# SCHEDULE 5 RESPONSE

**Prepared for:**

**ICoNiChem Widnes Ltd**
**Moss Bank Road**
**WA8 0RU**

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APPENDIX I – ECL Report ICON.01.01/AQA – Air Quality Assessment

# LIST OF ACRONYMS / TERMS USED

| | |
|---|---|
| ADM | Air Dispersion Modelling (ECL Report ICON.01.01/ADM) |
| ADMS | Atmospheric Dispersion Modelling System |
| AQS | Air Quality Standard |
| BFRs | Brominated Flame Retardants |
| $CO_2$ | Carbon dioxide |
| Co | Cobalt |
| EA | Environment Agency |
| ECL | Environmental Compliance Limited |
| ELV | Emission Limit Value |
| EP | Environmental Permit |
| GC–MS | Gas Chromatography–Mass Spectrometry |
| H1 | Environment Agency Environmental Risk Assessment Methodology (H1) |
| $H_2SO_4$ | Sulphuric acid |
| HCl | Hydrogen chloride |
| HF | Hydrogen fluoride |
| $LiPF_6$ | Lithium hexafluorophosphate |
| LiTFSI | Lithium bis(trifluoromethanesulfonyl)imide |
| LWS | Local Wildlife Site |
| Mn | Manganese |
| $NH_3$ | Ammonia |
| Ni | Nickel |
| NOx | Oxides of nitrogen |
| OECD | Organisation for Economic Co-operation and Development |
| PC | Process Contribution |
| PCBs | Polychlorinated biphenyls |
| PCDD/F | Polychlorinated dibenzo-p-dioxins and dibenzofurans (dioxins and furans) |
| PEC | Predicted Environmental Concentration |
| PFAS | Per- and polyfluoroalkyl substances |
| PFBA | Perfluorobutanoic acid |
| PFOA | Perfluorooctanoic acid |
| PFOS | Perfluorooctane sulfonate |
| $PM_{10}$ / $PM_{2.5}$ | Particulate Matter (diameter below 10 µm / 2.5 µm) |
| PVDF | Polyvinylidene fluoride |
| $SO_2$ | Sulphur dioxide |
| SOx | Oxides of sulphur |
| SPA | Special Protection Area |
| The Installation | ICoNiChem Metals Salt Installation, Moss Bank Road, Widnes, WA8 0RU |
| TVOCs | Total Volatile Organic Compounds |
| VOCs | Volatile Organic Compounds |

# 1. INTRODUCTION

## 1.1. Overview

1.1.1. Environmental Compliance Limited ("ECL") have been commissioned by ICoNiChem to respond to a Schedule 5 request for further information in relation to a permit variation application (EPR/FP3032RH/V005) for their site ("the Installation") located on Moss Bank Road, Widnes WA8 0RU.

1.1.2. The Schedule 5 request required further information including:

- an Air Emissions Risk Assessment (H1 Screening Tests);
- an Update on Abatement Plant; and
- a Revised Risk Assessment for Designated Conservation sites.

1.1.3. Each of the points above is discussed in the following chapters.

# 2. H1 Assessment

## 2.1. Introduction

2.1.1. A H1 Assessment was provided with the permit application, however, the EA have requested a revised H1 risk assessment for emissions to air, including an assessment of deposition to ground of substances, reasonably expected to be present in received black mass to include, but not limited to, the following substances.

- dust (as particulate matter $PM_{10}$ and $PM_{2.5}$);
- total volatile organic compounds ("TVOCs");
- speciated VOCs;
- dioxin-like polychlorinated biphenyls ("PCBs")
- dioxins and furans ("PCDD/F")
- brominated flame retardants ("BFRs")
- metals and metalloids excluding mercury (including arsenic ("As"), cadmium ("Cd"), cobalt ("Co"), chromium ("Cr"), copper ("Cu"), lithium ("Li"), manganese ("Mn"), nickel ("Ni"), lead ("Pb"), antimony ("Sb"), selenium ("Se"), thallium ("Tl"), vanadium ("V") and zinc ("Zn");
- fluoride ("$F^-$");
- mercury ("Hg");
- molybdenum ("Mo");
- sulphuric acid ("$H_2SO_4$");
- hydrogen chloride ("HCl");
- hydrogen fluoride ("HF");
- sulphur dioxide ($SO_2$);
- chlorine ("Cl");
- ammonia ("$NH_3$);
- oxides of nitrogen ("NOx");
- oxides of sulphur ("SOx");
- perfluorooctanoic acid ("PFOA");
- perfluorooctane sulfonate ("PFOS"); and
- other poly fluoroalkyl substances ("PFAS").

2.1.2. Of the substances listed above, there are some that will not be present in the extracted air. These are discussed on Section 2.3.

## 2.2. Scope and Scenarios

2.2.1. Due to the number of stacks, various pollutants, detailed building layout, timescales for a detailed response and professional judgment, it was considered that a H1 assessment would be too conservative and therefore the assessment proceeded directly to detailed air dispersion modelling.

2.2.2. An air dispersion model using ADMS6 has therefore been undertaken and is presented as ECL Report ICON.01.01/ADM. The full scope of the assessment, for the pollutants that are likely to be present in emissions from the installation is discussed in the ADM.

2.2.3. The assessment has been undertaken for one scenario only, which based on proposed emission limit values for the new black mass process and existing emission limits currently in the Installation's permit.

2.2.4. Data on flow has been used from the exiting H1 assessment and existing emissions monitoring reports where available.

2.2.5. It should also be noted that the black-mass reaction vessels are enclosed and extracted to the existing A1 wet scrubber. Reagent addition is interlocked with the scrubber fan, consequently acid addition is inhibited automatically if fan motion is lost. It should be notes that the wet scrubber is a scrubber system consisting of 6 wet scrubbers with an interlock on the final scrubber for NOx. The manway is also interlocked to inhibit acid and hydrogen-peroxide addition unless closed. The reactor temperature is controlled by cooling water and reagent addition is inhibited if either temperature probe reaches 90°C. These measures therefore prevent uncontrolled releases to the environment and route normal off-gas, acid mist and entrained particulate to the scrubber. The performance of the scrubber performance will be demonstrated by inspection and maintenance of the fan, liquid circulation, pressure differential, liquor condition and mist eliminator.

2.2.6. In addition, it is envisaged that an improvement condition will be contained within the Installation's permit which will require the operator to propose a monitoring programme to characterise and assess the Installation's point source emissions to air once fully operational and the findings of the air quality assessment confirmed.

## 2.3. Substances Potentially Present

2.3.1. Any emissions from the black mass process will only be released from emission point A1 – $NO_x$ scrubber. Emissions from all other emissions points will remain unchanged.

2.3.2. The process description submitted with the permit variation application confirms that black mass is pre-treated by upstream crushing, sorting, drying and, where applicable, pyrolysis to remove residual electrolyte and fluorine-containing components before receipt at the Installation.

2.3.3. At the Installation, the material is dissolved in nitric acid, with hydrogen peroxide added where required, in a semi-batch reaction controlled at 75–80°C. The credible release mechanisms are therefore reaction gases, vapour or acid mist, entrained droplets and fine particulate carried into the extracted off-gas, rather than any potential products of combustion.

2.3.4. Carbon dioxide and oxygen have been identified by Carius-tube and GC–MS testing following acid and peroxide addition. All reactor off-gas is extracted to the existing A1 scrubber; the process interlocks inhibit reagent addition following fan failure, excessive temperature or an open manway.

2.3.5. Sections 2.4. to 2.14. provide justification as to why the following pollutants are not expected to be released from A1 as a result of the black mass processing:

- PCBs;
- dioxins and furans;

- BFRs;
- fluoride;
- $H_2SO_4$;
- $SO_2$;
- $SO_x$;
- chlorine;
- ammonia; and
- PFAS (including PFOA and PFOS).

## 2.4. PCBs

2.4.1. Formation of dioxin-like PCBs is not expected during the proposed aqueous nitric-acid leach. The operation contains no combustion or high-temperature treatment at the Installation, and PCBs are not process reagents. Any PCB present would therefore have to enter as a feed impurity. At the normal operating temperature of 75–80°C, chemical formation or significant volatilisation is not expected.

## 2.5. Dioxins and Furans

2.5.1. New formation of polychlorinated dibenzo-p-dioxins and dibenzofurans is not expected because the ICoNiChem treatment is an aqueous hydrometallurgical operation at 75–80°C, with no combustion or thermal oxidation stage.

2.5.2. Published process assessments distinguish hydrometallurgy from pyrometallurgical treatment, for which high-temperature processing creates the dioxin and fluoride-emissions. Consequently dioxins and furans will not be released from the black mass processing.

## 2.6. Sulphuric Acid

2.6.1. Sulphuric acid is not used as a process reagent at the Installation; the leach uses nitric acid and, where required, hydrogen peroxide. There is no combustion of sulphur-bearing material. A process-generated sulphuric-acid emission is therefore not expected.

2.6.2. Trace sulphate already present in feed would be expected to remain dissolved or in the solid phase.

## 2.7. Sulphur Dioxide

2.7.1. $SO_2$ is not expected to be generated by the specified chemistry because nitric acid and hydrogen peroxide contain no sulphur and no sulphite or sulphide reagent is added. The process description identifies $CO_2$ and $O_2$, rather than $SO_2$, in reaction testing.

2.7.2. Published reports of $SO_2$ from battery black mass relate principally to pyrolysis or other thermal treatment; no such treatment occurs at the Installation. Any trace sulphur in accepted feed would be expected to remain in the aqueous or solid phase under the

proposed conditions.

## 2.8. Oxides of Sulphur

2.8.1. Oxides of sulphur are not expected as there is no sulphur-based reagent, combustion or high-temperature oxidation stage. Sulphate or other non-volatile sulphur species present as feed impurities would normally remain in the leach liquor or residue.

## 2.9. Brominated Flame Retardants and PFAS (including PFOA and PFOS)

2.9.1. BFRs are not used in the dissolving process. They could occur only as contaminants where plastics, separators or electronic components remain in the black mass. However, the pre-treatment undertaken prior to acceptance at the Installation is intended to remove these fractions.

2.9.2. The Installation's 75–80°C aqueous treatment is far below thermal decomposition or combustion conditions and therefore is not expected to generate brominated degradation products.

2.9.3. For the acid-leaching/hydrometallurgical process proposed, gaseous PFAS would not normally be expected to be generated as a significant reaction product. Black mass can contain the polymeric PFAS PVDF, and sometimes other fluoropolymer binders, together with residual fluorinated electrolyte constituents such as LiTFSI/bis-FASI salts. However, the common electrolyte salt $LiPF_6$ is an inorganic fluorine compound, not itself a PFAS, because it contains no fluorinated carbon. Other fluorinated electrolyte additives may be organic fluorine compounds without necessarily meeting the OECD PFAS definition[1].

2.9.4. Under the Installation's leaching conditions— nitric acid at 75–80°C, with hydrogen peroxide added —the predominant gas generated by the leaching reaction is oxygen, arising from peroxide decomposition and the cathode dissolution chemistry. These conditions are well below those associated with significant thermal decomposition of PVDF, which generally begins at approximately 350–400°C and can produce HF, fluorocarbons and other volatile fluorinated products during pyrolysis or combustion.

2.9.5. Although prolonged exposure to concentrated sulphuric acid can alter or partially dehydrofluorinate PVDF, available studies do not demonstrate formation of volatile PFAS from PVDF during short-duration, low-temperature aqueous leaching[2]. However, as discussed previously, sulphuric acid is not used.

2.9.6. As discussed previously, the most likely fluorinated emission is HF associated with hydrolysis of residual $LiPF_6$, rather than newly formed PFAS. Fluoride has been measured in real nickel manganese cobalt ("NMC") black-mass leachates, confirming that fluorine commonly transfers into the aqueous phase during hydrometallurgical processing. In a strongly acidic reactor, some dissolved fluoride may be present as HF and could be released with water vapour or acid mist.

2.9.7. Existing PFAS could also become airborne through entrainment of PFAS-containing droplets, foam or fine particulate, rather than through chemical generation of a PFAS gas.

[1] https://pubs.rsc.org/em/article/25/6/1015/767648/Lithium-ion-battery-recycling-a-source-of-per-and
[2] https://pubs.acs.org/ascecg/article-pdf/11/26/9662/2986354/sc3c01238.pdf

Recent preliminary research on acidic hydrometallurgical leaching of shredded electronic waste demonstrated aqueous-to-air transfer of selected PFAS at pH below 1, but it did not establish new PFAS formation and is not specific to lithium-ion black mass[3][4].

