.99	0.94
100th Percentile of 24-hour (ST) Mean	0.91	0.92	0.94	1.00	0.92
99.18th Percentile of 24-hour (ST) Mean	0.77	0.88	0.75	1.00	0.89
99.4th Percentile of 24-hour (ST) Mean	0.88	0.95	0.85	1.00	0.90
100th Percentile of 8-hour Mean	0.91	0.87	1.00	0.92	1.00
100th Percentile of 1-hour Mean	1.00	1.00	1.00	1.00	1.00
99.73rd Percentile of 1-hour Mean	0.97	1.00	1.00	1.00	1.00
99.9th Percentile of 15-minute Mean	0.98	0.99	0.99	1.00	1.00

Data Gaps and Assumptions

6.49 Table 6-11 details the data gaps identified during the course of the assessment and the corresponding assumption made in order to allow an assessment to proceed.

Table 6-11: Data Gaps and Assumptions

Data Gap	Assumption
Speciation of VOCs	VOCs have been modelled as a group with the model predictions for the group as a whole assessed against the benzene and methanol EALs in accordance with Environment Agency guidance.
Actual emission levels	Emissions have been modelled assuming they occur at the relevant emission limit value or estimated concentration throughout the year. Actual emission levels will be confirmed during commissioning.
Particle size distribution	It has been assumed that the total particulate matter in the airstream consists either entirely of particulate matter <10 µm in aerodynamic diameter or of particulate matter <2.5 µm in aerodynamic diameter. In reality, there will be a range of size fractions present in the airstream, such that assuming exclusively PM_{10} or $PM_{2.5}$ is conservative.

7 Assessment Approach

7.1 The Environment Agency's "*Air emissions risk assessment for your environmental permit*" guidance (2026) (previously Horizontal Guidance Note H1) provides methods for quantifying the environmental impacts of emissions to air. This compares predicted PC and predicted environmental concentrations (PEC, i.e., PC in addition to background) to both long- and short-term environmental standards. These standards include guideline EALs and statutory AQS / AQO.

7.2 Air emission risk assessments for environmental permits require a three-tiered approach to assessing the significance of emissions to atmosphere. The first stage is to 'screen out' insignificant emissions to air using the H1 screening tool; these are emissions which are emitted in such small quantities that they are unlikely to cause a significant effect on ground level concentrations. The Environment Agency's guidance suggests that emissions are insignificant where PCs are less than:

- 1% of a long-term environmental standard; or
- 10% of a short-term environmental standard

7.3 For those emissions that cannot be screened out as insignificant using the H1 software tool, the guidance indicates that further modelling of emissions may be appropriate for long term effects where the PEC is greater than 70% of the long-term environmental benchmark. For short-term effects, further modelling of emissions is required where the PC is more than 20% of the difference between twice the (long-term) background concentration and the relevant short term environmental benchmark (i.e., more than 20% of the model 'headroom').

7.4 The above criteria apply to human receptors and SPAs, Special Areas of Conservation (SACs), SSSIs and Ramsar sites. For local nature sites, emissions can be screened as insignificant where the short-term and long-term PC is less than 100% of the relevant environmental benchmark with modelling required where this metric is exceeded.

7.5 In any resultant modelling assessment, the EA guidance explains no further action is required where the assessment shows that both of the following apply:

- emissions comply with BAT-AELs or the equivalent requirements where there is no BAT-AEL; and
- the resulting PECs will not exceed environmental standards.

7.6 Consequently, in this modelling study, the assessment of impacts is primarily made with respect to the PEC. Where the PEC is exceeded and BAT-AELs are being met, an assessment of the significance of the facility's impact towards the exceedance is made using the H1 software tool first tier insignificance criteria and/or professional judgment taking into account other mitigating factors, e.g., the probability of exceedance. Although the insignificance criteria technically apply to PCs predicted using the H1 software tool, they are considered suitable proxies for determining the significance of a facility's modelled contribution to a PEC.

7.7 This assessment models all relevant pollutants emitted from the various emission sources, including those that may have been screened out as insignificant using the H1 software tool, to provide a more robust prediction of the facility's impact on local air quality.

8 Results

Human Health Receptors

Long-term

8.1 Table 8-1 presents the maximum long-term PCs and PECs at any receptor on the modelled grid, and at the worst-case specific receptor identified in Figure 6-3 and Table 6-3 for the pollutants modelled in this assessment. Predicted PCs and PECs at all of the specific receptors are set out in in Appendix A2.

Table 8-1: Maximum Long-term PCs and PECs Relevant for Human Health

Location	X Coordinate	Y Coordinate	PC (µg/m³)	PC (% of Assessment Level) [a]	PEC (µg/m³) [b]	PEC (% of Assessment Level) [a]
Annual Mean PM_{10} AQS (40 µg/m³)						
Max on Grid [c]	351271	380986	0.31	0.77	16.20	40.50
Max at Relevant Receptor	351226	381287	0.01	0.01	15.90	39.75
Annual Mean $PM_{2.5}$ AQS (20 µg/m³)						
Max on Grid [c]	351271	380986	0.31	1.54	9.67	48.34
Max at Relevant Receptor	351226	381287	0.01	0.03	9.37	46.83
Annual Mean Benzene AQS (5 µg/m³)						
Max on Grid [c]	351271	380986	4.47	89.38	5.03	100.61
Max at Relevant Receptor	351226	381287	0.09	1.81	0.65	13.03
Annual Mean Methanol EAL (2,660 µg/m³)						
Max on Grid [c]	351271	380986	4.47	0.17	- [d]	- [d]
Max at Relevant Receptor	351226	381287	0.09	<0.01	- [d]	- [d]

Location	X Coordinate	Y Coordinate	PC (µg/m³)	PC (% of Assessment Level) [a]	PEC (µg/m³) [b]	PEC (% of Assessment Level) [a]
24-hour Mean Copper EAL (0.05 µg/m³)						
Max on Grid [c]	351271	380991	0.04	89.65	0.06	121.08
Max at Relevant Receptor	351226	381287	<0.01	2.07	0.02	33.50
Annual Mean Nickel AQS (0.02 µg/m³)						
Max on Grid [c]	351271	380991	<0.01	5.29	0.02	102.94
Max at Relevant Receptor	351226	381287	<0.01	0.12	0.02	97.78
Annual Mean Lead AQS (0.25 µg/m³)						
Max on Grid [c]	351271	380991	<0.01	0.42	0.01	5.90
Max at Relevant Receptor	351226	381287	<0.01	0.01	0.01	5.49
Annual Mean Manganese EAL (0.15 µg/m³)						
Max on Grid [c]	351271	380991	<0.01	1.89	0.04	23.73
Max at Relevant Receptor	351226	381287	<0.01	0.04	0.03	21.88
Annual Mean Hexane EAL (720 µg/m³)						
Max on Grid [c]	351316	380971	0.01	<0.01	0.36	0.05
Max at Relevant Receptor	351226	381287	<0.01	<0.01	0.35	0.05

[a] Based on unrounded numbers.

[b] After adding the relevant baseline concentrations from Table 5-5.

[c] Where the assessment criterion does not apply at the location due to there being no relevant exposure, the row has been greyed out.

[d] Baseline data are not available, and thus a PEC has not been presented.

8.2 Figure 8-1 through Figure 8-4 present contours of the modelled process contributions for some of the pollutants considered in the assessment; additional contours are presented in Appendix A2. The contours depict the area where the long-term PCs are greater than 1% of the respective assessment criteria (or 0.1% in the case of PM_{10}). The contours also show the locations where the maximum PCs are predicted at any location on the modelled grid and the location of maximum PCs at any location with relevant exposure.

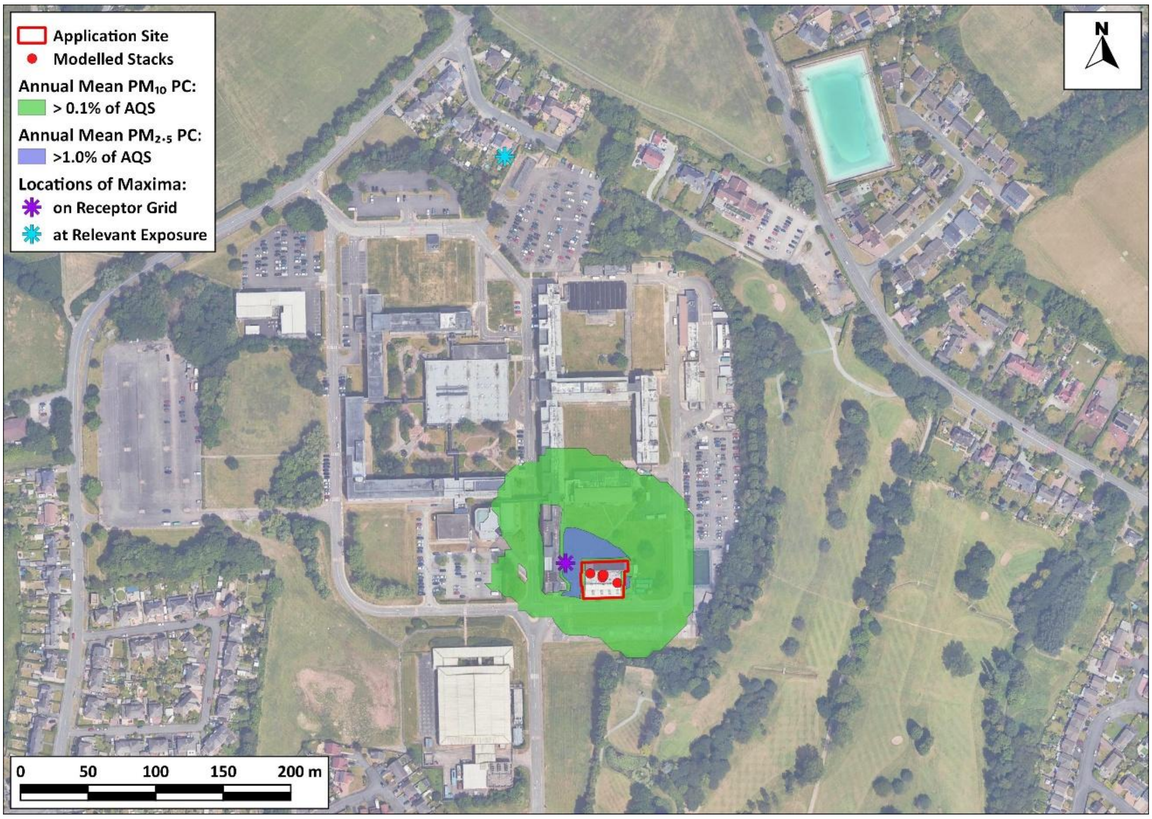

Figure 8-1: Contour Plot of Annual Mean PM_{10} and $PM_{2.5}$ PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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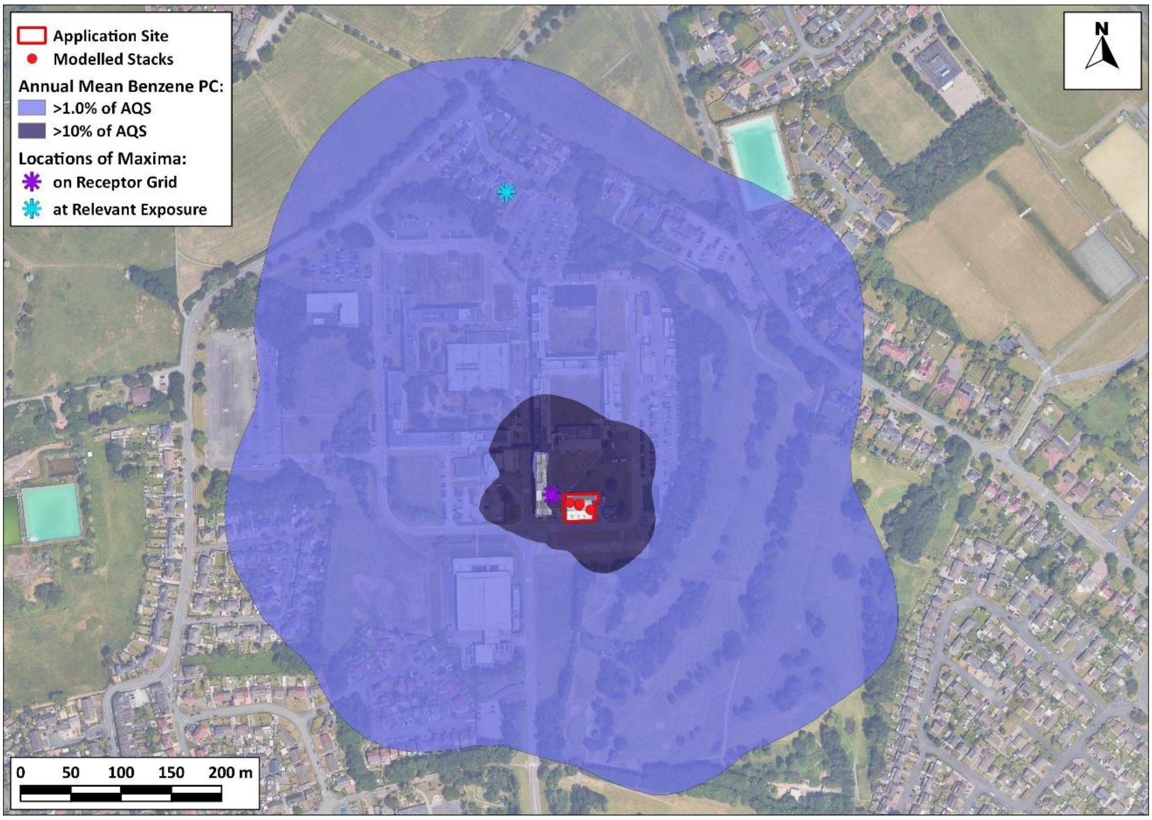

Figure 8-2: Contour Plot of Annual Mean Benzene PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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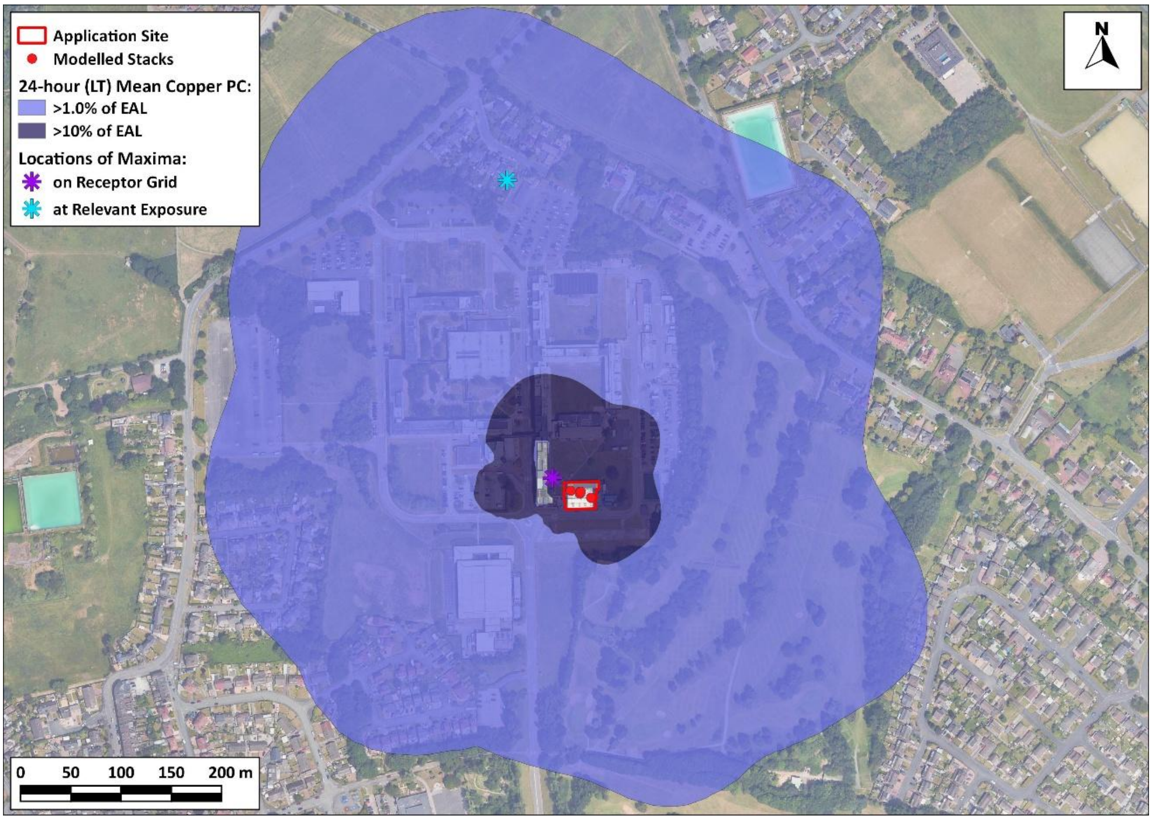

Figure 8-3: Contour Plot of 24-hour Mean Copper PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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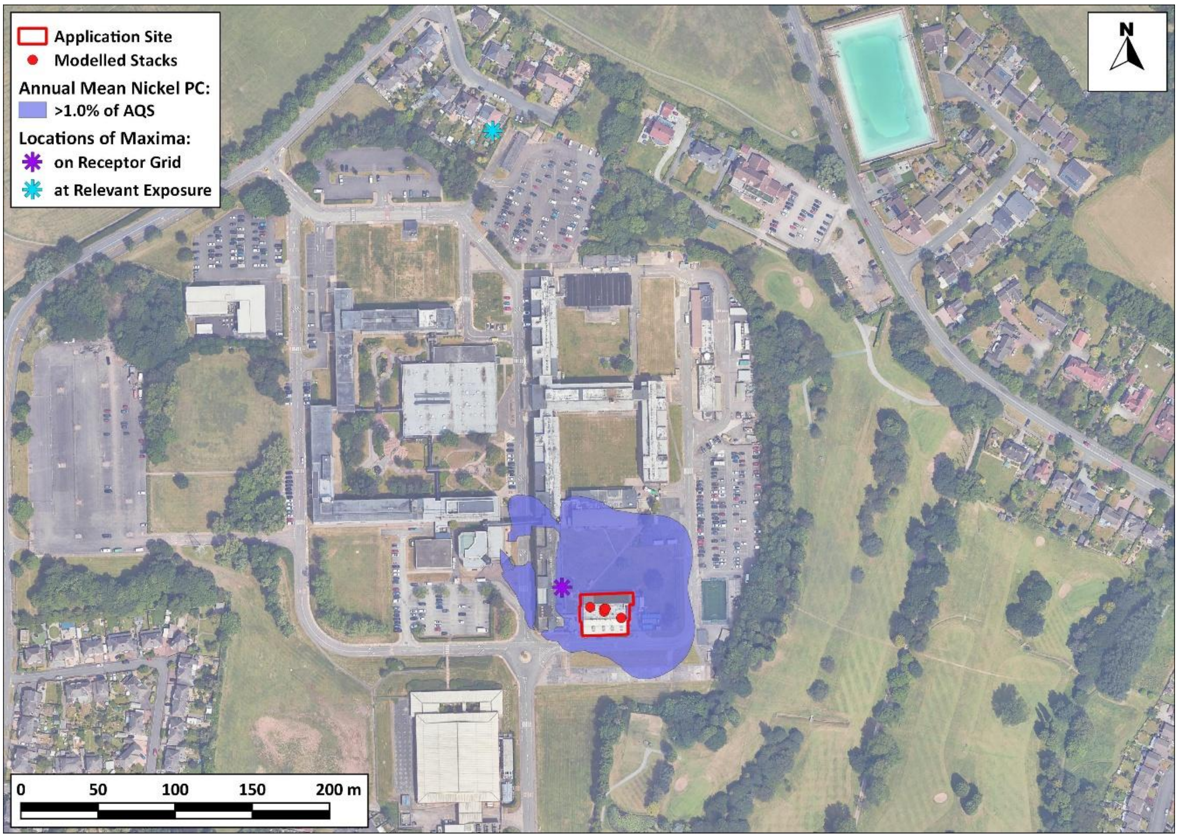

Figure 8-4: Contour Plot of Annual Mean Nickel PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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Short-term

8.3 Table 8-2 presents the maximum short-term PCs and PECs at any receptor on the modelled grid, and at the worst-case specific receptor identified in Figure 6-3 and Table 6-3 for the pollutants modelled in this assessment. Predicted PCs and PECs at all of the specific receptors are set out in in Appendix A2.

Table 8-2: Maximum Short-term PCs and PECs Relevant for Human Health

Location	X Coordinate	Y Coordinate	PC (µg/m³)	PC (% of Assessment Level) [a]	PEC (µg/m³) [b]	PEC (% of Assessment Level) [a]
24-hour Mean PM_{10} AQS (50 µg/m³)						
Max on Grid [c]	351271	380998	6.51	13.02	38.30	76.60
Max at Relevant Receptor	351349	380881	0.73	1.46	32.52	65.04
24-hour Mean Benzene EAL (30 µg/m³)						
Max on Grid [c]	351326	380986	47.35	157.84	48.47	161.58
Max at Relevant Receptor	351349	380881	9.71	32.35	10.83	36.09
1-hour Mean Methanol EAL (33,300 µg/m³)						
Max on Grid [c]	351336	380976	173.47	0.52	- [d]	- [d]
Max at Relevant Receptor	351349	380881	24.37	0.07	- [d]	- [d]
8-hour Rolling Mean CO AQS (10,000 µg/m³)						
Max on Grid [c]	351326	380956	22.48	0.22	312.48	3.12
Max at Relevant Receptor	351349	380881	6.81	0.07	296.80	2.97
1-hour Mean CO EAL (30,000 µg/m³)						
Max on Grid [c]	351271	380998	42.35	0.14	332.34	1.11
Max at Relevant Receptor	351349	380881	8.52	0.03	298.51	1.00

Location	X Coordinate	Y Coordinate	PC (µg/m³)	PC (% of Assessment Level) [a]	PEC (µg/m³) [b]	PEC (% of Assessment Level) [a]
1-hour Mean SO_2 AQS (350 µg/m³)						
Max on Grid [c]	351271	380998	146.80	41.94	149.46	42.70
Max at Relevant Receptor	351349	380881	32.02	9.15	34.67	9.91
24-hour Mean SO_2 AQS (125 µg/m³)						
Max on Grid [c]	351326	380956	53.35	42.68	56.01	44.81
Max at Relevant Receptor	351349	380881	11.44	9.15	14.10	11.28
15-minute Mean SO_2 AQS (266 µg/m³)						
Max on Grid [c]	351271	380998	207.60	78.04	210.26	79.04
Max at Relevant Receptor	351349	380881	43.59	16.39	46.24	17.38
1-hour Mean Nickel AQS (0.7 µg/m³)						
Max on Grid [c]	351271	380998	0.42	60.39	0.46	65.97
Max at Relevant Receptor	351349	380881	0.04	5.83	0.08	11.41
1-hour Mean Manganese EAL (1,500 µg/m³)						
Max on Grid [c]	351271	380998	1.13	0.08	1.20	0.08
Max at Relevant Receptor	351349	380881	0.11	0.01	0.17	0.01
1-hour Mean HF EAL (160 µg/m³)						
Max on Grid [c]	351271	380998	2.08	1.30	- [d]	- [d]
Max at Relevant Receptor	351349	380881	0.42	0.26	- [d]	- [d]

Location	X Coordinate	Y Coordinate	PC (µg/m³)	PC (% of Assessment Level) [a]	PEC (µg/m³) [b]	PEC (% of Assessment Level) [a]
1-hour Mean Hexane EAL (21,600)						
Max on Grid [c]	351271	380998	0.75	<0.01	1.45	0.01
Max at Relevant Receptor	351349	380881	0.15	<0.01	0.86	<0.01

[a] Based on unrounded numbers.

[b] After adding the relevant baseline concentrations from Table 5-5.

[c] Where the assessment criterion does not apply at the location (for instance, it occurs where members of the public do not have regular access), the row has been greyed out.

[d] Baseline data are not available, and thus a PEC has not been presented.

8.4 Figure 8-5 through Figure 8-8 present contours of the modelled short-term process contributions for some of the pollutants considered in the assessment; additional contours are presented in Appendix A2. The contours depict the area where the short-term PCs are greater than 10% of the respective assessment criteria. The contours also show the locations where the maximum PCs are predicted at any location on the modelled grid and the location of maximum PCs at any location with relevant exposure.