2.9.8. For an air quality assessment, it would therefore be reasonable to conclude that a material gaseous PFAS emission is not inherently expected from the nitric acid/$H_2O_2$ leaching chemistry, especially as there is no associated thermal treatment.

2.9.9. Direct off-gas evidence for black-mass dissolving has been obtained from several pilot scale studies. In DEKRA black mass study J4028005382 (which can be provided if required) mass spectrometry of gas showed no gas generation on addition of nitric acid and oxygen generation on addition of Hydrogen Peroxide, no further contaminants were detected.

2.9.10. Black mass study J4028006879 (which can be provided if required) mass spectrometry of gas showed carbon dioxide generation on addition of nitric acid and oxygen generation on addition of Hydrogen Peroxide, no further contaminants were detected.

2.9.11. Once the process is fully operational air emissions testing for PFAS will be undertaken to confirm the above assumptions.

2.9.12. It should be noted that ICoNiChem have tested 8 black mass raw materials, as part of pre acceptance checks for all new materials accepted at the Installation. Of the 8 samples tested, only one of them contained any PFAS, namely PFBA, recorded at 0.04 and 0.05 mg/kg within the received batch.

2.9.13. The waste material that results from processing black mass has also been tested, an no PFAS was found in the solid waste). Consequently, any PFAS is likely remain in the liquid effluent from the process. Due to the high sodium content of this waste steam, the required detection levels of detection cannot me met to confirm this. It is therefore proposed that any PFAS would be collected via an activate carbon filter fitted to the effluent line. Regular testing of the carbon filter would undertaken to complete a mass balance of the PFAS present. The contaminated activated Carbon would be disposed of via high temp incineration when considered spent.

## 2.10. Fluoride

2.10.1. Fluorine may enter with residual $LiPF_6$ electrolyte, other fluorinated salts or polyvinylidene fluoride (“PVDF”) binder. Upstream washing or thermal preparation can reduce these constituents but cannot be assumed to remove them completely. Published black-mass studies report fluoride in leachates, demonstrating that a significant fraction transfers to the aqueous phase during hydrometallurgical treatment. PVDF is expected to remain mainly with the solid residue under the Installation’s 75–80°C aqueous conditions; consequently, the credible air pathway is inorganic fluoride or HF in acid mist or entrained droplets rather than thermal breakdown of the binder.

[3] https://fluoridealert.org/studytracker/fluoride-removal-from-nmc-black-mass-leachates-during-lithium-ion-battery-recycling-via-aluminum-sulfate-precipitation/
[4] https://meetingorganizer.copernicus.org/EGU26/EGU26-11507.html?pdf

2.10.2. Each new feedstock is subject to the site Management of Change process, including chemical-reaction hazard review and analysis of soluble fluoride. Material with an unacceptably high fluoride content is not accepted.

2.10.3. Consequently, it is considered that HF is the more likely pollutant to be released, and therefore will be considered in the air quality assessment.

## 2.11. Chlorine

2.11.1. Chlorine is not expected as a reaction product because neither nitric acid nor hydrogen peroxide introduces chloride. Battery electrolytes are commonly fluorine-based rather than chloride-based.

## 2.12. Ammonia

2.12.1. Ammonia is not used and is not expected to be formed from the specified nitric-acid and hydrogen-peroxide reagents. Under the strongly acidic leach conditions, any trace ammonia would be protonated to non-volatile ammonium and retained in solution. However, as ammonia is released from other emission points at the Installation, it will be included in the air quality assessment.

## 2.13. Summary of Results

2.13.1. Based on the justification provided above, detailed air dispersions modelling was therefore undertaken for the following pollutants arising from the black mass process, in additional to those pollutants currently released from permitted emission points at the Installation:

- dust (as particulate matter $PM_{10}$ and $PM_{2.5}$);
- total volatile organic compounds ("TVOCs");
- speciated VOCs;
- metals and metalloids excluding mercury (including arsenic ("As"), cadmium ("Cd"), cobalt ("Co"), chromium ("Cr"), copper ("Cu"), lithium ("Li"), manganese ("Mn"), nickel ("Ni"), lead ("Pb"), antimony ("Sb"), selenium ("Se"), thallium ("Tl"), vanadium ("V") and zinc ("Zn");
- mercury ("Hg");
- molybdenum ("Mo");
- hydrogen chloride ("HCl");
- hydrogen fluoride ("HF");
- ammonia ($NH_3$); and
- oxides of nitrogen ("NOx").

2.13.2. The results are discussed in Section 3.1 and the full report provided as Appendix I.

# 3. Abatement

## 3.1. Modelling Results

3.1.1. Detailed air quality modelling using the ADMS dispersion model has been undertaken to predict the impacts associated with stack emissions from the Installation. As a worst-case, emissions from the Installation's stacks have been assumed to be released at the maximum ELVs twenty-four hours a day, 365 days of the year for those pollutants with short-term averaging periods; and released at the maximum ELVs for 24 hours a day, 5 days a week, 52 weeks a year for those pollutants with long-term averaging periods. This represents a conservative assessment of the impact since the actual emissions from the site are likely to be significantly lower during normal operation.

3.1.2. Long-term process PCs, adjusted for the operating mode of 24 hours a day, 5 days a week, 52 weeks a year, are below the AQSs for all pollutants. PECs are below 75% of the AQS for all pollutants except cadmium (maximum 96.6% of the AQS) and arsenic. For arsenic, the conservative sensitivity case (continuous emission at 0.10 mg/Nm³) gives a PC of up to 99.6% and a PEC of up to 153.6% of the AQS, which would constitute a breach. However, based on the more realistic release pattern for the process (8 hours a day, 5 days a week, 50 weeks a year), the adjusted PC is 0.00191 µg/m³ (32% of the AQS) and the PEC is 0.0052 µg/m³ (86% of the AQS), which is described as moderate and does not breach the AQS.

3.1.3. Short-term impacts range from small to large. Large impacts are predicted for cadmium (24-hour PC up to 60.1% of the AQS) and VOC as 1,3-butadiene (up to 80.2% of the AQS), but none of the short-term AQSs are breached. The 1,3-butadiene result is based on an assumed concentration of 5 µg/m³, unlikely and speciated VOC testing should be undertaken on the process emissions.

3.1.4. For the sensitive habitat sites assessed, predicted oxides of nitrogen, ammonia and hydrogen fluoride concentrations are below the critical levels at all LWSs and are not significant at the Mersey Estuary SPA/Ramsar (below 1% of the long-term and 10% of the short-term criteria).

3.1.5. There are no predicted exceedances of the critical loads for nutrient nitrogen or acid deposition at any modelled point. It has therefore been demonstrated that emissions from the Installation are unlikely to have a detrimental effect on these sites.

3.1.6. In summary, it can be concluded that the proposed black mass process at the Installation will not have a detrimental impact on local air quality, human health or sensitive habitat sites, with no breaches of the AQSs predicted at the point of maximum impact or at the human receptors under the assessed operating assumptions. This is subject to confirmation, through the further emissions testing set out in Section 7.2, that arsenic is not released at the conservative concentration assumed in the sensitivity case.

## 3.2. Existing Abatement

3.2.1. A1 is an existing wet scrubber serving the enclosed reaction vessels. Wet absorbers are established controls for water-soluble acid gases and can also capture particulate and entrained droplets; mist eliminators are important to prevent re-entrainment.

3.2.2. Scrubber liquid flow, liquor condition and pH, fan status be maintained, monitored and recorded. Additional polishing, such as activated carbon, is not considered necessary for emissions from A1 based on the introduction of the black mass process, however, this will be confirmed by emissions testing of A1.

**APPENDIX I**
**ECL Report ICON.01.01/AQA**

# AIR DISPERSION MODELLING ASSESSMENT

**ICoNiChem Widnes Ltd**
**Moss Bank Road**
**WA8 0RU**

**ECL Ref: ICON.01.01/AQA**
**Date: 30/10/2026**
**Version: Issue 1**

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# ACRONYMS / TERMS USED IN THIS REPORT

| | |
|---|---|
| AAD | Ambient Air Directive |
| ADMS | Atmospheric Dispersion Modelling System |
| APIS | Air Pollution Information System |
| AQAL | Air Quality Assessment Level |
| AQDD | Air Quality Daughter Directive |
| AQMA | Air Quality Management Area |
| AQMAU | Air Quality Modelling Assessment Unit |
| AQO | Air Quality Objective |
| AQS | Air Quality Standard |
| As | Arsenic |
| ASR | Annual Status Report |
| BAT | Best Available Techniques |
| BAT-AEL | Best Available Techniques–Associated Emission Level |
| BFRs | Brominated Flame Retardants |
| Bref | Best Available Techniques Reference Document |
| Cd | Cadmium |
| CERC | Cambridge Environmental Research Consultants |
| CrIII | Chromium III |
| Cu | Copper |
| EA | Environment Agency |
| ECL | Environmental Compliance Ltd |
| ELV | Emission Limit Value |
| EP | Environmental Permit |
| GLC | Ground Level Concentration |
| Hg | Mercury |
| IAQM | Institute of Air Quality Management |
| LNR | Local Nature Reserve |
| Met Data | Meteorological Data |
| Met Office | Meteorological Office |
| Met Station | Meteorological Station |
| Met Year | Meteorological Year |
| Mn | Manganese |
| $NH_3$ | Ammonia |
| Ni | Nickel |
| Pb | Lead |
| PC | Process Contribution |
| PEC | Predicted Environmental Concentration |
| $PM_{10}$ | Particulate Matter (with a diameter of 10 µm or less) |
| Ramsar | Ramsar Convention on Wetlands of International Importance |
| SAC | Special Areas of Conservation |
| Se | Selenium |
| SPA | Special Protection Areas |
| SSSI | Site of Special Scientific Interest |
| The Installation | ICoNiChem's Metal Salts Installation |
| V | Vanadium |
| VOC | Volatile Organic Compounds |
| WHO | World Health Organisation |
| Zn | Zinc |

# 1. INTRODUCTION

## 1.1. The Study

1.1.1. Environmental Compliance Ltd ("ECL") were commissioned by ICoNiChem Widnes Limited ("ICoNiChem") to undertake an air quality assessment of releases from their metal salts installation ("the Installation") located at Moss Bank Road, Widnes, Cheshire, WA8 0RU.

1.1.2. The study was conducted to determine the impact of emissions to air from the proposed Installation on both human health and local environmentally sensitive sites.

1.1.3. The study was undertaken using the ADMS modelling package, which is one of the models recognised as being suitable for this type of study.

1.1.4. The approximate site location is shown on the Site Location Map, outlined in red, which is presented as Figure 1.

**Figure 1: Site Location Map**



## 1.2. Objectives of the Study

1.2.1. The objectives of this study are as follows:

- to determine the maximum ground level concentrations ("GLCs") arising from the emission of pollutants from the Installation's stacks;
- to assess the impact of emissions from the Installation's stacks on existing local air quality in relation to human health at a range of potentially sensitive receptors by comparison with relevant air quality standards ("AQSs"); and
- to assess the impact of emissions, where relevant, from the Installation's stacks on potentially sensitive ecological receptors and compare these to the Critical Levels set for the protection of Ecosystems.

## 1.3. Scope of the Study

1.3.1. An assessment of potential pollutants likely to arise from a new black mass process at the Installation has been undertaken (see ECL Report ICON.01.01/S5R) and concluded that the following pollutants may be present in emissions to the atmosphere:

- dust (as particulate matter $PM_{10}$ and $PM_{2.5}$);
- total volatile organic compounds ("TVOCs");
- speciated VOCs;
- metals and metalloids excluding mercury (including arsenic ("As"), cadmium ("Cd"), cobalt ("Co"), chromium ("Cr"), copper ("Cu"), lithium ("Li"), manganese ("Mn"), nickel ("Ni"), lead ("Pb"), antimony ("Sb"), selenium ("Se"), thallium ("Tl"), vanadium ("V") and zinc ("Zn");
- mercury ("Hg");
- molybdenum ("Mo");
- hydrogen chloride ("HCl");
- hydrogen fluoride ("HF");
- ammonia ($NH_3$); and
- oxides of nitrogen ("NOx").

1.3.2. Modelling was carried out using the most appropriate emission limit values ("ELVs") derived from BAT conclusions documents, the Industrial Emissions Directive and relevant Sector Guidance Notes.

1.3.3. The effects of prevailing meteorological conditions, building downwash effects, local terrain and existing ambient air quality were also taken into account.

1.3.4. The maximum predicted pollutant ground level concentrations ("GLCs") - also known as the PCs - for each of the releases were compared with the relevant AQSs.

1.3.5. The predicted environmental concentrations ("PECs") - the sum of the pollutant PC and the existing pollutant background concentration from other sources - were also compared to the relevant standards. Results are presented as the maximum predicted GLC and the maximum sensitive receptor GLC.

1.3.6. Where relevant, maximum predicted annual mean GLCs of various potential pollutants were compared with the Critical Levels for the Protection of Ecosystems or Vegetation detailed in the Environment Agency's online guidance[1].

1.3.7. The maximum predicted pollutant GLCs at seven human receptors were also compared to the relevant AQSs.

1.3.8. There are currently no declared Air Quality Management Areas ("AQMAs") within Halton Borough Council ("HBC") (both AQMAs were revoked in November 2023). The nearest AQMAs are located within Warrington Borough Council ("WBC"), however, as these are in excess of 5km from the Installation, they have not been included in the assessment.

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

# 2. METHOD STATEMENT

## 2.1. Choice of Model

2.1.1. The UK-ADMS model was developed jointly by Cambridge Environmental Research Consultants ("CERC"), Her Majesty's Inspectorate of Pollution (the EA's predecessor body), the Meteorological Office and National Power, with sponsorship from the UK Government and a number of commercial organisations. UK-ADMS is a computer-based model of dispersion from both point and non-point sources in the atmosphere and is one of the modelling packages that are suitable for this type of study. The current version is ADMS 6.

2.1.2. ADMS 6 has been validated against a number of data sets in order to assess various configurations of the model such as flat or complex terrain, line/area/volume sources, buildings, dry deposition fluctuations and visible plumes. The model results have been compared to observational data or other model results if available.

2.1.3. ADMS 6 is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterised by two parameters:

- the boundary layer depth, and
- the Monin-Obukhov length,

rather than in terms of the single parameter Pasquill-Gifford class.

2.1.4. Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression).

2.1.5. ADMS 6 is therefore considered to be suitable for use in this assessment.

## 2.2. Key Assumptions

2.2.1. The study will be undertaken on the basis of a worst-case scenario. Consequently, the following assumptions have been made:

- the release concentrations of the pollutants will be at the permitted ELVs on a 24-hourly basis, 365 days of the year; in practice, when the plant is operating, the release concentrations will be below the ELVs, and, for most pollutants, considerably so; furthermore, taking shutdowns for planned maintenance into account, the plant will not operate for 365 days, consequently for long term emissions, PCs have been adjusted using the operating mode percentage;
- the highest predicted pollutant GLCs for the five years of meteorological data for each averaging period (annual mean, hourly, etc.) have been used;
- all of the particulate releases will be present as $PM_{2.5}$ and also as $PM_{10}$; this enables direct comparison with the particle AQSs, which are expressed in terms of $PM_{2.5}$ and $PM_{10}$; in practice, this will not be the case as some of the particles present will be larger than $PM_{10}$; and
- maximum predicted GLCs at any location, irrespective of whether a sensitive receptor is characteristic of public exposure, are compared against the relevant AQSs for each pollutant; in addition, the predicted maximum sensitive receptor GLC has also been assessed.

## 2.3. Sensitive Human Receptors

2.3.1. In addition to predicting concentrations over a 4km by 4km grid, there are nine potentially sensitive human receptors considered in the assessment (up to a distance of 1.3km from the main stacks). Details of these receptors are provided in Table 1 and shown on Figure 2 . All receptors are assumed to be at ground level.

**Table 1: Potentially Sensitive Human Receptors**

| Ref. | Name | Easting (X) | Northing (Y) | Distance from A1 Stack (m)[(a)] | Heading (°) |
|---|---|---|---|---|---|
| HR1 | Industrial Building Moss Street | 352829 | 385508 | 57 | 315 |
| HR2 | Industrial Building Moss Bank Road | 352972 | 385438 | 107 | 106 |
| HR3 | Industrial Building Brown Street | 352707 | 385357 | 196 | 236 |
| HR4 | Lugsdale Residential House | 352566 | 385258 | 369 | 235 |
| HR5 | Grove Street Residential House | 352541 | 385855 | 507 | 320 |
| HR6 | St John Fisher Catholic Primary School | 352810 | 386318 | 852 | 356 |
| HR7 | Anne Street Residential House | 351708 | 385100 | 1218 | 252 |

Notes to Table

(a) Distances are measured as the crow flies from the defined point of the receptor to the 'Source'. The 'Source' is the location of the A1 stack – location coordinates: 352869 (X), 385468 (Y).

**Figure 2: Sensitive Human Receptors Identified within 2km of the Installation**



## 2.4. Sensitive Ecological Receptors

2.4.1. The impact of emissions to air on vegetation and ecosystems from the Installation has been assessed for the following sensitive environmental receptors within 10km of the proposed discharge stacks:

- Special Areas of Conservation ("SACs") and candidate SACs ("cSACs") designated under the EC Habitats Directive[2];
- Special Protection Areas ("SPAs") and potential SPAs designated under the EC Birds Directive[3];
- SACs and SPAs are included in an EU-wide network of protected sites called Natura 2000[4]. The EC Habitats Directive and Wild Birds Directive have been transposed into UK law by the Habitats Regulations[5].
- Ramsar Sites designated under the Convention on Wetlands of International Importance[6];

2.4.2. In addition, the impact of emissions to air on vegetation and ecosystems from the Installation has been assessed for the following sensitive environmental receptors within 2km of the discharge stacks:

- Sites of Special Scientific Interest ("SSSI") established by the 1981 Wildlife and Countryside Act;
- Ancient woodland; and
- local nature sites (ancient woodland, local wildlife sites and national and local nature reserves).

2.4.3. For dispersion modelling purposes, the specified habitat coordinates are a precautionary approach, and are those located at the boundary of the protected site / priority habitat approximately closest in distance to the proposed Installation. All receptors are assumed to be at ground level. The details of the habitat sites are provided in Table 2 and 3 and on Figure 3.

2.4.4. It should be noted that Halton Borough Council's online viewer for LWSs is currently not available to provide either the spatial boundaries nor GIS/KML datafiles for the LWSs listed on the EA's nature conservation and screening assessment. Consequently, the locations of the various LWS identified in the EA's Nature and Heritage Conservation report have approximated. Should mapping data from Halton Borough Council become available, then this report will be updated.

**Table 2: SAC, SPA and Ramsar sites within 10km of the Installation Permit Boundary**

| Ref. | Name and Designation(s) | Easting (X) | Northing (Y) | Distance from EP Boundary (km) | Heading (°) |
|---|---|---|---|---|---|
| E11 | Mersey Estuary - SPA/Ramsar | 350950 | 383750 | 2576 | 228 |

Notes to Table
Distances are measured as the crow flies from the defined point of the receptor to the 'Source'. The 'Source' is the location of the A1 stack – location coordinates: 352869 (X), 385468 (Y).

[2] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora
[3] Council Directive 79/409/EEC on the conservation of wild birds
[4] www.natura.org
[5] The Conservation (Natural Habitats, &c.) Regulations 1994. The Conservation (Natural Habitats, &c.) (Amendment) Regulations 1997 (Statutory Instrument 1997 No. 3055), The Conservation (Natural Habitats, &c.) (Amendment) (England) Regulations 2000 (Statutory Instrument 2000 No. 192)
[6] The Convention of Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, Iran,1971)

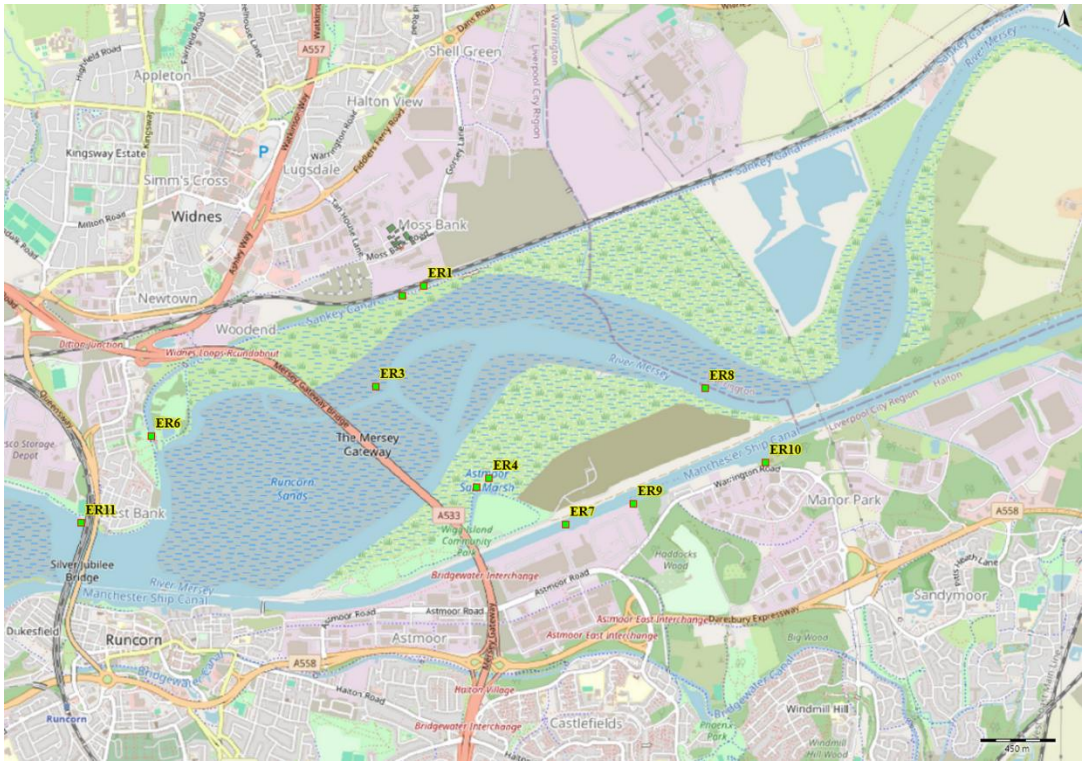
**Table 3: SSSI, NNR, LNR, AW and LWS within 2km of the Installation Permit Boundary**

| Ref. | Name and Designation(s) | Easting (X) | Northing (Y) | Distance from EP Boundary (km) | Heading (°) |
|---|---|---|---|---|---|
| E1 | St Helens Canal - LWS | 352970 | 385148 | 336 | 162 |
| E2 | Widnes Warth Saltmarsh - LWS | 352845 | 385088 | 381 | 184 |
| E3 | Upper Mersey Estuary Intertidal Area and Mudflats - LWS | 352691 | 384553 | 932 | 191 |
| E4 | Astmoor Saltmarsh and Swamp - LWS | 353358 | 384012 | 1536 | 161 |
| E5 | Wigg Island - LNR + LWS | 353283 | 383959 | 1565 | 165 |
| E6 | St Helens Canal Disused - LWS | 351363 | 384261 | 1930 | 231 |
| E7 | Manchester Ship Canal Bank, Astmoor - LWS | 353812 | 383740 | 1969 | 151 |
| E8 | Upper Mersey Estuary - LWS | 354637 | 384545 | 1994 | 118 |
| E9 | Haddocks Wood - LWS | 354209 | 383860 | 2093 | 140 |
| E10 | Haystack Lodge - LWS | 354993 | 384104 | 2524 | 123 |

Notes to Table

Distances are measured as the crow flies from the defined point of the receptor to the 'Source'. The 'Source' is the location of the A1 stack – location coordinates: 352869 (X), 385468 (Y).

**Figure 3: Sensitive Ecological Receptors Identified within 2km of the Installation**



## 2.5. Air Quality Standards for the Protection of Human Health

2.5.1. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland[7] details Air Quality Strategy Objectives for a range of pollutants, including a number that are directly relevant to this study. In addition, the Regulatory Authorities must ensure that the proposals do not exceed Ambient Air Directive ("AAD") limit values.

2.5.2. The 4th Air Quality Daughter Directive[8] ("AQDD") details Target Values for arsenic, cadmium and nickel. The Expert Panel on Air Quality Standards ("EPAQS"), which advises the UK Government on air quality, has set recommended Guideline Values for arsenic, chromium VI and nickel; the EPAQS Guideline Value for nickel is the same as the AQDD Target Value, but the EPAQS Guideline Value for arsenic is half that of the AQDD value. The lowest of these values have been taken into account in this study.