Figure 8-5: Contour Plot of 90.4th Percentile of 24-hour Mean PM_{10} PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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Figure 8-6: Contour Plot of 100th Percentile of 24-hour Mean Benzene PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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Figure 8-7: Contour Plots of SO_2 PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor for Each Averaging Period (15-minute, 1-hour and 24-hour)

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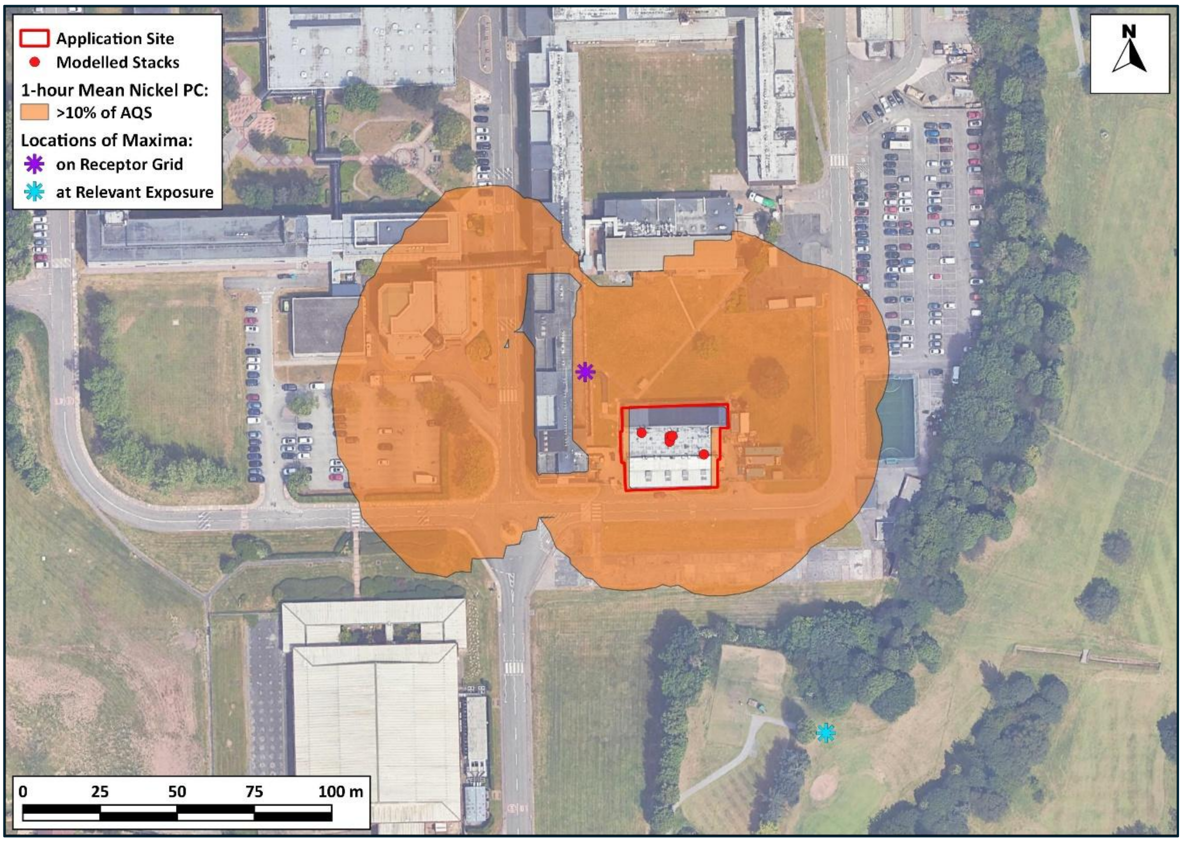

Figure 8-8: Contour Plot of 100th Percentile of 1-hour Mean Nickel PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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Deposition

8.5 Table 8-3 presents the maximum deposition PCs and PECs at any receptor on the modelled grid, and at the worst-case specific receptor identified in Figure 6-3 and Table 6-3 for the pollutants modelled in this assessment. Predicted PCs and PECs at all of the specific receptors are set out in in Appendix A2.

Table 8-3: Maximum Deposition PCs and PECs Relevant for Human Health

Location	X Coordinate	Y Coordinate	PC (mg/m²/day)	PC (% of Assessment Level) [a]	PEC (mg/m²/day) [b]	PEC (% of Assessment Level) [a]
Copper Deposition EAL (0.25 mg/m²/day)						
Max on Grid [c]	351271	380991	0.12	46.48	0.16	62.77
Max at Relevant Receptor	351226	381287	<0.01	1.07	0.04	17.37
Nickel Deposition EAL (0.11 mg/m²/day)						
Max on Grid [c]	351271	380991	<0.01	2.49	0.05	48.51
Max at Relevant Receptor	351226	381287	<0.01	0.06	0.05	46.08
Lead Deposition EAL (1.1 mg/m²/day)						
Max on Grid [c]	351271	380991	<0.01	0.25	0.04	3.47
Max at Relevant Receptor	351226	381287	<0.01	0.01	0.04	3.23
Zinc Deposition EAL (0.48 mg/m²/day)						
Max on Grid [c]	351271	380991	0.01	1.21	0.24	49.82
Max at Relevant Receptor	351226	381287	<0.01	0.03	0.23	48.64
Fluoride Deposition EAL (2.1 mg/m²/day)						
Max on Grid [c]	351316	380971	0.02	0.84	0.02	0.84
Max at Relevant Receptor	351226	381287	<0.01	0.02	0.00	0.02

[a] Based on unrounded numbers.

[b] After adding the relevant baseline concentrations from Table 5-5.

[c] Where the assessment criterion does not apply at the location, the row has been greyed out.

8.6 Figure 8-9 through Figure 8-11 present contours of the modelled process contributions for some of the pollutants considered in the assessment; additional contours are presented in Appendix A2. The contours depict the area where the deposition PCs are greater than 1% of the respective assessment criteria. The contours also show the locations where the maximum PCs are predicted at any location on the modelled grid and the location of maximum PCs at any location with relevant exposure.

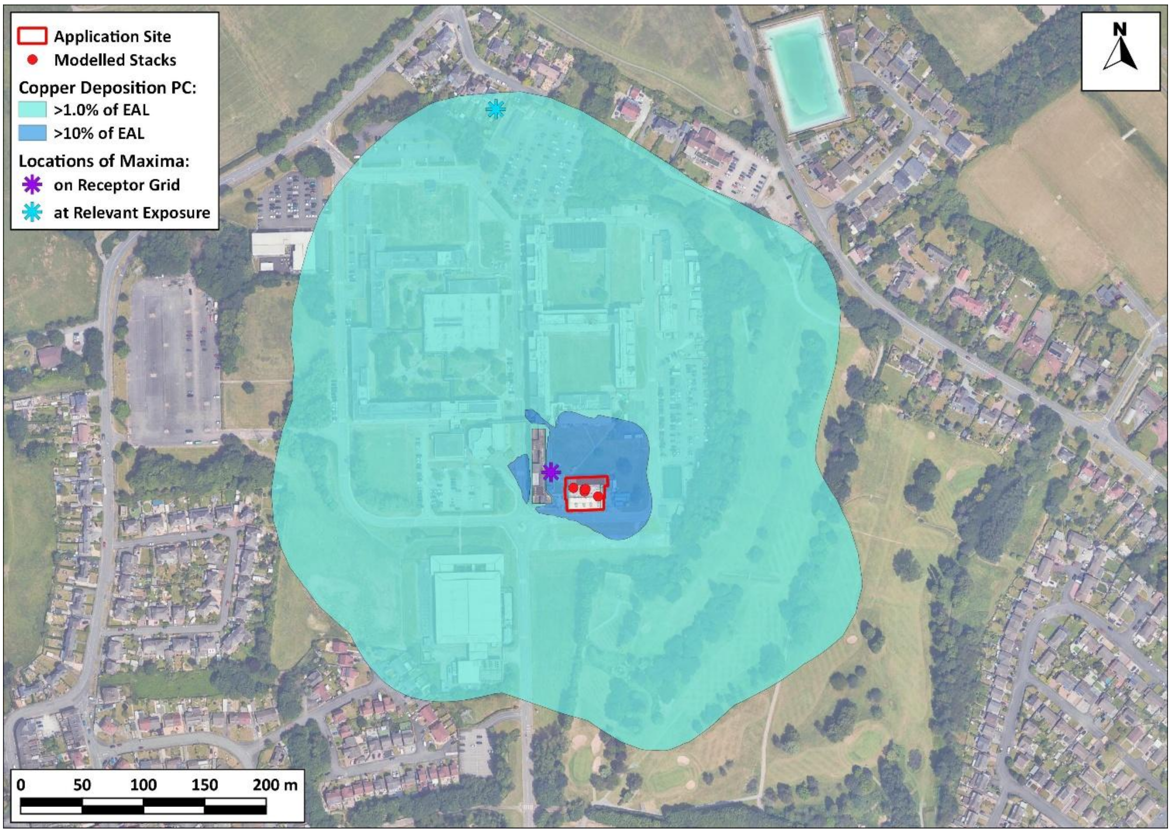

Figure 8-9: Contour Plot of Copper Deposition PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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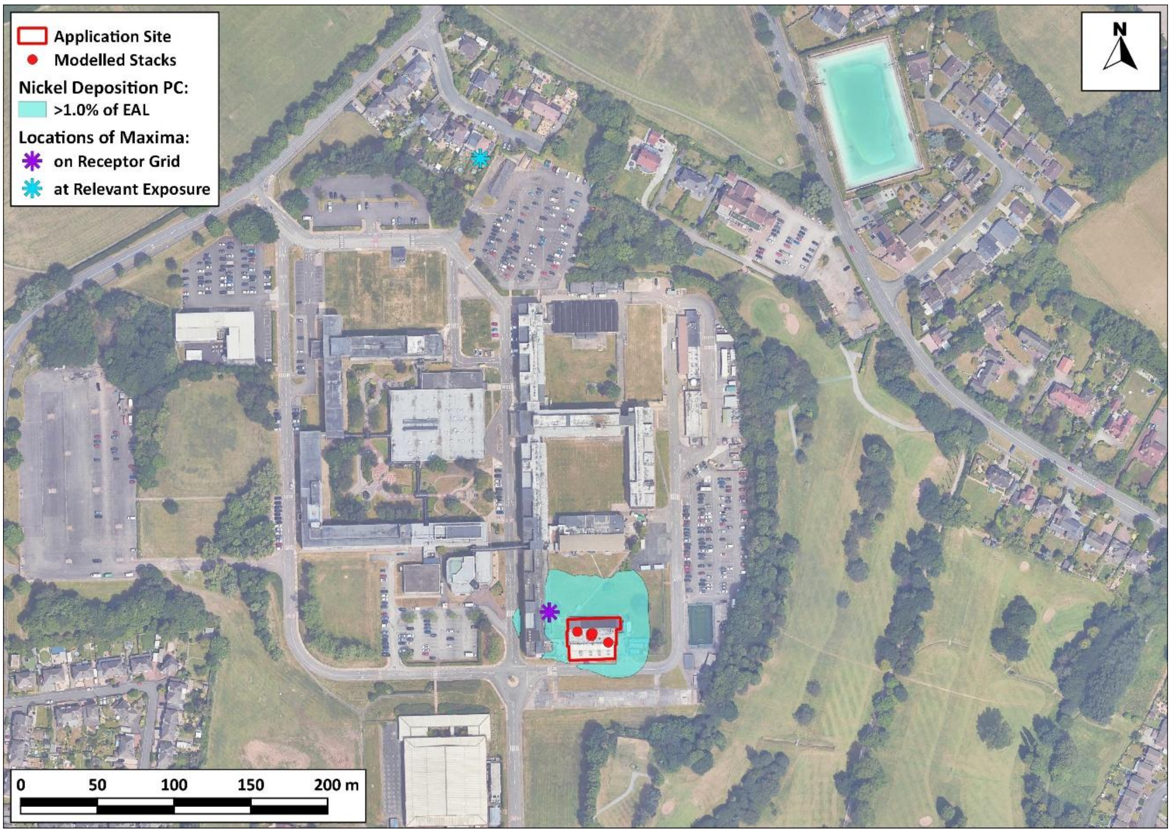