2.5.3. In the case of arsenic, EPAQS has set recommended Guideline Values which have been taken into account in this study. Environmental Quality Standards ("EQSs") have been assigned by the EA (by the use of the EA's EQS) to a number of the other pollutants assessed in the modelling study; these are detailed (where assigned) in the EA's online guidance; these have been derived from a variety of published UK and international sources (including the World Health Organisation ("WHO")).

2.5.4. In this report, the generic term Air Quality Standard ("AQS") is used to refer to any of the above values. The various AQSs - Air Quality Objectives, Target Values, EPAQS Guideline Values and EALs - are intended to be used as guidelines for the protection of human health and the management of local air quality. The values relevant to this study are detailed in Table 4.

[7] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1), July 2007
[8] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air, 15th December 2004.

**Table 4: Air Quality Standards for the Protection of Human Health**

| Pollutant | Averaging Period | AQS ($\mu g/m^3$) | Comments |
|---|---|---|---|
| Particulate Matter, as $PM_{10}$ | Annual | 40 | UK Air Quality Objective |
| | 24-hour (short term) | 50 | UK AQO, not to be exceeded more than 35 times per annum, equivalent to the 90.41$^{st}$ percentile of 24 hour means |
| Particulate Matter, as PM2.5 | Annual | 20 | UK Air Quality Objective |
| VOC (as benzene) | Annual | 5 | UK Air Quality Objective |
| | 24-hour (short term) | 30 | Hazard characterisation method for determining Tolerable Concentrations in Air (2021) |
| VOC (as 1,3-butadiene) | 24-hour (short term) | 2.25 | UK Air Quality Objective |
| Hydrogen chloride (HCl) | 1-hour | 750 | EPAQS Halogen and Hydrogen Halides (2006) |
| Hydrogen fluoride (HF) | Monthly mean | 16 | EPAQS Addendum to Halogens and Hydrogen Halides Report (2009) |
| | 1-hour | 160 | EPAQS Halogen and Hydrogen Halides (2006) |
| Oxides of nitrogen ($NO_x$) | annual | 40 | UK Air Quality Objective ("AQO") and AAD Limit |
| | 1-hour | 200 | UK AQO and AAD Limit, not to be exceeded more than 18 times per annum, equivalent to the 99.79$^{th}$ percentile of 1-hour means |
| Ammonia ($NH_3$) | annual (long term) | 180 | Old EAL derivation method from EH40/2001 OEL |
| | 1-hour (short term) | 2,500 | Old EAL derivation method from EH40/2001 OEL |
| Arsenic (As) | annual (long term) | 0.006 | Air Quality Standards Regulations 2010 Target Values |
| Cadmium (Cd) | annual mean (long term) | 0.005 | Air Quality Standards Regulations 2010 Target Values |
| | 24 hour mean (short term) | 0.03 | Hazard characterisation method for determining TCA (2023) |

**Table 4: Air Quality Standards for the Protection of Human Health (cont)**

| Pollutant | Averaging Period | AQS (µg/m³) | Comments |
|---|---|---|---|
| Cobalt (Co) | annual | 0.2 | EAL derived from long-term occupational exposure limits |
| | 1-hour | 6 | EAL derived from short-term occupational exposure limits |
| Chromium (CrIII) as chromium | 24 hour mean (long term) | 2 | Hazard characterisation method for determining Tolerable Concentrations in Air (2023) |
| Copper (Cu) | 24 hour mean (long term) | 0.05 | Hazard characterisation method for determining Tolerable Concentrations in Air (2023) |
| Lithium (Li) | 8-hour TWA | 200 | German and Swiss Limit[9] |
| | 15 min STEL | 20 | Swedish Limit[3] |
| Lead (Pb) | annual (long term) | 0.25 | UK AQO |
| Manganese (Mn) | annual (long term) | 0.15 | WHO Air Quality Guidelines for Europe (2000) |
| | 1-hour (short term) | 1,500 | Old EAL derivation method from EH40/2001 OEL |
| Mercury (Hg) | annual (24 hour long term) | 0.06 | Hazard characterisation method for determining Tolerable Concentrations in Air (2023) |
| | 1-hour (short term) | 0.6 | Hazard characterisation method for determining Tolerable Concentrations in Air (2023) |
| Molybdenum (Mo) | 8-hour TWA | 5 | EH40 WEL |
| | 15 min STEL | 10 | EH40 WEL |
| Nickel (Ni) | annual (long term) | 0.02 | Air Quality Standards Regulations 2010 Target Values |
| | 1-hour (short term) | 0.7 | Hazard characterisation method for determining Tolerable Concentrations in Air (2023) |
| Antimony (Sb) | annual (long term) | 5 | Old EAL derivation method from EH40/2001 OEL |
| | 1-hour (short term) | 150 | Old EAL derivation method from EH40/2001 OEL |

[9] https://gestis-database.dguv.de/

**Table 4: Air Quality Standards for the Protection of Human Health (cont)**

| Pollutant | Averaging Period | AQS (µg/m³) | Comments |
|---|---|---|---|
| Selenium (Se) | annual (24 hour long term) | 2.0 | Hazard characterisation method for determining Tolerable Concentrations in Air (2023) |
| Thallium (Tl) | Annual (long term) | 1 | EAL derived from long-term occupational exposure limits |
| | 1-hour (short term) | 30 | EAL derived from short-term occupational exposure limits |
| Vanadium (V) | 24-hour (short term) | 1 | WHO Air Quality Guidelines for Europe (2000) |
| Zinc (as zinc oxide) | annual (long term) | 50 | Old EAL derivation method from EH40/2001 OEL |
| | 1-hour (short term) | 1,000 | Old EAL derivation method from EH40/2001 OEL |

## 2.6. Assessment Criteria for the Protection of Sensitive Habitat Sites and Ecosystems - Critical Levels

2.6.1. Critical levels are thresholds of airborne pollutant concentrations above which damage may be sustained to sensitive plants and animals. High concentrations of pollutants in ambient air directly cause harm to leaves and needles of forests and other plant communities.

2.6.2. The 2008 Air Quality Directive[10] set limit values for the protection of vegetation and ecosystems and these have been adopted by the Air Quality Strategy but are not currently set in Regulations. The current objectives are summarised in Table 5.

**Table 5: Assessment Criteria for the Protection of Sensitive Habitats and Ecosystems**

| Pollutant | Averaging Period | Critical Level (µg/m³) | Comments |
|---|---|---|---|
| Nitrogen Oxides (as $NO_2$) | annual | 30 | Air Quality Objective |
| | daily | 75 | (a) |
| Ammonia ($NH_3$) | annual | 1 | Sensitive lichen communities & bryophytes and ecosystems where lichens & bryophytes are an important part of the ecosystem's integrity (b) |
| | annual | 3 | All other ecosystems (b) |
| Hydrogen Fluoride (HF) | daily | 5 | (c) |
| | weekly | 0.5 | (c) |

Notes to Table
(a) WHO (2000) Air Quality Guidelines for Europe; 2nd Edition. WHO Regional Publications, European Series, No. 91.

[10] Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, 21st May 2008

(b) UN Economic & Social Council, Executive Body for the Convention on Long-Range Transboundary Air Pollution, ECE/EB.AIR/WG.5/2007/3.
(c) Mc Cune, DC (1969a): Fluoride criteria for vegetation reflect the diversity of the plant kingdom. In a symposium: The technical significance of air quality standards. Environmental Science & Technology. 3: 720-735.

## 2.7. Assessment Criteria for the Protection of Sensitive Habitat Sites and Ecosystems - Critical Loads

2.7.1. Critical Loads are defined as:
*"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"*[11].

2.7.2. Critical loads for nutrient nitrogen are set under the Convention on Long-Range Transboundary Air Pollution based on empirical evidence, mainly observations from experiments and gradient studies. Critical loads[12] are assigned to habitat classes of the European Nature Information System[13] in units of kgN/ha/yr.

2.7.3. Predicted $NO_x$ deposition rates in units of µg $m^{-2}$ $s^{-1}$ are converted to units of kg/ha/yr as nitrogen for direct comparison with critical loads as follows:

$$kgN/ha/yr = \mu g/m^2/s \times (14/46)^{14} \times 315.36^{15}$$

2.7.4. Exceedance of critical loads for nitrogen deposition can result in significant terrestrial and freshwater impacts due to changes in species composition, reduction in species richness, increase in nitrate leaching, increases in plant production, changes in algal productivity and increases in the rate of succession[16].

2.7.5. In the UK, an empirical approach is applied to critical loads for acidity for non-woodland habitats; and the simple mass balance equation is applied to both managed and unmanaged woodland habitats. For freshwater ecosystems, national critical load maps are currently based on the First-order Acidity Balance model. All of these methods provide critical loads for systems at steady-state[12] in units of keq/ha/yr.

2.7.6. The unit kiloequivalent (keq) is the molar equivalent of potential acidity resulting from sulphur or oxidised and reduced nitrogen. Predicted acid deposition rates in units of µg/$m^2$/s are converted to units of keq/ha/yr) as hydrogen for direct comparison with critical loads as follows:

- nitrogen from $NO_x$ (keq) =([$NO_x$]µg/$m^2$/s × (14/46) × 315.36) ÷ 14[17]
- sulphur (keq) =([$SO_2$]µg/$m^2$/s × (32/64) × 315.36) ÷ 16[18].

2.7.7. Emissions of ammonia ("$NH_3$") and hydrogen chloride ("HCl") from the Installation will also contribute to the total acidification rate.

[11] From http://www.unece.org/env/lrtap/WorkingGroups/wge/definitions.htm
[12] From http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm
[13] See http://eunis.eea.europa.eu/ for details
[14] Ratio of atomic weight of nitrogen to molecular weight of nitrogen dioxide
[15] Conversion factor from µg/$m^2$ to kg/ha.
[16] From http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm#_Toc279788052
[17] 14kg nitrogen/$ha^{/yr}$ = 1keq nitrogen/ha/yr
[18] 16kg sulphur/ha/yr= 1keq sulphur/ha/yr

2.7.8. Exceedance of the critical loads for acid deposition can result in significant terrestrial and freshwater impacts due to leaching and subsequent increase in availability of potentially toxic metal ions.

2.7.9. Table 6 list the site-specific critical loads for nutrient nitrogen deposition and acid deposition. As the Air Pollution Information System ("APIS") does not provide any information for local nature sites, an equivalent feature was used to derive (where possible) critical loads, as indicated in the Habitats Table on the APIS website[19].

[19] http:/www.apis.ac.uk/habitat_table.html

**Table 6: Critical Loads for Deposition**

| ADMS Receptor Reference | Site Name and Designation | Habitat Interest and Habitat Feature | Nutrient Nitrogen (kgN/ha/yr) | | Acid Deposition (keq/ha/yr) | | |
|---|---|---|---|---|---|---|---|
| | | | Lower Critical Load (N) | Upper Critical Load (N) | CL MinN | CL MaxN | CL MaxS |
| ER1 | St Helens Canal - LWS | Calcareous grassland | 10 | 20 | 1.071 | 5.071 | 4.00 |
| ER2 | Widnes Warth Saltmarsh - LWS | Calcareous grassland | 10 | 20 | 1.071 | 5.071 | 4.00 |
| ER3 | Upper Mersey Estuary Intertidal Area and Mudflats - LWS | Calcareous grassland | 10 | 20 | 1.071 | 5.071 | 4.00 |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | Unmanaged woodland | 10 | 20 | 0.357 | 11.126 | 10.77 |
| ER5 | Wigg Island - LNR + LWS | Calcareous grassland | 10 | 20 | 1.071 | 5.071 | 4.00 |
| ER6 | St Helens Canal Disused - LWS | Calcareous grassland | 10 | 20 | 1.071 | 5.071 | 4.00 |
| ER7 | Manchester Ship Canal Bank, Astmoor - LWS | Calcareous grassland | 10 | 20 | 1.071 | 5.071 | 4.00 |
| ER8 | Upper Mersey Estuary - LWS | Unmanaged woodland | 10 | 20 | 0.357 | 11.126 | 10.77 |

**Table6: Critical Loads for Deposition (cont)**

| ADMS Receptor Reference | Site Name and Designation | Habitat Interest and Habitat Feature | Nutrient Nitrogen (kgN/ha/yr) | | Acid Deposition (keq/ha/yr) | | |
|---|---|---|---|---|---|---|---|
| | | | Lower Critical Load (N) | Upper Critical Load (N) | CL MinN | CL MaxN | CL MaxS |
| ER9 | Haddocks Wood - LWS | Calcareous grassland | 10 | 20 | | | |
| ER10 | Haystack Lodge - LWS | Unmanaged woodland | 10 | 20 | | | |
| ER11 | Mersey Estuary - SPA/Ramsar | Wintering Birds (Littoral Sediment | 10 | 20 | 1.071 | 5.071 | 4 |

## 2.8. Habitat Site Specific Baseline Concentrations and Deposition Rates

### Airborne $NO_X$, HF and $NH_3$ Concentrations

2.8.1. A summary of site-specific baseline concentrations of $NO_X$ and $NH_3$, as provided by APIS, is presented in Table 7. Background concentrations for each ecological receptor have been obtained at the same point as listed in Table 2 i.e., the closest grid square to the point of the site used in the assessment.