Figure 8-10: Contour Plot of Nickel Deposition PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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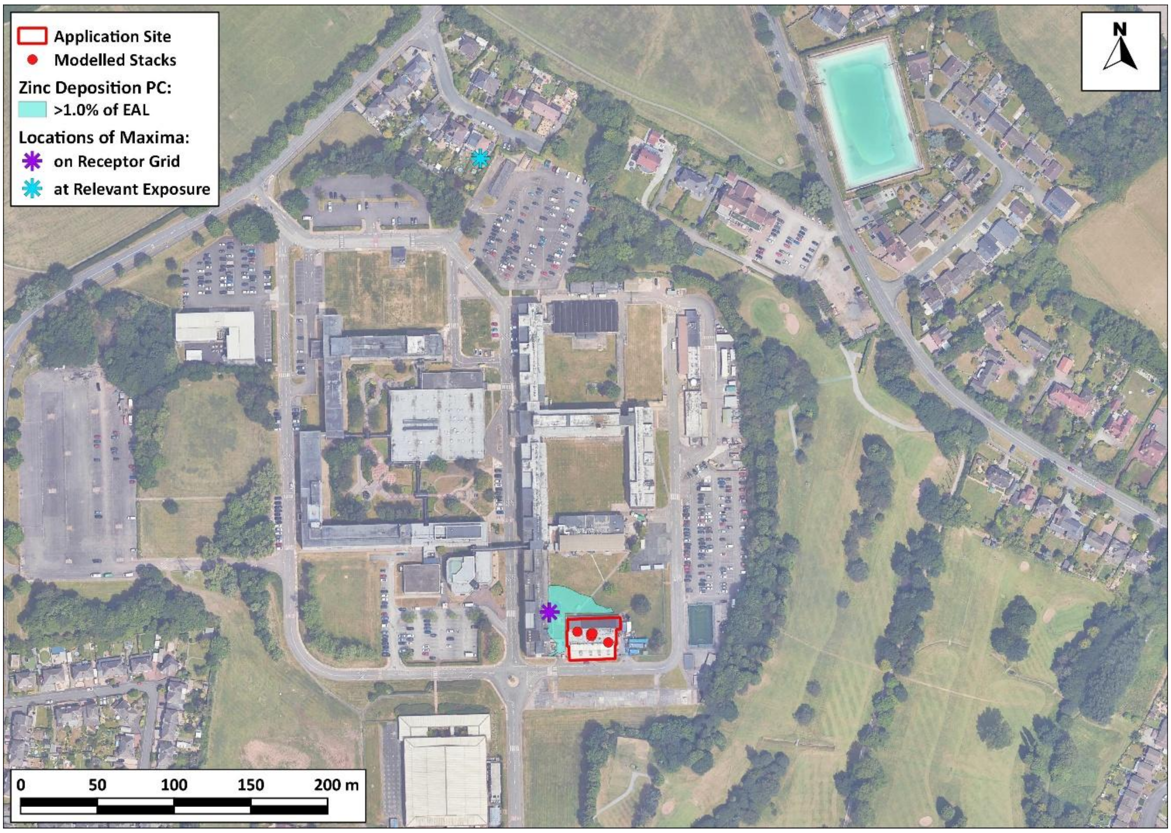

Figure 8-11: Contour Plot of Zinc Deposition PCs and Locations of Maxima on Entire Grid and at a Relevant Receptor

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Designated Ecological Sites

8.7 Table 8-4 presents the maximum PCs and PECs at the designated ecological sites.

Table 8-4: Maximum PCs and PECs at Designated Ecological Sites

Receptor	PC	PC (% of CLe / CLo) [a]	PEC [b]	PEC (% of CLe / CLo) [a]	CLe / CLo
Annual Mean SO_2 (µg/m³)					
1 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.02	5.60	56.0	10
2 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.02	5.60	56.0	10
3 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.02	5.60	56.0	10
4 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.02	5.60	56.0	10
5 (Midland Meres and Mosses Phase 1 Ramsar)	<0.001	<0.01	5.60	56.0	10

Receptor	PC	PC (% of CLe / CLo) [a]	PEC [b]	PEC (% of CLe / CLo) [a]	CLe / CLo
6 (Runcorn Hill LNR / LWS)	0.011	0.11	5.61	56.1	10
7 (Clifton Cloughs LWS)	0.004	0.04	5.60	56.0	10
8 (Clifton Lagoon LWS)	0.002	0.02	5.60	56.0	10
9 (Weston Marsh Lagoon LWS)	0.002	0.02	5.60	56.0	10
10 (Frodsham Helsby and Ince LWS)	0.002	0.02	5.60	56.0	10
11 (Frodsham Helsby and Ince LWS)	0.002	0.02	5.60	56.0	10
12 (Frodsham Field Studies Centre LWS)	0.002	0.02	5.60	56.0	10
13 (Land North of Hallwood Park LWS)	0.001	0.01	5.60	56.0	10
14 (Stenhills Open Space LWS)	0.002	0.02	5.60	56.0	10
Weekly Mean HF (µg/m³)					
1 (Mersey Estuary SPA / Ramsar / LWS)	<0.001	0.04	- [c]	- [c]	0.5
2 (Mersey Estuary SPA / Ramsar / LWS)	<0.001	0.03	- [c]	- [c]	0.5
3 (Mersey Estuary SPA / Ramsar / LWS)	<0.001	0.03	- [c]	- [c]	0.5
4 (Mersey Estuary SPA / Ramsar / LWS)	<0.001	0.03	- [c]	- [c]	0.5
5 (Midland Meres and Mosses Phase 1 Ramsar)	<0.001	<0.01	- [c]	- [c]	0.5
6 (Runcorn Hill LNR / LWS)	0.001	0.19	- [c]	- [c]	0.5
7 (Clifton Cloughs LWS)	<0.001	0.07	- [c]	- [c]	0.5
8 (Clifton Lagoon LWS)	<0.001	0.04	- [c]	- [c]	0.5
9 (Weston Marsh Lagoon LWS)	<0.001	0.04	- [c]	- [c]	0.5
10 (Frodsham Helsby and Ince LWS)	<0.001	0.03	- [c]	- [c]	0.5
11 (Frodsham Helsby and Ince LWS)	<0.001	0.03	- [c]	- [c]	0.5
12 (Frodsham Field Studies Centre LWS)	<0.001	0.04	- [c]	- [c]	0.5

Receptor	PC	PC (% of CLe / CLo) [a]	PEC [b]	PEC (% of CLe / CLo) [a]	CLe / CLo
13 (Land North of Hallwood Park LWS)	<0.001	0.02	- [c]	- [c]	0.5
14 (Stenhills Open Space LWS)	<0.001	0.03	- [c]	- [c]	0.5
24-hour Mean HF (µg/m³)					
1 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.05	- [c]	- [c]	5
2 (Mersey Estuary SPA / Ramsar / LWS)	0.001	0.03	- [c]	- [c]	5
3 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.04	- [c]	- [c]	5
4 (Mersey Estuary SPA / Ramsar / LWS)	0.001	0.03	- [c]	- [c]	5
5 (Midland Meres and Mosses Phase 1 Ramsar)	<0.001	<0.01	- [c]	- [c]	5
6 (Runcorn Hill LNR / LWS)	0.014	0.29	- [c]	- [c]	5
7 (Clifton Cloughs LWS)	0.003	0.06	- [c]	- [c]	5
8 (Clifton Lagoon LWS)	0.002	0.04	- [c]	- [c]	5
9 (Weston Marsh Lagoon LWS)	0.003	0.06	- [c]	- [c]	5
10 (Frodsham Helsby and Ince LWS)	0.002	0.04	- [c]	- [c]	5
11 (Frodsham Helsby and Ince LWS)	0.004	0.08	- [c]	- [c]	5
12 (Frodsham Field Studies Centre LWS)	0.003	0.05	- [c]	- [c]	5
13 (Land North of Hallwood Park LWS)	0.001	0.02	- [c]	- [c]	5
14 (Stenhills Open Space LWS)	0.001	0.03	- [c]	- [c]	5
Acid Deposition - Grassland Features (keq/ha/yr) [d]					
1 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.05	1.83	37.69	4.86
2 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.04	1.83	37.68	4.86
3 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.04	1.83	37.69	4.86

Receptor	PC	PC (% of CLe / CLo) [a]	PEC [b]	PEC (% of CLe / CLo) [a]	CLe / CLo
4 (Mersey Estuary SPA / Ramsar / LWS)	0.002	0.04	1.83	37.68	4.86
5 (Midland Meres and Mosses Phase 1 Ramsar)	<0.001	- [d]	1.73	- [d]	- [d]
6 (Runcorn Hill LNR / LWS)	0.013	0.94	1.61	120.16	1.34
7 (Clifton Cloughs LWS)	0.005	0.35	1.61	125.35	1.29
8 (Clifton Lagoon LWS)	0.003	0.21	1.61	125.21	1.29
9 (Weston Marsh Lagoon LWS)	0.002	0.05	1.65	36.33	4.55
10 (Frodsham Helsby and Ince LWS)	0.002	0.05	1.65	36.33	4.55
11 (Frodsham Helsby and Ince LWS)	0.002	0.05	1.63	35.89	4.55
12 (Frodsham Field Studies Centre LWS)	0.003	0.06	1.61	35.46	4.55
13 (Land North of Hallwood Park LWS)	0.001	0.21	1.60	237.96	0.67
14 (Stenhills Open Space LWS)	0.002	0.15	1.61	125.15	1.29
Acid Deposition - Forest Features (keq/ha/yr) [d]					
6 (Runcorn Hill LNR / LWS)	0.025	2.19	2.795	243.06	1.15
7 (Clifton Cloughs LWS)	0.009	0.51	2.809	158.53	1.77
8 (Clifton Lagoon LWS)	0.005	0.31	2.805	158.32	1.77
9 (Weston Marsh Lagoon LWS)	0.005	0.04	2.885	25.97	11.11
10 (Frodsham Helsby and Ince LWS)	0.004	0.04	2.884	25.97	11.11
11 (Frodsham Helsby and Ince LWS)	0.005	0.04	2.855	25.70	11.11
12 (Frodsham Field Studies Centre LWS)	0.005	0.05	2.815	25.33	11.11
13 (Land North of Hallwood Park LWS)	0.003	0.25	2.783	241.99	1.15
14 (Stenhills Open Space LWS)	0.004	0.22	2.784	156.84	1.78

[a] Based on unrounded numbers.

[b] After adding the relevant baseline values from Table 5-6.

[c] Baseline data are not available, and thus a PEC has not been presented.

[d] The Midland Meres and Mosses Ramsar – Phase 1 (Receptor 5) is not sensitive to acid deposition. Similarly, the Mersey Estuary SPA / Ramsar (Receptors 1 – 4) is only notified for grassland features. Results have not, therefore, been presented for these receptors.

8.8 As shown in Table 8-4, the annual mean SO_2 PECs at all assessed locations are well below the most stringent critical level. Whilst there are no baseline data for HF, the PCs are also well below 1% of the critical levels, regardless of averaging period (i.e. weekly mean or 24-hour mean).

8.9 With respect to acid deposition, the PECs exceed the relevant critical load at some designated habitats. At the Mersey Estuary SPA / Ramsar (Receptors 1 – 4) the PECs are below the critical load for grassland features; this is also the case for some of the locally designated sites (Receptors 9 to 12) for both forest and grassland features. Notwithstanding, where the PECs at locally designated sites exceed the critical load, the PCs are well below 100% of the relevant critical loads.

8.10 On the basis that the screening thresholds for PCs have not been exceeded at any relevant habitat, contours have not been presented.

9 Discussion

Human Health Receptors

9.1 Table 8-1 demonstrates that the maximum long-term PECs of all pollutants at locations where there is relevant exposure are less than the respective assessment levels. Whilst the long-term PEC for benzene, copper and nickel exceed the respective assessment levels at the location of maximum impact anywhere across the modelled grid, Figure 8-2 to Figure 8-4 demonstrate that in all three cases these maxima occur within the boundary of the Heath where there is no relevant exposure for members of the general public. As discussed in Paragraph 4.9, there is no relevant exposure in places of work where members of the general public have no free access and where relevant provisions concerning health and safety at work apply.

9.2 Table 8-2 demonstrates that, with the exception of the 24-hour mean benzene PECs, the maximum short-term PECs of all pollutants at locations where there is relevant exposure are less than the respective assessment levels. For benzene, Figure 8-6 demonstrates that the area where the PC exceeds the assessment level covers a portion of the highway to the south of the facility and a grassed area that is fenced off to the general public. Further, even if members of the public could access these areas, they are unlikely to spend 24-hours there. It must also be considered that based on initial laboratory-scale testing, it is highly unlikely for benzene to be present in the emissions and assessing the process contribution for total VOCs as a group is grossly pessimistic.