**Table 7: Baseline Concentrations of $NO_X$, HF and $NH_3$**

| ADMS Receptor Reference | Name and Designation(s) | Background Concentration [a] | | |
|---|---|---|---|---|
| | | $NO_X$ ($\mu g/m^3$) | | $NH_3$ ($\mu g/m^3$) |
| | | Annual Mean | 24 Hour Mean [b] | Annual Mean |
| ER1 | St Helens Canal - LWS | 18.53 | 21.87 | 1.88 |
| ER2 | Widnes Warth Saltmarsh - LWS | 18.53 | 21.87 | 1.88 |
| ER3 | Upper Mersey Estuary Intertidal Area and Mudflats - LWS | 16.1 | 19.00 | 1.93 |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | 13.95 | 16.46 | 1.98 |
| ER5 | Wigg Island - LNR + LWS | 19.03 | 22.46 | 2.1 |
| ER6 | St Helens Canal Disused - LWS | 17.61 | 20.78 | 1.91 |
| ER7 | Manchester Ship Canal Bank, Astmoor - LWS | 19.03 | 22.46 | 2.1 |
| ER8 | Upper Mersey Estuary - LWS | 12.96 | 15.29 | 2.04 |
| ER9 | Haddocks Wood - LWS | 14.89 | 17.57 | 2.14 |
| ER10 | Haystack Lodge - LWS | 12.96 | 15.29 | 2.04 |
| ER11 | Mersey Estuary - SPA/Ramsar | 15.06 | 17.77 | 2 |

Notes to Table

(a) Background concentrations have been taken from the APIS website for the closest grid square to the site (data year: 2023).

(b) The 24-hour mean baseline concentration is twice the annual mean multiplied by a factor of 0.59, in accordance with the H1 guidance.

### Nutrient Nitrogen and Acid Deposition

2.8.2. A summary of site-specific baseline nutrient nitrogen and acid deposition rates, as obtained from APIS, is presented in Table 8. Again, the specific deposition rates for each ecological receptor have been obtained from the same point as listed in Table 2, i.e., the closest grid square to the point of the site used in the assessment.

**Table 8: Background Nutrient Nitrogen and Acid Deposition**

| ADMS Receptor Reference | Name and Designation(s) | Nutrient Nitrogen Background (kgN/ha/yr) [(a)] | Acid Deposition Background - (keq/ha/yr) [(a)] | |
|---|---|---|---|---|
| | | | Nitrogen | Sulphur |
| ER1 | St Helens Canal - LWS | 8.67 | 1.17 | 0.24 |
| ER2 | Widnes Warth Saltmarsh - LWS | 8.67 | 1.17 | 0.24 |
| ER3 | Upper Mersey Estuary Intertidal Area and Mudflats - LWS | 9.21 | 1.20 | 0.24 |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | 9.01 | 1.21 | 0.24 |
| ER5 | Wigg Island - LNR + LWS | 9.43 | 1.24 | 0.24 |
| ER6 | St Helens Canal Disused - LWS | 9.19 | 1.18 | 0.24 |
| ER7 | Manchester Ship Canal Bank, Astmoor - LWS | 9.43 | 1.24 | 0.24 |
| ER8 | Upper Mersey Estuary - LWS | 8.82 | 1.22 | 0.23 |
| ER9 | Haddocks Wood - LWS | 9.11 | 1.25 | 0.23 |
| ER10 | Haystack Lodge - LWS | 8.82 | 1.22 | 0.23 |
| ER11 | Mersey Estuary - SPA/Ramsar | 9.71 | 1.18 | 0.24 |

Notes to Table

(a) Background concentrations have been taken from the APIS website for the closest grid square to the site (data range : 2022-2024, mid year 2023).

## 2.9. Deposition Parameters - Sensitive Habitats

2.9.1. Deposition of nitrogen and acids at designated habitats sites was also included in the assessment. This focused on sites within 10km of the Installation as detailed in Section 2.4.3. The pollutant deposition rates are presented in Table 9. These parameters are detailed in AQTAG06. Since woodland sites have a greater surface area, higher deposition velocities are adopted for these sites.

2.9.2. For acidification impacts, the deposition of oxides of nitrogen, ammonia and hydrogen chloride are considered. For nutrient nitrogen, the deposition of the oxides of nitrogen and ammonia are included.

**Table 9: Acid/Nitrogen Dry Deposition Velocities [(a)]**

| Pollutant | Grassland (m/s) | Woodland (m/s) |
|---|---|---|
| Oxides of Nitrogen (as $NO_2$) | 0.0015 | 0.003 |
| Ammonia | 0.02 | 0.03 |
| Hydrogen Chloride | 0.025 | 0.06 |

## 2.10. Background Air Quality

2.10.1. Background air quality data has been obtained for all pollutants, where relevant, so that the PECs can be calculated. Where background concentrations were needed, the source and concentrations used are discussed in the relevant sections of this report.

## 2.11. Stack Emission Parameters

2.11.1. The stack emission parameters used in the study are presented in Table 10 for the Installations stacks. Emissions parameters were provided by ICoNiChem.

**Table 10: Stack Emission Parameters**

| Parameter Name | Units | A1 | A2 | A3 | A6 | A7 | A9 | A10 | A11 | A12 | A13 | A16 | A21 | A23 | A26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stack Height | m | 12.65 | 12.5 | 12.5 | 12.5 | 10.5 | 13.5 | 12 | 10 | 14.2 | 10 | 10 | 12 | 10 | 10 |
| *Actual Volumetric Flow Rate | $m^3/s$ | 3.11 | 1.20 | 0.94 | 1.39 | 0.00 | 1.20 | 1.33 | 0.70 | 0.64 | 0.34 | 0.34 | 16.26 | 0.97 | 0.08 |
| Stack Diameter | m | 0.38 | 0.38 | 0.30 | 0.38 | 0.15 | 0.30 | 0.38 | 0.30 | 0.30 | 0.20 | 0.30 | 0.39 | 0.30 | 0.25 |
| *Actual Stack Velocity | m/s | 27.43 | 10.58 | 13.30 | 12.25 | 0.24 | 16.98 | 11.71 | 9.90 | 9.09 | 10.81 | 4.87 | 136.11 | 13.65 | 1.53 |
| Stack Gas Temperature | $^oC$ | 20 | 20 | 20 | 50 | 20 | 30 | 20 | 21 | 90 | 20 | 21 | 61.3 | 18 | 18.9 |
| Stack x coordinate | UK OS Grid | 352869 | 352881 | 352869 | 352847 | 352840 | 352824 | 352804 | 352796 | 352789 | 352795 | 352797 | 352809 | 352801 | 352794 |
| Stack y coordinate | UK OS Grid | 385468 | 385441 | 385437 | 385450 | 385444 | 385419 | 385384 | 385387 | 385395 | 385396 | 385399 | 385387 | 385389 | 385401 |
| Normalised Volumetric Flow Rate | $Nm^3/s$ | 2.90 | 1.12 | 0.88 | 1.17 | 0.0039 | 1.08 | 0.0059 | 0.0031 | 0.0023 | 0.32 | 0.0015 | 0.063 | 0.0043 | 0.00033 |

**Table10: Stack Emission Parameters (cont)**

| Parameter Name | Units | A27 | A29 | A30 | A31 | A33 |
|---|---|---|---|---|---|---|
| Stack Height | m | 12.5 | 12.5 | 12 | 10 | 12.5 |
| *Actual Volumetric Flow Rate | $m^3/s$ | 0.72 | 1.54 | 1.79 | 0.21 | 1.20 |
| Stack Diameter | m | 0.30 | 0.38 | 0.45 | 0.20 | 0.30 |
| *Actual Stack Velocity | m/s | 10.22 | 13.60 | 11.28 | 6.55 | 17.02 |
| Stack Gas Temperature | $^oC$ | 30 | 30 | 44.8 | 20 | 165 |
| Stack x coordinate | UK OS Grid | 352816 | 352836 | 352814 | 352807 | 352852 |
| Stack y coordinate | UK OS Grid | 385442 | 385449 | 385388 | 385395 | 385494 |
| Normalised Volumetric Flow Rate | $Nm^3/s$ | 0.65 | 1.39 | 0.0073 | 0.19 | 0.75 |

(a) Referenced to 273K, 1 atm, dry

2.11.2. The ELVs assumed for each pollutant and the pollutant mass emission rate for the study are presented in Table 11. These are the assumed ELVs used for the modelling assessment.

## Table 11: Pollutant Emission Rates

| Pollutant | Daily ELVs[a][b] (mg/Nm³) | A1 | A2 | A3 | A6 | A7 | A9 | A10 | A11 | A12 | A13 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Emission Rate (g/s) | | | | | | | | | |
| NOx | 90 | 0.261 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| NOx | 100 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Chlorides (as HCL) | 10 | 0.0290 | 0.0112 | 0.00876 | n/a | 0.0000393 | 0.0108 | n/a | n/a | n/a | n/a |
| NH3 | 10 | 0.0290 | n/a | n/a | 0.0117 | n/a | n/a | n/a | n/a | n/a | n/a |
| PM[c] | 20 | 0.0580 | n/a | n/a | n/a | n/a | n/a | 0.000117 | 0.0000615 | 0.0000459 | 0.00633 |
| 1,3 butadiene | 5 | 0.0145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Benzene | 5 | 0.0145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| As | 0.1 | 0.000290 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cd | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Co | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cr | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cu | 0.5 | 0.00145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Li | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Mn | 0.5 | 0.00145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Ni | 0.1 | 0.000290 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Pb | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Sb | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Se | 0.01 | 0.0000290 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Tl | 0.005 | 0.0000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| V | 0.5 | 0.00145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Zn | 0.5 | 0.00145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Hg | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Mo | 0.05 | 0.000145 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| HF | 1 | 0.0029 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

## Table 11: Pollutant Emission Rates (cont)

| Pollutant | Daily ELVs[a][b] (mg/Nm³) | A21 | A23 | A26 | A27 | A29 | A30 | A31 | A33 |
|---|---|---|---|---|---|---|---|---|---|
| | | Emission Rate (g/s) | | | | | | | |
| NOx | 90 | n/a | n/a | n/a | 0.0586 | n/a | n/a | n/a | n/a |
| NOx | 100 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 0.0750 |
| Chlorides (as HCL) | 10 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| NH3 | 10 | n/a | n/a | n/a | n/a | 0.0139 | n/a | n/a | n/a |
| PM[c] | 20 | 0.00126 | 0.0000860 | 0.00000665 | n/a | n/a | 0.000147 | 0.00384 | n/a |
| 1,3 butadiene | 5 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Benzene | 5 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| As | 0.1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cd | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Co | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cr | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cu | 0.5 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Li | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Mn | 0.5 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Ni | 0.1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Pb | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Sb | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Se | 0.01 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Tl | 0.005 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| V | 0.5 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Zn | 0.5 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Hg | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Mo | 0.05 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| HF | 1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

Notes to Table

(a) Concentrations are at reference conditions i.e., 273K, 1 atmosphere, dry.
(b) BAT-AELs have been selected from various guidance documents
(c) It has been assumed that all particulate matter can be present as $PM_{10}$ or $PM_{2.5}$.

## 2.12. Meteorological (Met) Data

2.12.1. ADMS has a meteorological pre-processing capability, which calculates the required boundary layer parameters from a variety of data. Meteorological data ("met data") can be utilised in its sequentially analysed form, which estimates the pattern of dispersion through 10° sectors from the source or as raw data.

2.12.2. The Meteorological Office ("Met Office") were contacted to query the location of the nearest appropriate meteorological station ("met station") for the purposes of providing data for an air dispersion modelling assessment utilising ADMS.

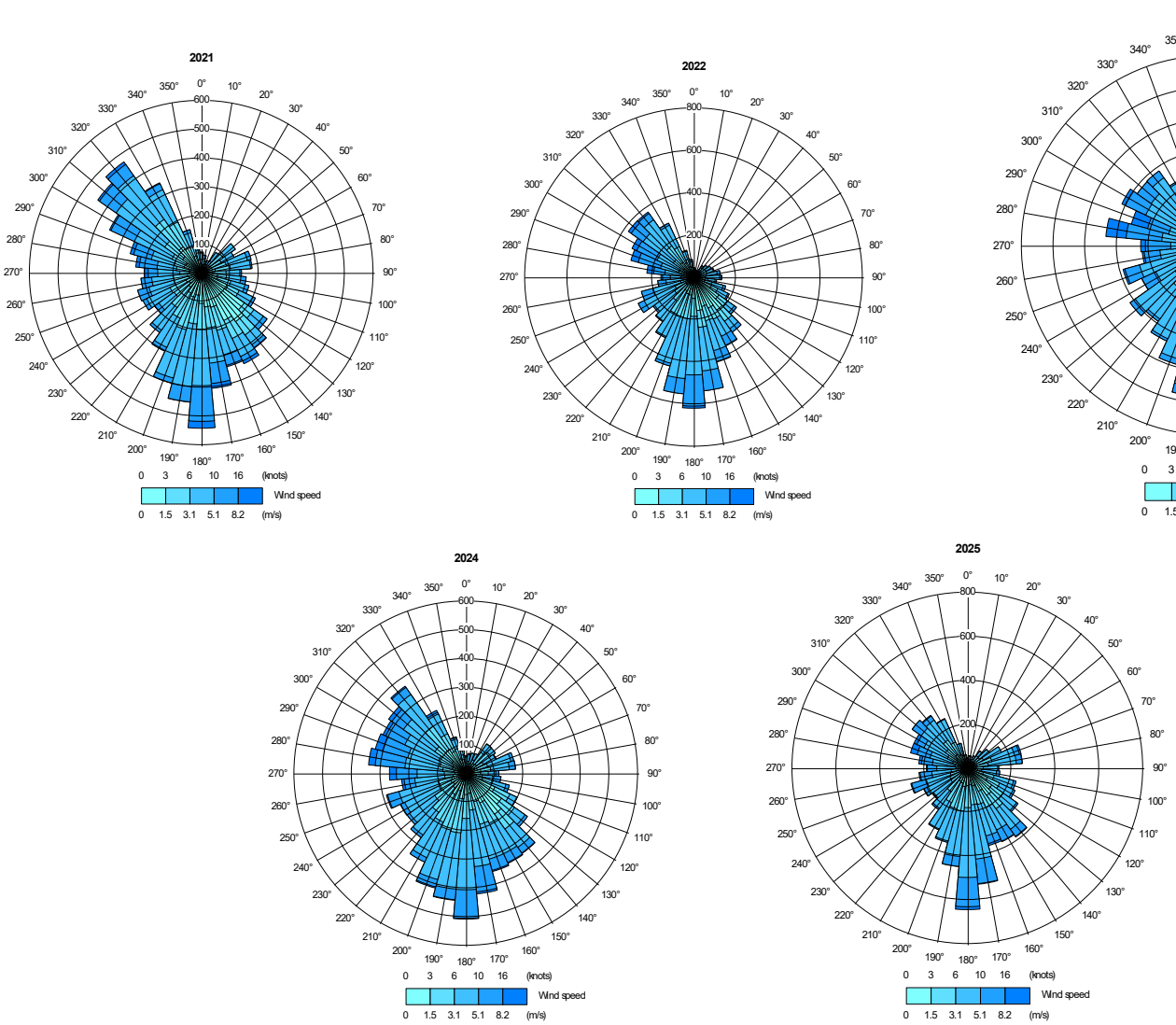
2.12.3. The met station option presented by the Met Office was Rostherne No2, which is located approximately 20.8km to the east of the Installation.

2.12.4. The assessment utilises five years (2021 – 2025, inclusive) of observed data from Loftus met station, all hourly sequentially analysed in sectors of 10°.

2.12.5. Over the five years (43,824 hours) of meteorological data used from Rostherne No 2, ADMS reported that 71 hours were calm, 3,867 hours contained inadequate data and 5,840 hours were non-calm met data lines with a wind speed less than the minimum value (0.75 m/s). These represent 0.16%, 8.89% and 13.33% of the data, respectively.

2.12.6. Wind roses for the data are presented as Figure 4.

## Figure 4: Wind Roses - Met Years 2021-2025



2.12.7. The wind roses presented in Figure 6 show a consistent bimodal pattern across the 2021–2025 meteorological years. Winds are predominantly from the south to south-south-west, with a secondary component from the west-north-west to north-west.

2.12.8. The southerly maximum is more narrowly defined in 2022 and 2025 and broader across the south-easterly to south-westerly sectors in 2023 and 2024.

2.12.9. Wind speeds are principally within the low-to-moderate bands of approximately 1.5–5.1 m/s; speeds of 5.1–8.2 m/s occur less frequently, and the highest wind-speed category is comparatively limited.

## 2.13. Surface Albedo

2.13.1. The surface albedo is the ratio of reflected to incident shortwave solar radiation at the surface of the earth[20]. ADMS allows the user to set this value between 0 and 1. A value of 0.40-0.95 would be considered representative of snow-covered ground where a large proportion of the light is reflected, soils from 0.05-0.40, agricultural crops 0.18-0.25, and grass would be 0.16 – 0.26 depending on length[21]. A value of 0.23 is an average value for non-snow-covered surfaces and is the default value used in the model. This value is considered appropriate for the rural setting of the dispersion site.

## 2.14. Priestley-Taylor Parameter

2.14.1. The Priestley Taylor parameter is a parameter representing the surface moisture available for evaporation[11]. This parameter must be set between 0 and 3 where 0 would be classed as dry bare earth, 0.45 as dry grassland, 1 as moist grassland and a value of 3 is suggested for a saturated forest surrounded by forest[22]. The value of 1 was considered to be appropriate for the setting of the dispersion site.

## 2.15. Minimum Monin-Obukhov Length

2.15.1. The Monin-Obukhov length provides a measure of the stability of the atmosphere. For example, in urban areas the air is affected by heat generated from buildings and traffic which prevents the atmosphere from becoming stable. In rural areas the atmosphere would be more stable. The minimum Monin-Obukhov length can be set between 1 and 200m. Typical values would be[11]:

- large conurbations >1 million = 100m;
- cities and large towns = 30m;
- mixed urban/industrial = 30m;
- small towns <50,000 = 10m; and
- rural areas = 1m.

2.15.2. Given the location of the Installation, a value of 30m was used.

[20] ADMS5 User Guide, CERC, V5, Nov 2012
[21] TR Oke, Boundary Layer Climates, 2nd Edition 1987
[22] J P Lhomme, A Theorestivl Basis for the Priestley-Taylor Coefficient, February 1997.

## 2.16. Buildings Data

2.16.1. The building parameters utilised for the study are detailed in Table 12 and a plan view is provided as Figure 5.

**Table 12: Building Parameters**

| Building | X [a] | Y [a] | Angle (°) [b] | Height (m) [c] | Length/ Diameter (m) [c] | Width (m) [c] |
|---|---|---|---|---|---|---|
| Building 006 | 352842.3 | 385371.9 | 62.5 | 6.5 | 25.5 | 13.3 |
| Building 007 | 352910.5 | 385405.8 | 65.7 | 5 | 20.3 | 18.9 |
| Building 008 | 352971.9 | 385428.8 | 62.7 | 7 | 31.8 | 7.5 |
| Building 009 | 353013.1 | 385451.4 | 64.7 | 8 | 33.5 | 8.9 |
| Building 005 | 352816.2 | 385398.1 | 236.8 | 8.5 | 54.8 | 14.9 |
| Building 010 | 352801.5 | 385403.1 | 57.1 | 8.5 | 35.2 | 11.2 |
| Building 011 | 352786.5 | 385406.1 | 326.3 | 8.5 | 9.8 | 13.4 |
| Building 012 | 352817.9 | 385429.9 | 55.8 | 8.5 | 29.1 | 9.2 |
| Building 013 | 352873.7 | 385442.4 | 52.2 | 9 | 28.0 | 45.1 |
| Building 014 | 352848.2 | 385484.5 | 60.3 | 8 | 7.3 | 14.8 |
| Building 015 | 352812.9 | 385472.1 | 235 | 5.5 | 22.8 | 13.1 |
| Building016 | 352791.6 | 385440.0 | 319.1 | 4.5 | 4.9 | 15.2 |
| Building017 | 352768.8 | 385433.9 | 324.8 | 7.5 | 20.7 | 17.1 |
| Building018 | 352779.6 | 385488.7 | 325 | 9 | 34.6 | 46.7 |

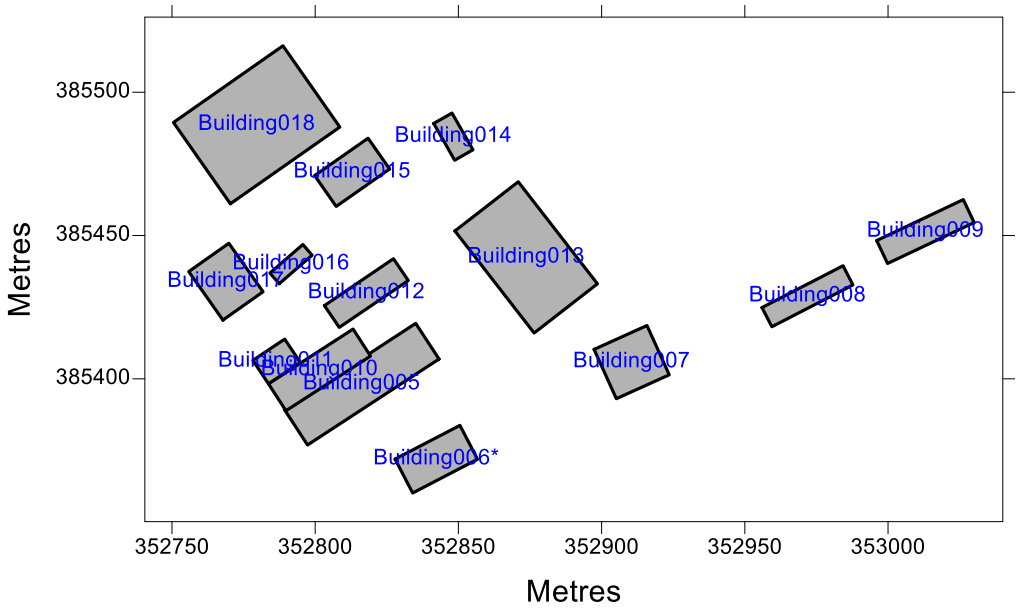
Notes to Table

(a) X(m), Y(m) denote the grid reference coordinates of the centre of the building.

(b) Angle denotes the angle between north and the side designated as length in the ADMS model.

(c) Building dimensions obtained from the ADMS Mapper and heights from LIDAR data

**Figure 5: Buildings Layout – Plan View**



## 2.17. Terrain Data – Grid Resolution

2.17.1. ADMS has a terrain pre-processing capability, which calculates the required boundary layer parameters from a variety of data. A terrain file was created for the purposes of this study by compiling the data from the relevant Ordnance Survey tiles and using an ADMS terrain grid resolution of 64 x 64.

2.17.2. For modelling the pollutant PCs from the Installation at the maximum point of impact and at all potentially sensitive receptors, terrain data was used for an area 6km by 6km north, south, east and west of the A1 stack.

## 2.18. Roughness Length

2.18.1. The surface nature of the terrain is defined in terms of Roughness Length ($Z_o$). The roughness length is dependent on the type of terrain and its physical properties. The ADMS model gives values to various types of terrain, for example, agricultural areas are classed as 0.2-0.3m, parkland and open suburbia is classed as 0.5m, and cities and woodlands are classed as 1.0m.

2.18.2. Based on a review of the terrain, the most appropriate surface roughness was considered to be 1m for the dispersion site due to the industrial nature of the area.

2.18.3. The met measurement site is located in a field and is encapsulated by agricultural land. Consequently, a value of 0.3m was selected.