9.3 Table 8-3 demonstrates that the maximum deposition PECs of all pollutants are less than the respective assessment levels. This is the case even at the point of maximum impact anywhere across the modelled grid.

9.4 Accounting for the worst-case assumptions adopted within this assessment, there is a negligible risk that emissions from the facility will cause an exceedance of any assessment level at locations of relevant exposure and, consequently, effects are assessed as not significant.

Designated Ecological Sites

9.5 Table 8-4 demonstrates that the annual mean SO_2 PECs are well below the most stringent critical level, and the HF PCs are well below 1% of the critical levels, regardless of averaging period (i.e. weekly mean or 24-hour mean), at all designated sites.

9.6 With respect to acid deposition, the PECs at the Mersey Estuary SPA / Ramsar are below the critical load for grassland features. At the local wildlife sites, whilst the PECs exceed the relevant critical load at some designated habitats due to the background deposition rate alone, the PCs are all well below 100% of the relevant critical loads and, under the Environment Agency’s guidance, would not be considered significant.

9.7 Accounting for the worst-case assumptions adopted within this assessment, impacts on ecological habitats are assessed as not significant.

10 Conclusions

10.1 The assessment uses dispersion modelling to predict the impacts on local air quality associated with emissions to air from the Watercycle Technologies facility in the Heath Business and Technical Park in Runcorn.

10.2 For human health receptors, the assessment concludes that modelled PECs of all pollutants will be less than the respective assessment levels at all locations where there is relevant exposure. This includes PECs for concentrations in air and deposition rates of metals and fluoride.

10.3 For the Mersey Estuary SPA and Ramsar and Midland Meres and Mosses – Phase 1 Ramsar, modelled PECs for all pollutants are less than the relevant critical levels and critical loads. At the local designations, whilst the PECs are exceeded for acid deposition at some sites due to the background deposition rate alone exceeding the critical load, the PCs are well below 100% of the critical loads and, under Environment Agency guidance, are therefore not considered to be significant.

10.4 The assessment includes a number of conservative assumptions. It also uses sensitivity analysis to investigate the sensitivity of the model to certain assumptions and model treatments. These conservative assumptions include:

- the facility operates at maximum design capacity throughout the year;
- emissions have been modelled assuming they occur at either the respective emission limit values or the estimated concentration. In reality, emissions across the different stacks will vary, and in many cases, will be considerably less than those modelled in this assessment;
- the assessment of VOC impacts assumes all VOC emissions occur exclusively as either benzene or methanol in accordance with Environment Agency guidance. However, based on initial laboratory-scale testing, it is highly unlikely that benzene will be present in the emissions;
- the modelling has assumed that particulate matter emissions are either exclusively PM_{10} or $PM_{2.5}$. In reality, the particulate fraction will comprise a mixture of both size fractions;
- the results presented are the maxima from modelling with five separate years of meteorological data;
- deposition has not been included in the model and has been calculated external to the model. This ignores plume depletion effects and will cause a tendency for impacts to be over-predicted; and
- in some cases, baseline concentrations are derived from more built-up areas due to the absence of local monitoring data (e.g. Sheffield for the heavy metals) which might lead to overestimations for the PECs.

10.5 It is, therefore, concluded that the air quality impacts of the proposed facility will be not significant.

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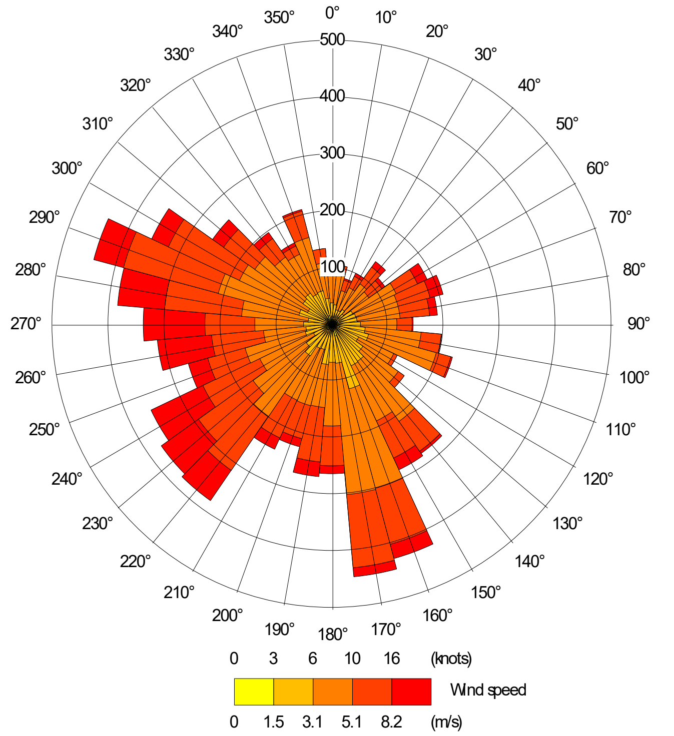
12 Appendices

A1 Wind Roses for Liverpool Airport

2020



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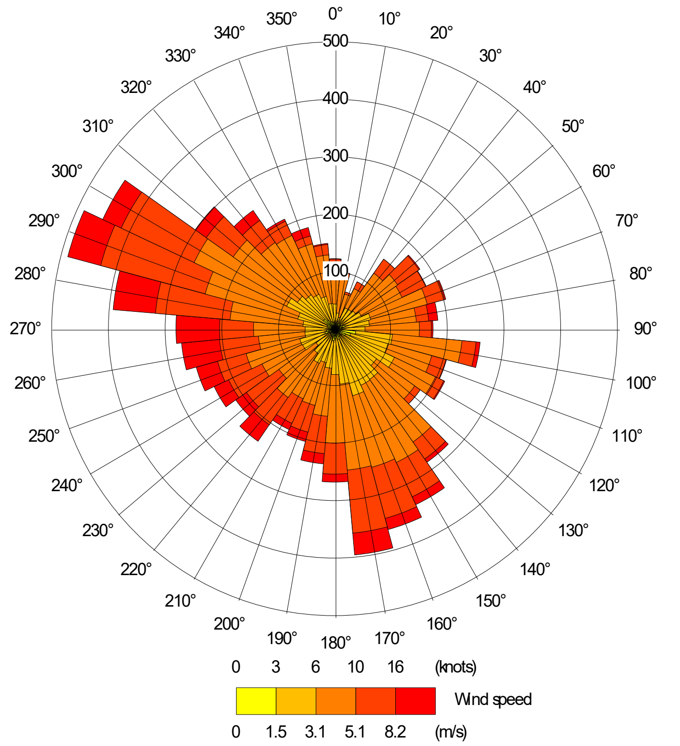

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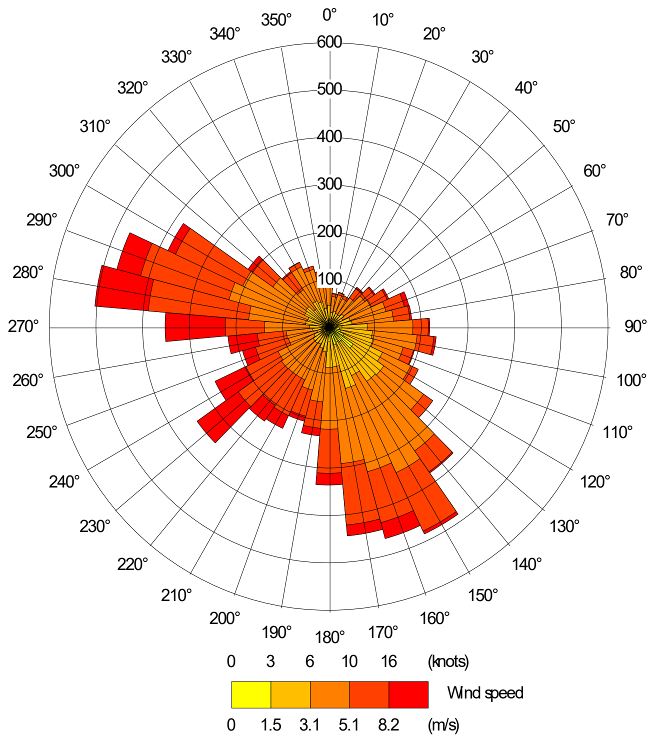
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Wind speed
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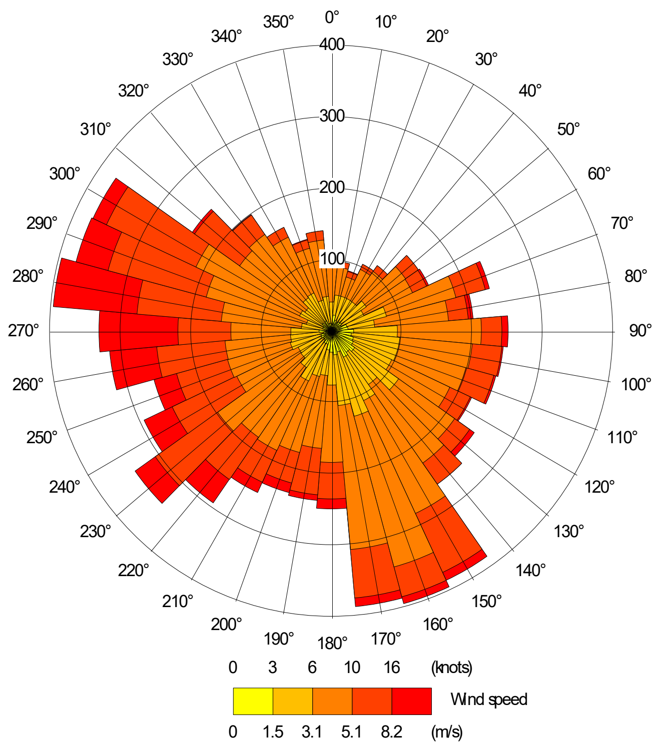
2023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Wind speed
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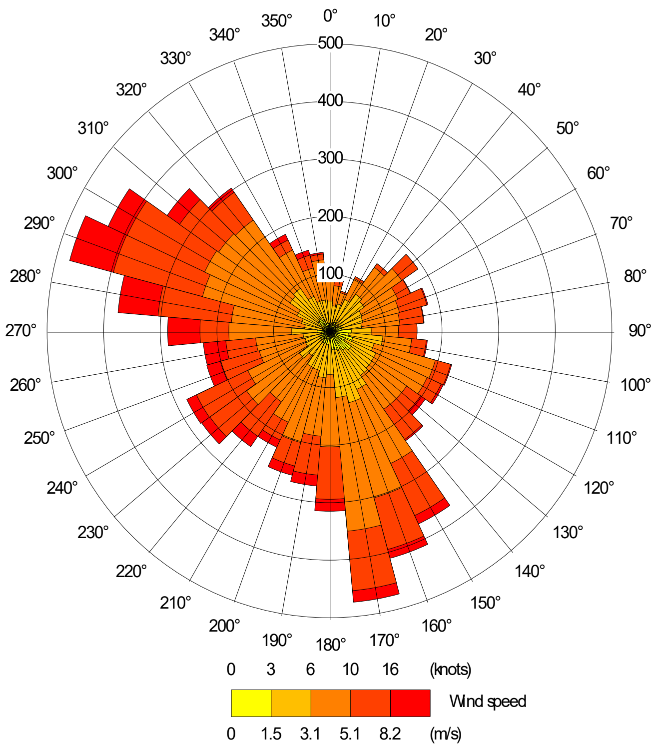
2024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Wind speed
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A2 Specific Receptor Result Tables and Concentration Contours

Concentrations

A2.1 Table A2-1 through Table A2-12 present the PCs and PECs (where baseline concentrations are available) for each pollutant and averaging period at the specific receptors.