## 2.19. Model Output Parameters

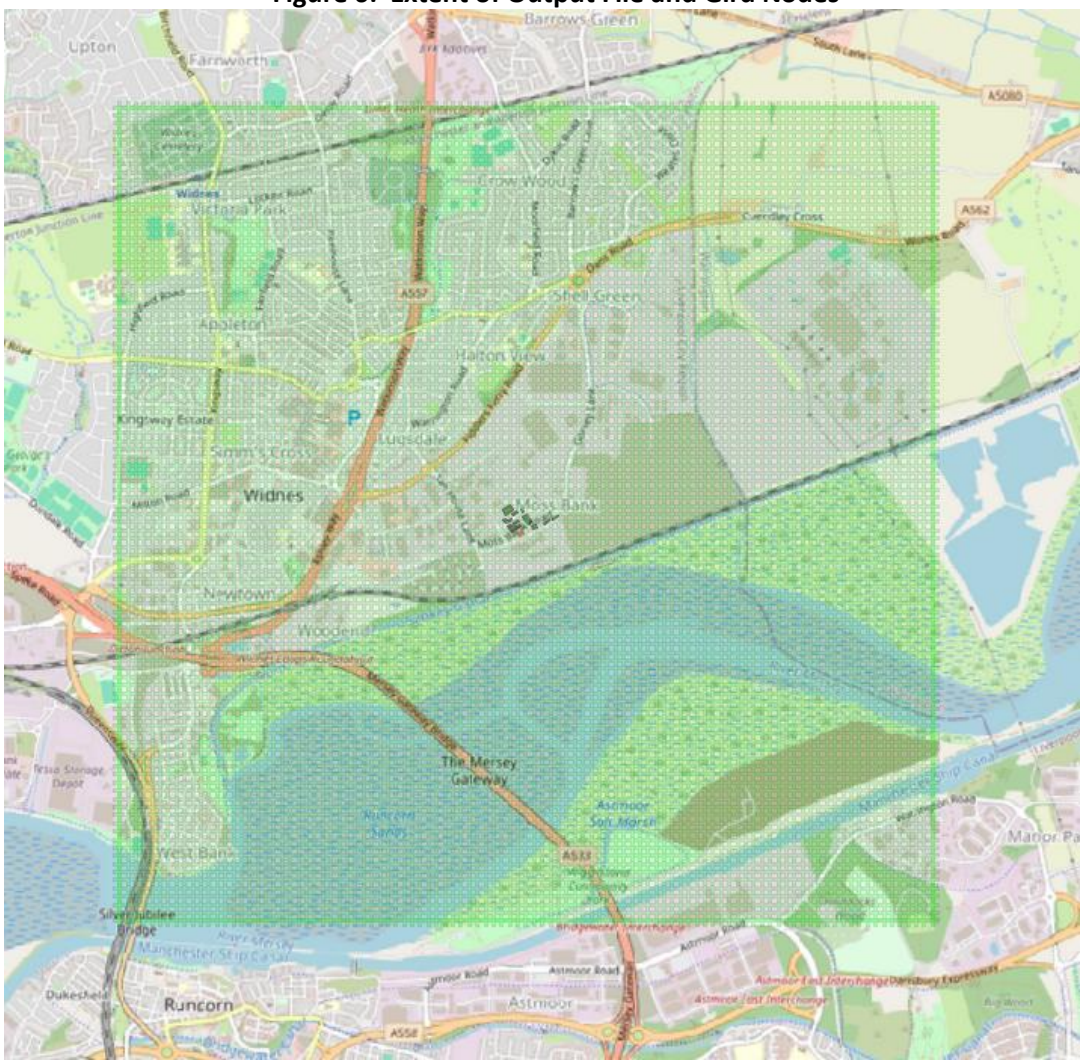
2.19.1. The ADMS model calculates the likely pollutant GLCs at locations within a definable grid system pre-determined by a user. Output grids may be determined in terms of a Cartesian or Polar coordinate system. For the purposes of this study the Cartesian system was used.

2.19.2. A Cartesian grid is constructed with reference to an initial origin, which is taken to be the bottom left corner of the grid. The lines of the grid are inserted at regular pre-defined increments in both northerly and easterly directions. Pollutant GLCs are calculated at the intersection of these grid lines; they are calculated in this manner primarily to aid in the generation of pollutant contours.

2.19.3. For assessing the maximum point of impact from the Installation, a grid sizing of 4km x 4km was utilised in order to capture values of the predicted pollutant GLCs arising from the model. The grid coordinates were X = 350869 to 354869 and Y = 383468 to 387468, with 101 nodes along each axis i.e., a grid spacing of 40m.

2.19.4. The extent of the output grid and gird nodes are shown on Figure 6.

**Figure 6: Extent of Output File and Gird Nodes**




2.19.5. For assessing the impact of emissions on human health the grid references of each were included as specified points within the ADMS model. Also, for assessing ecological sites, the grid reference of the ecological sites' boundary closest to the stack location was used, together with some in the "unknown" LWS..

## 2.20. Scenarios Modelled

2.20.1. The modelling study assessed the following scenarios:

- emissions from the Installation for all pollutants at the maximum GLC;
- emissions from the Installation for all pollutants at the potentially sensitive human receptor locations;
- emissions from the Installation for $NO_x$, $NH_3$ and HF at the ecological habitat sites; and
- modelled deposition rates (acid and nitrogen) at the ecological habitat sites.

## 2.21. Assessment of Significance of Impact Guidelines – Maximum GLC and Human Receptors

2.21.1. Both the EA online guidance and IAQM[23] guidance has been used for the purposes of significance assessment, and this guidance details the guidelines upon which the assessment of the significance of impact can be established.

2.21.2. In the first instance, the EA online guidance indicates that PCs can be considered insignificant if:

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

2.21.3. As outlined in the EA online guidance, there are no criteria to determine whether:

- PCs are significant; and
- PECs are insignificant or significant.

2.21.4. Consequently, significance will be judged based on the site-specific circumstances and on the EPUK and IAQM methodology as described in Sections 2.21.5 to 2.21.12.

**Long-Term Impacts**

2.21.5. If the PCs exceed the long-term criteria outlined in the EA online guidance, the potential long-term effects on human receptors from the operation of the two stacks will be assessed in accordance with the latest guidance produced by EPUK and IAQM in January 2017.

2.21.6. The guidance provides a basis for a consistent approach that could be used by all parties to professionally judge the overall significance of the air quality effects based on the severity of air quality impacts.

2.21.7. The following rationale is used in determining the severity of the air quality impacts at individual human receptors:

- the effects are provided as a percentage of the AQAL;
- the absolute concentrations are also considered in terms of the AQAL and are divided into categories for long-term concentrations. The categories are based on the sensitivity of the individual receptor in terms of harmful potential. The degree of potential to change increases as absolute concentrations are close to or above the AQAL;
- severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQAL will have higher severity compared to a relatively large change at a receptor which is significantly below the AQAL, >75% AQAL;
- the effects can be adverse when the air quality concentration increases or beneficial when the concentration decreases as a result of development; and
- the judgement of overall significance of the effects is then based on severity of effects on all the individual receptors considered.

2.21.8. The impact descriptors for individual receptors are presented in Table 13.

[23] IAQM guidance, January 2017 (Land-Use Planning & Development Control: Planning for Air Quality')

**Table 13: Impact Descriptors for Individual Receptors – Long-Term Concentrations**

| Long-term average concentration at receptor in assessment year | % Change in concentration relative to AQAL | | | |
|---|---|---|---|---|
| | 1 | 2-5 | 6-10 | >10 |
| ≤75% of AQAL | Negligible | Negligible | Slight | Moderate |
| 76-94% of AQAL | Negligible | Slight | Moderate | Moderate |
| 95-102% of AQAL | Slight | Moderate | Moderate | Substantial |
| 103-109% of AQAL | Moderate | Moderate | Substantial | Substantial |
| ≥ 110% of AQAL | Moderate | Substantial | Substantial | Substantial |

**Short-Term Impacts**

*2.21.9.* As stated in EPUK / IAQM guidance, January 2017 (Land-Use Planning & Development Control: Planning for Air Quality') in Section 6.36, Page 27: *"For any point source, some consideration must also be given to the impacts resulting from short term, peak concentrations of those pollutants that can affect health through inhalation. The Environment Agency uses a threshold criterion of 10% of the short term AQAL as a screening criterion for the maximum short-term impact. This is a reasonable value to take and this guidance also adopts this as a basis for defining an impact that is sufficiently small in magnitude to be regarded as having an insignificant effect. Background concentrations are less important in determining the severity of impact for short term concentrations, not least because the peak concentrations attributable to the source and the background are not additive."*

*2.21.10.* Short-term concentrations, in the context laid out in the IAQM guidance, are those averaged over periods of an hour or less. These exposures would be regarded as acute and occur when a plume from an elevated source affects airborne concentrations experienced by a receptor over an hour or less.

2.21.11. The IAQM guidance offers the following severity of impact descriptors for peak short-term concentrations from an elevated source:

- 11-20% of the relevant AQAL – the magnitude can be regarded as 'small';
- 21-50% of the relevant AQAL – the magnitude can be regarded as 'medium'; and
- 51% or more of the relevant AQAL – the magnitude can be regarded as 'large'.

*2.21.12.* It is argued that this approach is intended to be a streamlined and pragmatic assessment procedure that avoids undue complexity.

## 2.22. Assessment of Significance of Impact Guidelines – Ecological Receptors, Critical Levels and/or Loads

2.22.1. EA Operational Instruction 67_12[24] states that a detailed assessment is required where modelling predicts that the long-term PC is greater than:

[24] EA Operational Instruction 67_12 Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation, V2, 27.3.15

- 1% for European sites and SSSIs; or
- 100% for NNR, LNR, LWS and ancient woodlands.

And, the PEC is greater than:

- 70% for European sites and SSSIs; or
- 100% for NNR, LNR, LWS and ancient woodlands.

2.22.2. For short-term emissions, modelling is required at European site and SSSI's where the PC is greater than 10% of the critical level, or 100% for NNR, LNR, LWS and ancient woodland.

2.22.3. Following detailed assessment, if the PEC is less than 100% of the appropriate environmental criterion, then it can be assumed there will be no adverse effect for European Sites and SSSI's.

2.22.4. However, for NNR, LNR, LWS or ancient woodland, if the PC is less than 100% of the appropriate environmental criterion, then it can be assumed there will be no significant pollution.

## 2.23. $NO_x$ to $NO_2$ conversion Rates

2.23.1. EA online guidance states that emissions of $NO_x$ should be recorded as $NO_2$ as follows:

- for the long-term PCs and PECs, assume 100% of the emissions of $NO_x$ convert to $NO_2$; and
- for the short-term PCs and PECs assume 50% of the emissions of $NO_x$ convert to $NO_2$.

2.23.2. However, further to detailed discussion with both NRW and the EA on previous studies, a long-term 70% NO to $NO_2$ conversion rate, and a short-term 35% NO to $NO_2$ as required by guidance on $NO_X$ and $NO_2$ Conversion Ratios as referenced in AQTAG06 should be used in all detailed modelling assessments.

# 3. ASSESSMENT OF AIR QUALITY IMPACTS AT THE MAXIMUM GROUND LEVEL CONCENTRATIONS

## 3.1. Comparison of Maximum Predicted Pollutant Ground Level Concentrations with Air Quality Standards

3.1.1. The predicted PCs for each of the pollutants considered in the assessment at the maximum point of impact have been extracted and are presented in Table 14.

3.1.2. It should be noted that for long-term concentrations, the maximum PC has been adjusted in accordance with the EA's guidance on operating modes. It is assumed that the Installation will operate a maximum of 24 hours a day, 5 days a week for 52 weeks per year, i.e. 6,240 hours out of 8,760.

3.1.3. Maximum concentrations are considered potentially significant if the long-term prediction is greater than 1% of the long-term AQS. For short-term predictions, a potentially significant concentration would be greater than 10% of the short-term AQS. In Table 14, any PCs that are above these significance criteria are indicated in bold type (see the final column).