Table A2-1: PM_{10} PCs and PECs at Specific Receptors

Receptor ID	Annual Mean PM_{10} AQS (40 µg/m³)				24-hour Mean PM_{10} AQS (50 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]
1	0.01	0.01	15.90	39.75	0.20	0.40	31.99	63.97
2	<0.01	0.01	15.90	39.75	0.15	0.30	31.94	63.88
3	<0.01	0.01	15.90	39.74	0.15	0.29	31.93	63.87
4	<0.01	0.01	15.90	39.74	0.12	0.24	31.91	63.81
5	<0.01	0.01	15.90	39.74	0.10	0.20	31.89	63.77
6	<0.01	0.01	15.90	39.74	0.19	0.37	31.97	63.94
7	<0.01	0.01	15.90	39.75	0.20	0.40	31.99	63.98
8	<0.01	0.01	15.90	39.74	0.09	0.19	31.88	63.76
9	<0.01	0.01	15.90	39.74	0.09	0.17	31.87	63.75
10	0.02	0.05	15.91	39.78	0.73	1.46	32.52	65.04
11	0.02	0.05	15.91	39.78	0.65	1.30	32.44	64.88
12	0.01	0.03	15.91	39.77	0.44	0.87	32.22	64.44
13	0.01	0.02	15.90	39.75	0.27	0.54	32.06	64.11
14	0.01	0.02	15.90	39.75	0.20	0.41	31.99	63.98

[a] 90.4th percentile of 24-hour means.

[b] After adding the relevant baseline concentration from Table 5-5.

[c] Based on unrounded numbers.

Table A2-2: $PM_{2.5}$ PCs and PECs at Specific Receptors

Receptor ID	Annual Mean $PM_{2.5}$ AQS (20 µg/m³)			
	PC		PEC [a]	
	µg/m³	% AQS [b]	µg/m³	% AQS [b]
1	0.01	0.03	9.37	46.83
2	<0.01	0.02	9.37	46.83

Receptor ID	Annual Mean $PM_{2.5}$ AQS (20 µg/m³)			
	PC		PEC [a]	
	µg/m³	% AQS [b]	µg/m³	% AQS [b]
3	<0.01	0.02	9.36	46.82
4	<0.01	0.02	9.36	46.82
5	<0.01	0.01	9.36	46.82
6	<0.01	0.02	9.37	46.83
7	<0.01	0.02	9.37	46.83
8	<0.01	0.01	9.36	46.81
9	<0.01	0.01	9.36	46.81
10	0.02	0.09	9.38	46.90
11	0.02	0.09	9.38	46.90
12	0.01	0.07	9.37	46.87
13	0.01	0.04	9.37	46.84
14	0.01	0.03	9.37	46.83

[a] After adding the relevant baseline concentration from Table 5-5.

[b] Based on unrounded numbers.

Table A2-3: Benzene PCs and PECs at Specific Receptors

Receptor ID	Annual Mean Benzene AQS (5 µg/m³)				24-hour Mean Benzene EAL (30 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% EAL [c]	µg/m³	% EAL [c]
1	0.09	1.81	0.65	13.03	2.14	7.13	3.26	10.88
2	0.08	1.51	0.64	12.74	2.13	7.11	3.26	10.85
3	0.07	1.38	0.63	12.61	1.63	5.42	2.75	9.16
4	0.06	1.13	0.62	12.36	1.48	4.94	2.60	8.68
5	0.04	0.90	0.61	12.12	1.18	3.94	2.30	7.68
6	0.07	1.43	0.63	12.66	3.59	11.97	4.71	15.71
7	0.07	1.47	0.63	12.69	2.54	8.47	3.66	12.22
8	0.04	0.72	0.60	11.95	2.49	8.31	3.61	12.05
9	0.03	0.64	0.59	11.87	1.23	4.09	2.35	7.83
10	0.28	5.54	0.84	16.76	9.71	32.35	10.83	36.09
11	0.29	5.77	0.85	16.99	6.74	22.48	7.87	26.22

Receptor ID	Annual Mean Benzene AQS (5 µg/m³)				24-hour Mean Benzene EAL (30 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% EAL [c]	µg/m³	% EAL [c]
12	0.20	4.05	0.76	15.27	4.68	15.59	5.80	19.33
13	0.13	2.56	0.69	13.78	2.85	9.50	3.97	13.24
14	0.10	1.90	0.66	13.12	2.38	7.92	3.50	11.66

[a] 100th percentile of 24-hour means.

[b] After adding the relevant baseline concentration from Table 5-5.

[c] Based on unrounded numbers.

Table A2-4: Methanol PCs at Specific Receptors [a]

Receptor ID	Annual Mean Methanol EAL (2,660 µg/m³)		1-hour Mean Methanol EAL (33,300 µg/m³) [b]	
	µg/m³	% EAL [c]	µg/m³	% EAL [c]
1	0.09	<0.01	6.10	0.02
2	0.08	<0.01	7.01	0.02
3	0.07	<0.01	6.63	0.02
4	0.06	<0.01	5.43	0.02
5	0.04	<0.01	3.42	0.01
6	0.07	<0.01	10.71	0.03
7	0.07	<0.01	6.62	0.02
8	0.04	<0.01	6.94	0.02
9	0.03	<0.01	3.02	0.01
10	0.28	0.01	24.37	0.07
11	0.29	0.01	17.41	0.05
12	0.20	0.01	16.32	0.05
13	0.13	<0.01	11.00	0.03
14	0.10	<0.01	8.19	0.02

[a] Baseline concentrations are not available, and thus PECs have not been presented.

[b] 100th percentile of 1-hour means.

[c] Based on unrounded numbers.

Table A2-5: Carbon Monoxide PCs and PECs at Specific Receptors

Receptor ID	8-hour Rolling Mean [a] CO AQS (10 mg/m³)				1-hour Mean CO AQS (30 mg/m³) [b]			
	PC		PEC [c]		PC		PEC [c]	
	mg/m³	% AQS [d]	mg/m³	% AQS [d]	mg/m³	% AQS [d]	mg/m³	% AQS [d]
1	<0.01	0.01	0.29	2.91	<0.01	0.01	0.29	0.97
2	<0.01	0.01	0.29	2.91	<0.01	0.01	0.29	0.97
3	<0.01	0.01	0.29	2.91	<0.01	0.01	0.29	0.97
4	<0.01	0.01	0.29	2.91	<0.01	0.01	0.29	0.97
5	<0.01	0.01	0.29	2.91	<0.01	0.00	0.29	0.97
6	<0.01	0.02	0.29	2.92	<0.01	0.01	0.29	0.98
7	<0.01	0.01	0.29	2.91	<0.01	0.01	0.29	0.97
8	<0.01	0.01	0.29	2.91	<0.01	0.01	0.29	0.97
9	<0.01	0.01	0.29	2.91	<0.01	0.00	0.29	0.97
10	0.01	0.07	0.30	2.97	0.01	0.03	0.30	1.00
11	<0.01	0.04	0.29	2.94	<0.01	0.02	0.29	0.98
12	<0.01	0.03	0.29	2.93	0.01	0.02	0.30	0.99
13	<0.01	0.02	0.29	2.92	<0.01	0.01	0.29	0.98
14	<0.01	0.01	0.29	2.91	<0.01	0.01	0.29	0.97

[a] 100th percentile of rolling 8-hour means.

[b] 100th percentile of 1-hour means.

[c] After adding the relevant baseline concentration from Table 5-5.

[d] Based on unrounded numbers.

Table A2-6: Sulphur Dioxide PCs and PECs at Specific Receptors

Receptor ID	15-minute Mean SO_2 AQS (266 µg/m³) [a]				1-hour Mean SO_2 AQS (350 µg/m³) [a]				24-hour Mean SO_2 AQS (125 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% AQS [c]
1	11.03	4.15	13.69	5.15	7.78	2.22	10.44	2.98	2.43	1.94	5.08	4.07
2	12.38	4.65	15.03	5.65	8.43	2.41	11.09	3.17	2.22	1.78	4.88	3.90
3	11.93	4.48	14.58	5.48	8.23	2.35	10.89	3.11	2.06	1.65	4.72	3.78
4	13.24	4.98	15.90	5.98	9.05	2.59	11.71	3.35	2.03	1.62	4.69	3.75
5	6.14	2.31	8.80	3.31	4.52	1.29	7.17	2.05	1.23	0.99	3.89	3.11
6	17.97	6.76	20.63	7.75	12.56	3.59	15.22	4.35	3.87	3.09	6.52	5.22
7	11.54	4.34	14.19	5.34	8.80	2.51	11.45	3.27	2.59	2.07	5.24	4.19
8	11.95	4.49	14.61	5.49	8.38	2.39	11.04	3.15	2.30	1.84	4.96	3.97
9	5.58	2.10	8.24	3.10	3.94	1.13	6.60	1.88	1.34	1.07	3.99	3.19
10	43.59	16.39	46.24	17.38	32.02	9.15	34.67	9.91	11.44	9.15	14.10	11.28
11	27.39	10.30	30.04	11.29	22.66	6.48	25.32	7.23	7.07	5.66	9.73	7.78
12	30.56	11.49	33.22	12.49	21.75	6.21	24.40	6.97	6.47	5.18	9.13	7.30
13	18.73	7.04	21.39	8.04	13.23	3.78	15.88	4.54	3.19	2.55	5.85	4.68
14	13.44	5.05	16.09	6.05	10.29	2.94	12.95	3.70	3.08	2.46	5.74	4.59

[a] 99.9th percentile of 15-minute means, 99.73rd percentile of 1-hour means and 99.18th percentile of 24-hour means.

[b] After adding the relevant baseline concentration from Table 5-5.

[c] Based on unrounded numbers.

Table A2-7: Nickel PCs and PECs at Specific Receptors

Receptor ID	Annual Mean Nickel AQS (0.02 µg/m³)				1-hour Mean Nickel EAL (0.7 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% AQS [c]	µg/m³	% AQS [c]	µg/m³	% EAL [c]	µg/m³	% EAL [c]
1	<0.01	0.12	0.02	97.78	0.01	1.67	0.05	7.25
2	<0.01	0.10	0.02	97.76	0.01	1.94	0.05	7.52
3	<0.01	0.09	0.02	97.75	0.01	1.82	0.05	7.40
4	<0.01	0.07	0.02	97.73	0.01	1.45	0.05	7.03
5	<0.01	0.06	0.02	97.72	0.01	0.92	0.05	6.50
6	<0.01	0.10	0.02	97.75	0.02	2.89	0.06	8.47
7	<0.01	0.09	0.02	97.75	0.01	1.70	0.05	7.28
8	<0.01	0.05	0.02	97.70	0.01	1.88	0.05	7.46
9	<0.01	0.04	0.02	97.70	0.01	0.79	0.04	6.37
10	<0.01	0.35	0.02	98.01	0.04	5.83	0.08	11.41
11	<0.01	0.38	0.02	98.04	0.03	4.69	0.07	10.27
12	<0.01	0.26	0.02	97.92	0.03	3.99	0.07	9.57
13	<0.01	0.17	0.02	97.83	0.02	3.02	0.06	8.60
14	<0.01	0.13	0.02	97.78	0.02	2.21	0.05	7.79

[a] 100th percentile of 1-hour means.

[b] After adding the relevant baseline concentration from Table 5-5.

[c] Based on unrounded numbers.

Table A2-8: Copper PCs and PECs at Specific Receptors

Receptor ID	24-hour Mean (Long-term) Copper EAL (0.05 µg/m³)			
	PC		PEC [a]	
	µg/m³	% EAL [b]	µg/m³	% EAL [b]
1	<0.01	2.07	0.02	33.50
2	<0.01	1.73	0.02	33.15
3	<0.01	1.58	0.02	33.00
4	<0.01	1.21	0.02	32.63
5	<0.01	1.03	0.02	32.45
6	<0.01	1.56	0.02	32.99
7	<0.01	1.60	0.02	33.03

Receptor ID	24-hour Mean (Long-term) Copper EAL (0.05 µg/m³)			
	PC		PEC [a]	
	µg/m³	% EAL [b]	µg/m³	% EAL [b]
8	<0.01	0.80	0.02	32.23
9	<0.01	0.73	0.02	32.15
10	<0.01	6.09	0.02	37.52
11	<0.01	6.54	0.02	37.96
12	<0.01	4.37	0.02	35.79
13	<0.01	2.92	0.02	34.34
14	<0.01	2.14	0.02	33.57

[a] After adding the relevant baseline concentration from Table 5-5.

[b] Based on unrounded numbers.

Table A2-9: Lead PCs and PECs at Specific Receptors

Receptor ID	Annual Mean Lead AQS (0.25 µg/m³)			
	PC		PEC [a]	
	µg/m³	% AQS [b]	µg/m³	% AQS [b]
1	<0.01	0.01	0.01	5.49
2	<0.01	0.01	0.01	5.48
3	<0.01	0.01	0.01	5.48
4	<0.01	0.01	0.01	5.48
5	<0.01	<0.01	0.01	5.48
6	<0.01	0.01	0.01	5.48
7	<0.01	0.01	0.01	5.48
8	<0.01	<0.01	0.01	5.48
9	<0.01	<0.01	0.01	5.48
10	<0.01	0.03	0.01	5.50
11	<0.01	0.03	0.01	5.51
12	<0.01	0.02	0.01	5.50
13	<0.01	0.01	0.01	5.49
14	<0.01	0.01	0.01	5.49

[a] After adding the relevant baseline concentration from Table 5-5.

[b] Based on unrounded numbers.

Table A2-10: Manganese PCs and PECs at Specific Receptors

Receptor ID	Annual Mean Manganese EAL (0.15 µg/m³)				1-hour Mean Manganese EAL (1,500 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% EAL [c]	µg/m³	% EAL [c]	µg/m³	% EAL [c]	µg/m³	% EAL [c]
1	<0.01	0.04	0.03	21.88	0.03	<0.01	0.10	0.01
2	<0.01	0.04	0.03	21.88	0.04	<0.01	0.10	0.01
3	<0.01	0.03	0.03	21.87	0.03	<0.01	0.10	0.01
4	<0.01	0.03	0.03	21.86	0.03	<0.01	0.09	0.01
5	<0.01	0.02	0.03	21.86	0.02	<0.01	0.08	0.01
6	<0.01	0.03	0.03	21.87	0.05	<0.01	0.12	0.01
7	<0.01	0.03	0.03	21.87	0.03	<0.01	0.10	0.01
8	<0.01	0.02	0.03	21.86	0.04	<0.01	0.10	0.01
9	<0.01	0.02	0.03	21.85	0.01	<0.01	0.08	0.01
10	<0.01	0.13	0.03	21.97	0.11	0.01	0.17	0.01
11	<0.01	0.14	0.03	21.98	0.09	0.01	0.15	0.01
12	<0.01	0.09	0.03	21.93	0.07	<0.01	0.14	0.01
13	<0.01	0.06	0.03	21.90	0.06	<0.01	0.12	0.01
14	<0.01	0.05	0.03	21.88	0.04	<0.01	0.11	0.01

[a] 100th percentile of 1-hour means.

[b] After adding the relevant baseline concentration from Table 5-5.

[c] Based on unrounded numbers.

Table A2-11: HF PCs at Specific Receptors

Receptor ID	1-hour Mean HF EAL (160 µg/m³)	
	µg/m³	% EAL [a]
1	0.08	0.05
2	0.10	0.06
3	0.09	0.06
4	0.10	0.07
5	0.05	0.03
6	0.14	0.09
7	0.10	0.06
8	0.10	0.06

Receptor ID	1-hour Mean HF EAL (160 µg/m³)	
	µg/m³	% EAL [a]
9	0.04	0.03
10	0.42	0.26
11	0.24	0.15
12	0.28	0.17
13	0.15	0.09
14	0.12	0.07

[a] Based on unrounded numbers.

Table A2-12: Hexane PCs and PECs at Specific Receptors

Receptor ID	Annual Mean Hexane EAL (720 µg/m³)				1-hour Mean Hexane EAL (21,600 µg/m³) [a]			
	PC		PEC [b]		PC		PEC [b]	
	µg/m³	% EAL [c]	µg/m³	% EAL [c]	µg/m³	% EAL [c]	µg/m³	% EAL [c]
1	<0.01	<0.01	0.35	0.05	0.03	<0.01	0.73	<0.01
2	<0.01	<0.01	0.35	0.05	0.04	<0.01	0.74	<0.01
3	<0.01	<0.01	0.35	0.05	0.03	<0.01	0.74	<0.01
4	<0.01	<0.01	0.35	0.05	0.04	<0.01	0.74	<0.01
5	<0.01	<0.01	0.35	0.05	0.02	<0.01	0.72	<0.01
6	<0.01	<0.01	0.35	0.05	0.05	<0.01	0.76	<0.01
7	<0.01	<0.01	0.35	0.05	0.04	<0.01	0.74	<0.01
8	<0.01	<0.01	0.35	0.05	0.03	<0.01	0.74	<0.01
9	<0.01	<0.01	0.35	0.05	0.02	<0.01	0.72	<0.01
10	<0.01	<0.01	0.35	0.05	0.15	<0.01	0.86	<0.01
11	<0.01	<0.01	0.35	0.05	0.09	<0.01	0.79	<0.01
12	<0.01	<0.01	0.35	0.05	0.10	<0.01	0.80	<0.01
13	<0.01	<0.01	0.35	0.05	0.05	<0.01	0.76	<0.01
14	<0.01	<0.01	0.35	0.05	0.04	<0.01	0.75	<0.01

[a] 100th percentile of 1-hour means.

[b] After adding the relevant baseline concentration from Table 5-5.

[c] Based on unrounded numbers.

Deposition Rates

A2.2 Table A2-13 presents the deposition PCs and PECs for each metal at the specific receptors.

Table A2-13: Maximum Deposition Rate PCs and PECs at Specific Receptors

Receptor ID	PC		PEC [a]	
	mg/m²/day	% EAL [b]	mg/m²/day	% EAL [b]
Nickel Maximum Deposition Rate EAL (0.11 mg/m²/day)				
1	<0.001	0.06	0.051	46.08
2	<0.001	0.05	0.051	46.07
3	<0.001	0.04	0.051	46.07
4	<0.001	0.03	0.051	46.06
5	<0.001	0.03	0.051	46.05
6	<0.001	0.04	0.051	46.07
7	<0.001	0.04	0.051	46.07
8	<0.001	0.02	0.051	46.05
9	<0.001	0.02	0.051	46.04
10	<0.001	0.17	0.051	46.19
11	<0.001	0.18	0.051	46.20
12	<0.001	0.12	0.051	46.14
13	<0.001	0.08	0.051	46.10
14	<0.001	0.06	0.051	46.08
Copper Maximum Deposition Rate EAL (0.25 mg/m²/day)				
1	0.003	1.07	0.043	17.37
2	0.002	0.89	0.043	17.19
3	0.002	0.82	0.043	17.11
4	0.002	0.63	0.042	16.92
5	0.001	0.53	0.042	16.82
6	0.002	0.81	0.043	17.10
7	0.002	0.83	0.043	17.12
8	0.001	0.41	0.042	16.71
9	0.001	0.38	0.042	16.67
10	0.008	3.16	0.049	19.45
11	0.008	3.39	0.049	19.68
12	0.006	2.26	0.046	18.56
13	0.004	1.51	0.045	17.80
14	0.003	1.11	0.044	17.40

Receptor ID	PC		PEC [a]	
	mg/m²/day	% EAL [b]	mg/m²/day	% EAL [b]
Lead Maximum Deposition Rate EAL (1.1 mg/m²/day)				
1	<0.001	0.01	0.036	3.23
2	<0.001	<0.01	0.036	3.23
3	<0.001	<0.01	0.036	3.23
4	<0.001	<0.01	0.036	3.23
5	<0.001	<0.01	0.036	3.23
6	<0.001	<0.01	0.036	3.23
7	<0.001	<0.01	0.036	3.23
8	<0.001	<0.01	0.036	3.23
9	<0.001	<0.01	0.036	3.23
10	<0.001	0.02	0.036	3.24
11	<0.001	0.02	0.036	3.24
12	<0.001	0.01	0.036	3.24
13	<0.001	0.01	0.036	3.23
14	<0.001	0.01	0.036	3.23
Zinc Maximum Deposition Rate EAL (0.48 mg/m²/day)				
1	<0.001	0.03	0.233	48.64
2	<0.001	0.02	0.233	48.64
3	<0.001	0.02	0.233	48.63
4	<0.001	0.02	0.233	48.63
5	<0.001	0.01	0.233	48.63
6	<0.001	0.02	0.233	48.63
7	<0.001	0.02	0.233	48.63
8	<0.001	0.01	0.233	48.62
9	<0.001	0.01	0.233	48.62
10	<0.001	0.08	0.234	48.69
11	<0.001	0.09	0.234	48.70
12	<0.001	0.06	0.234	48.67
13	<0.001	0.04	0.234	48.65
14	<0.001	0.03	0.233	48.64
Fluoride Deposition EAL (2.1 mg/m²/day)				

Receptor ID	PC		PEC [a]	
	mg/m²/day	% EAL [b]	mg/m²/day	% EAL [b]
1	<0.001	0.02	0.000	0.02
2	<0.001	0.02	0.000	0.02
3	<0.001	0.02	0.000	0.02
4	<0.001	0.02	0.000	0.02
5	<0.001	0.01	0.000	0.01
6	<0.001	0.02	0.000	0.02
7	<0.001	0.02	0.000	0.02
8	<0.001	0.01	0.000	0.01
9	<0.001	0.01	0.000	0.01
10	0.002	0.08	0.002	0.08
11	0.002	0.07	0.002	0.07
12	0.001	0.06	0.001	0.06
13	0.001	0.03	0.001	0.03
14	0.001	0.02	0.001	0.02

[a] After adding the relevant baseline concentration from Table 5-5.

[b] Based on unrounded numbers.

Concentration Contours

A2.3 Contours showing the locations where the PCs exceed 1% (for long-term) and 10% (for short-term) of the assessment level for pollutants and averaging periods not presented in Section 8 are shown in Figure A2-1 through Figure A2-12. Where the PC does not exceed the screening criteria, contours have been presented to demonstrate the dispersion pattern of the plume.

Figure A2-1: Contour Plot of the Annual Mean Methanol PCs

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Figure A2-2: Contour Plot of the 1-hour Mean Methanol PCs

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Figure A2-3: Contour Plot of the 8-hour Rolling Mean CO PCs

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Figure A2-4: Contour Plot of the 1-hour Mean CO PCs

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Figure A2-5: Contour Plot of the Annual Mean Lead PCs

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Figure A2-6: Contour Plot of the Lead Deposition PCs

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Figure A2-7: Contour Plot of the Annual Mean Manganese PCs

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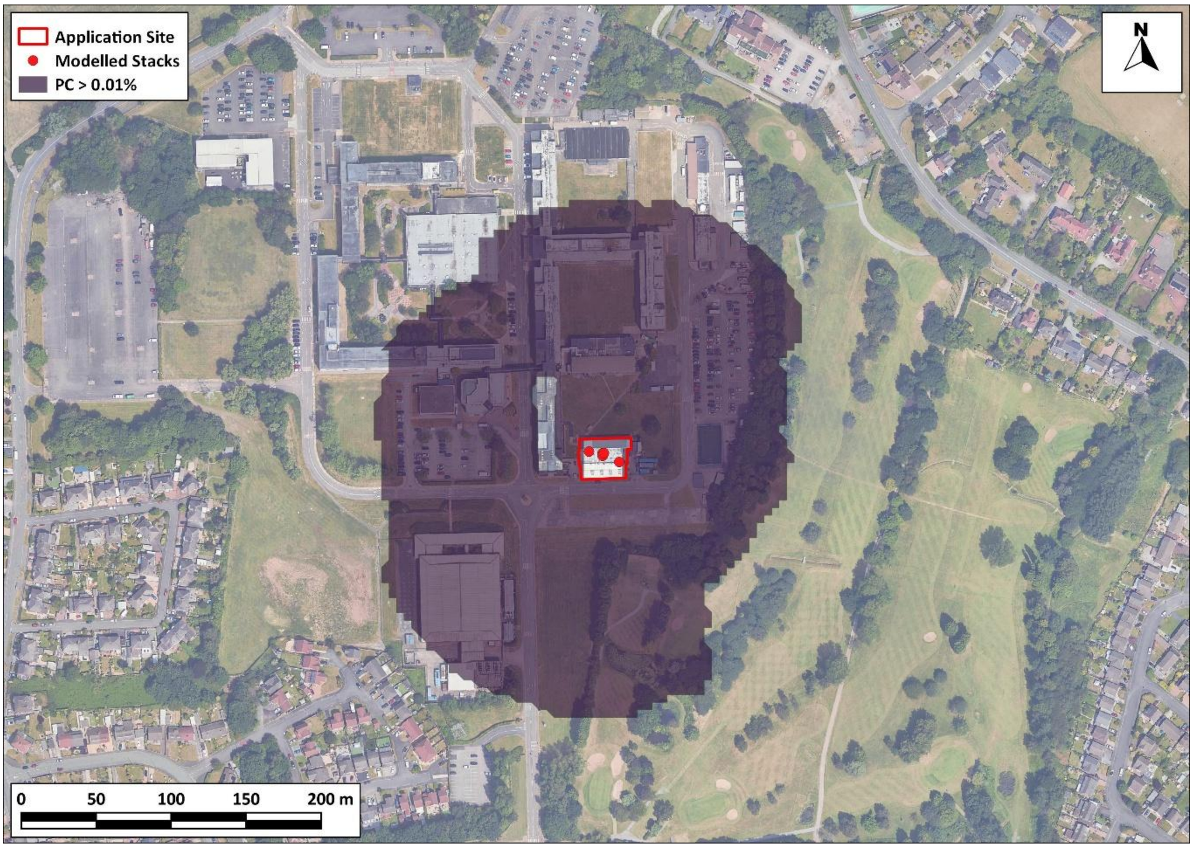

Figure A2-8: Contour Plot of the 1-hour Mean Manganese PCs

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Figure A2-9: Contour Plot of the 1-hour Mean HF PCs

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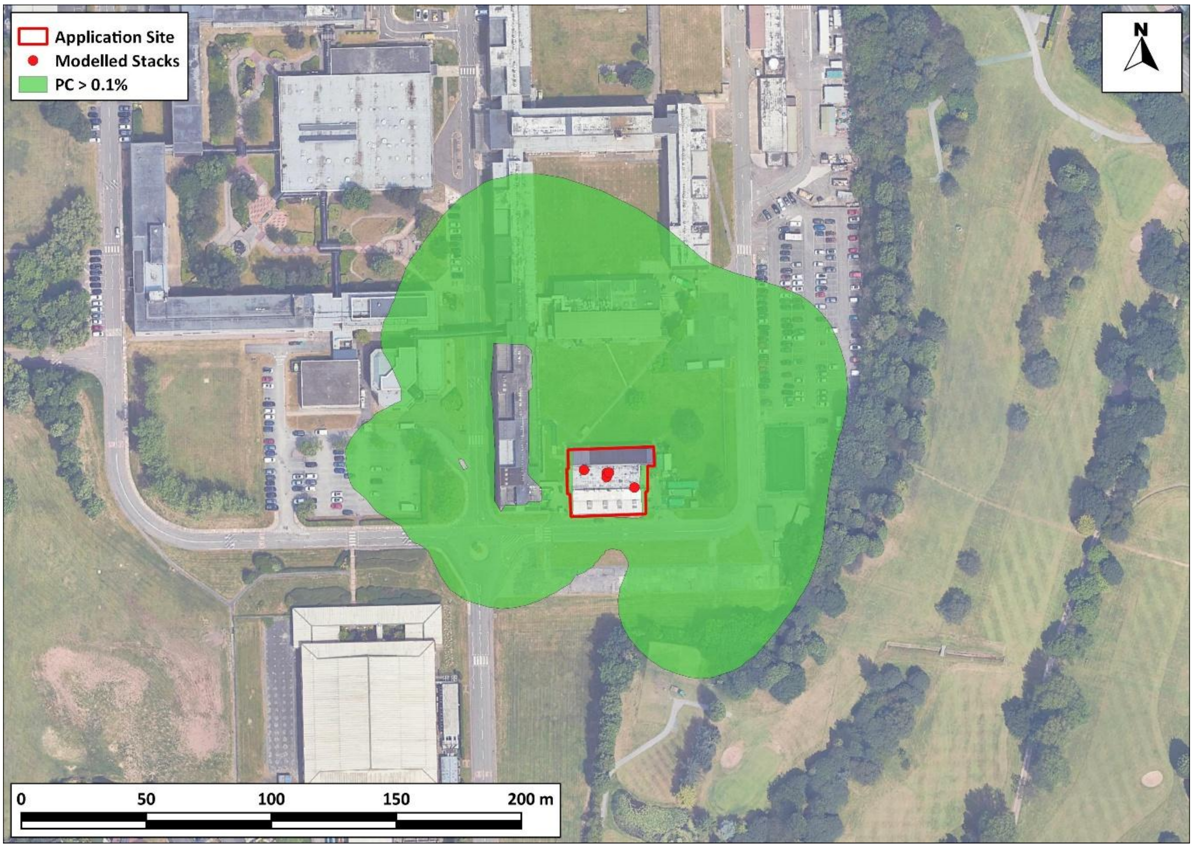

Figure A2-10: Contour Plot of the HF Deposition PCs

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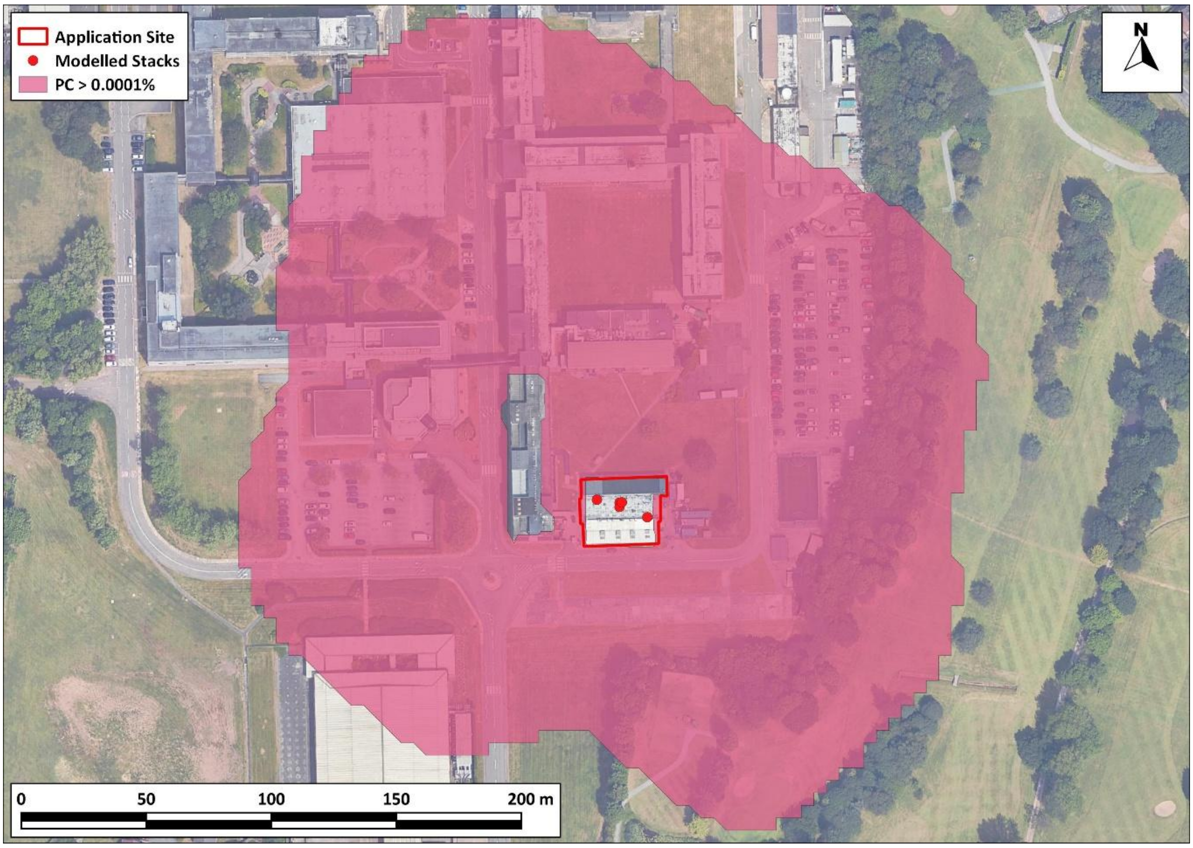

Figure A2-11: Contour Plot of the Annual Mean Hexane PCs

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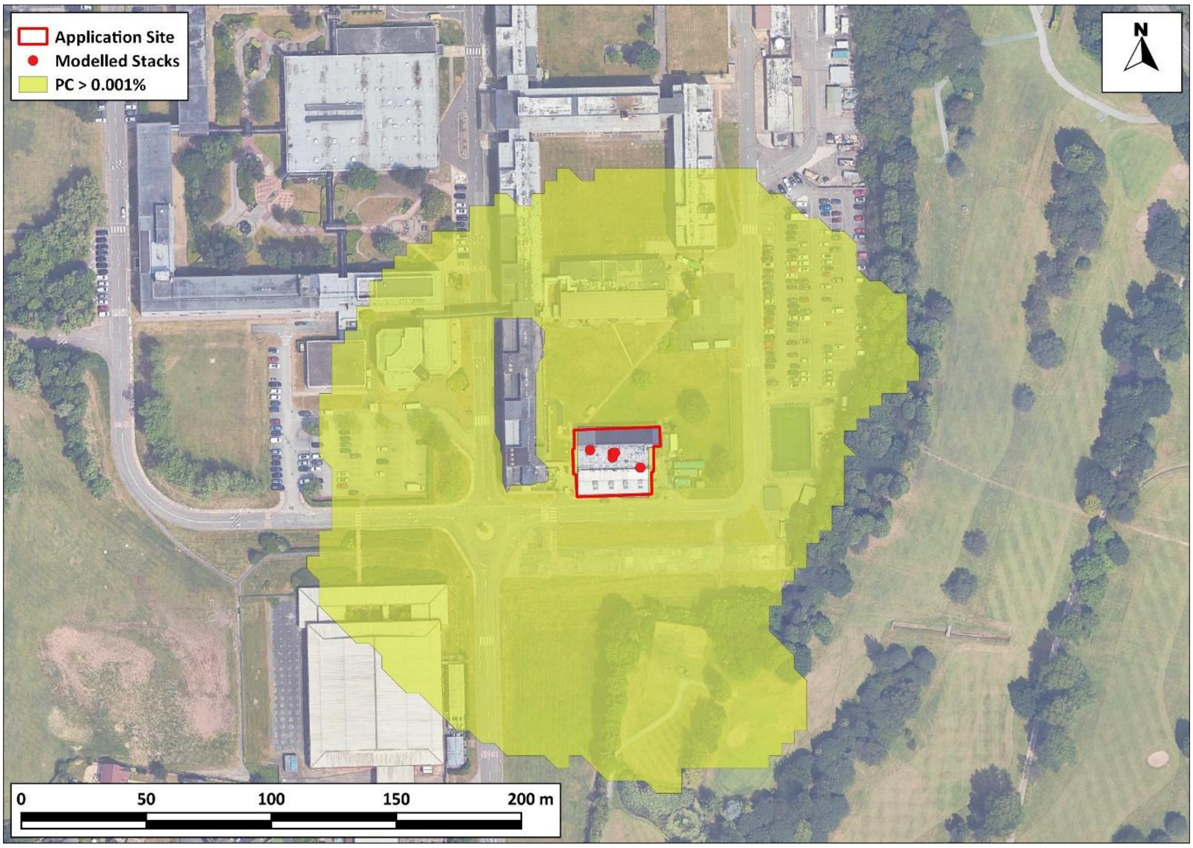

Figure A2-12: Contour Plot of the 1-hour Mean Hexane PCs

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A3 EA Checklist for Dispersion Modelling Report for Installations

Table A3-1: EA Checklist for Dispersion Modelling Report for Installations

Item	Included	Comment
Location map	✓	See Figure 2-1 and Figure 2-2
Site plan	✓	See Figure 3-1
List of emissions modelled	✓	See Paragraphs 1.3 and 1.4
Details of modelled scenarios	✓	See Table 1-2 and Section 6
Details of relevant ambient concentrations used	✓	See Section 5
Model description and justification	✓	See Paragraphs 6.2 through 6.4
Special model treatments used	✓	See Section 6.38
Table of emission parameters used	✓	See Table 6-1 and Table 6-2
Details of modelled domain and receptors	✓	See Figure 2-1 and Figure 2-2, Paragraphs 6.8 to 6.11, Table 6-3 and Table 6-4, and Figure 6-2 to Figure 6-4
Details of meteorological data used (including origin) and justification	✓	See Paragraphs 6.12 to 6.14, and Table 6-5
Details of terrain treatment	✓	See Paragraphs 2.3, 2.4, 6.15 and 6.16, and Figure 2-3
Details of building treatment	✓	See Paragraphs 6.22 through 6.24, Figure 6-6 and Table 6-7
Sensitivity analysis	✓	See Section 6, Table 6-9 and Table 6-10
Assessment of impacts	✓	See Sections 8 and 9
Model input files	✓	Sent electronically

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