**Table 14: Comparison of Predicted Maximum Ground Level PCs with AQSs**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS |
|---|---|---|---|---|---|
| $NO_2$ (Annual Mean) | 2021 | 9.99 | 4.981 | 40 | **12.45%** |
| | 2022 | 11.18 | 5.576 | | **13.94%** |
| | 2023 | 9.73 | 4.851 | | **12.13%** |
| | 2024 | 9.48 | 4.726 | | **11.81%** |
| | 2025 | 10.07 | 5.021 | | **12.55%** |
| $NO_2$ (99.79th percentile) | 2021 | 79.49 | 27.8 | 200 | **13.91%** |
| | 2022 | 68.43 | 23.9 | | **11.97%** |
| | 2023 | 69.08 | 24.2 | | **12.09%** |
| | 2024 | 69.68 | 24.4 | | **12.19%** |
| | 2025 | 67.65 | 23.7 | | **11.84%** |
| Particulate Matter, as $PM_{10}$ (Annual) | 2021 | 2.98 | 2.123 | 40 | **5.31%** |
| | 2022 | 2.57 | 1.832 | | **4.58%** |
| | 2023 | 2.90 | 2.066 | | **5.16%** |
| | 2024 | 2.90 | 2.069 | | **5.17%** |
| | 2025 | 2.97 | 2.117 | | **5.29%** |
| Particulate Matter, as $PM_{10}$ (24 hr) - 90.41 percentile | 2021 | 5.72 | [redacted] | 50 | **11.43%** |
| | 2022 | 5.21 | | | **10.42%** |
| | 2023 | 5.35 | | | **10.71%** |
| | 2024 | 5.32 | | | **10.64%** |
| | 2025 | 5.51 | | | **11.03%** |
| Particulate Matter, as $PM_{2.5}$ (Annual) | 2021 | 2.98 | 2.123 | 20 | **10.62%** |
| | 2022 | 2.57 | 1.832 | | **9.16%** |
| | 2023 | 2.90 | 2.066 | | **10.33%** |
| | 2024 | 2.90 | 2.069 | | **10.34%** |
| | 2025 | 2.97 | 2.117 | | **10.58%** |

**Table14: Comparison of Predicted Maximum Ground Level PCs with AQSs (cont)**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS |
|---|---|---|---|---|---|
| VOC (as benzene), Annual | 2021 | 0.38 | 0.267 | 5 | **5.34%** |
| | 2022 | 0.42 | 0.299 | | **5.97%** |
| | 2023 | 0.38 | 0.272 | | **5.45%** |
| | 2024 | 0.37 | 0.263 | | **5.25%** |
| | 2025 | 0.39 | 0.276 | | **5.52%** |
| VOC (as benzene), 24 hour | 2021 | 1.80 | [redacted] | 30 | 6.01% |
| | 2022 | 1.65 | | | 5.51% |
| | 2023 | 1.79 | | | 5.96% |
| | 2024 | 1.63 | | | 5.42% |
| | 2025 | 1.73 | | | 5.78% |
| VOC (as 1,3-butadiene), 24 hour | 2021 | 1.80 | | 2.25 | **80.16%** |
| | 2022 | 1.65 | | | **73.46%** |
| | 2023 | 1.79 | | | **79.47%** |
| | 2024 | 1.63 | | | **72.28%** |
| | 2025 | 1.73 | | | **77.11%** |
| Hydrogen Chloride (HCL), 1 hour | 2021 | 99.56 | | 750 | **13.27%** |
| | 2022 | 103.08 | | | **13.74%** |
| | 2023 | 96.36 | | | **12.85%** |
| | 2024 | 98.58 | | | **13.14%** |
| | 2025 | 95.99 | | | **12.80%** |
| Hydrogen Fluoride (HF), Monthly Mean | 2021 | 0.19 | 0.136 | 16 | 0.85% |
| | 2022 | 0.21 | 0.148 | | 0.92% |
| | 2023 | 0.21 | 0.149 | | 0.93% |
| | 2024 | 0.17 | 0.120 | | 0.75% |
| | 2025 | 0.22 | 0.158 | | 0.99% |
| Hydrogen Fluoride (HF), 1-hour | 2021 | 1.05 | [redacted] | 160 | 0.66% |
| | 2022 | 1.05 | | | 0.66% |
| | 2023 | 1.10 | | | 0.69% |
| | 2024 | 0.90 | | | 0.56% |
| | 2025 | 0.97 | | | 0.61% |
| Ammonia ($NH_3$), Annual | 2021 | 1.36 | 0.967 | 180 | 0.54% |
| | 2022 | 1.54 | 1.094 | | 0.61% |
| | 2023 | 1.39 | 0.993 | | 0.55% |
| | 2024 | 1.32 | 0.938 | | 0.52% |
| | 2025 | 1.37 | 0.979 | | 0.54% |
| Ammonia ($NH_3$), 1 hour | 2021 | 16.05 | [redacted] | 2500 | 0.64% |
| | 2022 | 15.69 | | | 0.63% |
| | 2023 | 17.56 | | | 0.70% |
| | 2024 | 18.77 | | | 0.75% |
| | 2025 | 17.83 | | | 0.71% |
| Arsenic (As), Annual | 2021 | 0.0075 | 0.00534 | 0.006 | **89.04%** |
| | 2022 | 0.0084 | 0.00597 | | **99.57%** |
| | 2023 | 0.0076 | 0.00545 | | **90.82%** |
| | 2024 | 0.0074 | 0.00525 | | **87.56%** |
| | 2025 | 0.0078 | 0.00552 | | **92.08%** |

**Table14: Comparison of Predicted Maximum Ground Level PCs with AQSs (cont)**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS |
|---|---|---|---|---|---|
| Cadmium (Cd), Annual | 2021 | 0.0038 | 0.00267 | 0.005 | **53.42%** |
| | 2022 | 0.0042 | 0.00299 | | **59.74%** |
| | 2023 | 0.0038 | 0.00272 | | **54.49%** |
| | 2024 | 0.0037 | 0.00263 | | **52.54%** |
| | 2025 | 0.0039 | 0.00276 | | **55.25%** |
| Cadmium (Cd), 24 hour mean | 2021 | 0.018 | [redacted] | 0.03 | **60.12%** |
| | 2022 | 0.017 | | | **55.10%** |
| | 2023 | 0.018 | | | **59.60%** |
| | 2024 | 0.016 | | | **54.21%** |
| | 2025 | 0.017 | | | **57.83%** |
| Cobalt (Co), Annual | 2021 | 0.00390 | 0.00278 | 0.2 | **1.39%** |
| | 2022 | 0.00436 | 0.00310 | | **1.55%** |
| | 2023 | 0.00376 | 0.00268 | | **1.34%** |
| | 2024 | 0.00362 | 0.00258 | | **1.29%** |
| | 2025 | 0.00390 | 0.00278 | | **1.39%** |
| Cobalt (Co), 1-hour | 2021 | 0.00375 | [redacted] | 6 | 0.06% |
| | 2022 | 0.00419 | | | 0.07% |
| | 2023 | 0.00382 | | | 0.06% |
| | 2024 | 0.00369 | | | 0.06% |
| | 2025 | 0.00388 | | | 0.06% |
| Chromium (CrIII) as chromium, 24 hour | 2021 | 0.00390 | [redacted] | 2 | 0.20% |
| | 2022 | 0.00436 | | | 0.22% |
| | 2023 | 0.00376 | | | 0.19% |
| | 2024 | 0.00362 | | | 0.18% |
| | 2025 | 0.00390 | | | 0.20% |
| Copper (Cu), 24 hour | 2021 | 0.039 | 0.02780 | 0.05 | **55.59%** |
| | 2022 | 0.044 | 0.03102 | | **62.05%** |
| | 2023 | 0.038 | 0.02676 | | **53.51%** |
| | 2024 | 0.036 | 0.02580 | | **51.60%** |
| | 2025 | 0.039 | 0.02778 | | **55.57%** |
| Lithium (Li), 8-hour TWA | 2021 | 0.033 | [redacted] | 200 | 0.017% |
| | 2022 | 0.023 | | | 0.011% |
| | 2023 | 0.024 | | | 0.012% |
| | 2024 | 0.023 | | | 0.011% |
| | 2025 | 0.021 | | | 0.010% |
| Lithium (Li), 15 min STEL | 2021 | 0.054 | [redacted] | 20 | 0.27% |
| | 2022 | 0.054 | | | 0.27% |
| | 2023 | 0.057 | | | 0.29% |
| | 2024 | 0.047 | | | 0.23% |
| | 2025 | 0.050 | | | 0.25% |
| Lead (Pb), Annual | 2021 | 0.004 | 0.00267 | 0.25 | **1.07%** |
| | 2022 | 0.004 | 0.00299 | | **1.19%** |
| | 2023 | 0.004 | 0.00272 | | **1.09%** |
| | 2024 | 0.004 | 0.00263 | | **1.05%** |
| | 2025 | 0.004 | 0.00276 | | **1.10%** |

**Table14: Comparison of Predicted Maximum Ground Level PCs with AQSs (cont)**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS |
|---|---|---|---|---|---|
| Manganese (Mn), Annual | 2021 | 0.038 | 0.02671 | 0.15 | **17.81%** |
| | 2022 | 0.042 | 0.02987 | | **19.91%** |
| | 2023 | 0.038 | 0.02725 | | **18.16%** |
| | 2024 | 0.037 | 0.02627 | | **17.51%** |
| | 2025 | 0.039 | 0.02762 | | **18.42%** |
| Manganese (Mn), 1 hour | 2021 | 0.525 | [redacted] | 1,500 | 0.035% |
| | 2022 | 0.525 | | | 0.035% |
| | 2023 | 0.552 | | | 0.037% |
| | 2024 | 0.452 | | | 0.030% |
| | 2025 | 0.487 | | | 0.032% |
| Mercury (Hg), Annual - 24 hour | 2021 | 0.00390 | 0.00278 | 0.06 | **4.63%** |
| | 2022 | 0.00436 | 0.00310 | | **5.17%** |
| | 2023 | 0.00376 | 0.00268 | | **4.46%** |
| | 2024 | 0.00362 | 0.00258 | | **4.30%** |
| | 2025 | 0.00390 | 0.00278 | | **4.63%** |
| Mercury (Hg), 1 hour | 2021 | 0.0525 | 0.03 | 0.6 | 8.76% |
| | 2022 | 0.053 | 0.03 | | 8.75% |
| | 2023 | 0.055 | 0.03 | | 9.20% |
| | 2024 | 0.045 | 0.02 | | 7.53% |
| | 2025 | 0.049 | 0.02 | | 8.12% |
| Molybdenum (Mo), 8-hour TWA | 2021 | 0.033 | 0.02 | 5 | 0.66% |
| | 2022 | 0.023 | 0.01 | | 0.46% |
| | 2023 | 0.024 | 0.01 | | 0.48% |
| | 2024 | 0.023 | 0.01 | | 0.45% |
| | 2025 | 0.021 | 0.01 | | 0.42% |
| Molybdenum (Mo), 15 min STEL | 2021 | 0.054 | 0.03 | 10 | 0.54% |
| | 2022 | 0.054 | 0.03 | | 0.54% |
| | 2023 | 0.057 | 0.03 | | 0.57% |
| | 2024 | 0.047 | 0.02 | | 0.47% |
| | 2025 | 0.050 | 0.03 | | 0.50% |
| Nickel (Ni), Annual | 2021 | 0.00750 | 0.00534 | 0.02 | **26.71%** |
| | 2022 | 0.00839 | 0.00597 | | **29.87%** |
| | 2023 | 0.00765 | 0.00545 | | **27.25%** |
| | 2024 | 0.00738 | 0.00525 | | **26.27%** |
| | 2025 | 0.00776 | 0.00552 | | **27.62%** |
| Nickel (Ni), 1 hour | 2021 | 0.105 | [redacted] | 0.7 | **15.01%** |
| | 2022 | 0.105 | | | **15.00%** |
| | 2023 | 0.110 | | | **15.78%** |
| | 2024 | 0.090 | | | **12.91%** |
| | 2025 | 0.097 | | | **13.92%** |
| Antimony (Sb), Annual | 2021 | 0.004 | 0.00267 | 5 | 0.053% |
| | 2022 | 0.004 | 0.00299 | | 0.060% |
| | 2023 | 0.004 | 0.00272 | | 0.054% |
| | 2024 | 0.004 | 0.00263 | | 0.053% |
| | 2025 | 0.004 | 0.00276 | | 0.055% |

**Table14: Comparison of Predicted Maximum Ground Level PCs with AQSs (cont)**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS |
|---|---|---|---|---|---|
| Antimony (Sb), 1 hour | 2021 | 0.053 | [redacted] | 150 | 0.035% |
| | 2022 | 0.053 | | | 0.035% |
| | 2023 | 0.055 | | | 0.037% |
| | 2024 | 0.045 | | | 0.030% |
| | 2025 | 0.049 | | | 0.032% |
| Selenium (Se), Annual - 24 hour | 2021 | 0.001 | 0.00056 | 2 | 0.028% |
| | 2022 | 0.001 | 0.00062 | | 0.031% |
| | 2023 | 0.001 | 0.00054 | | 0.027% |
| | 2024 | 0.001 | 0.00052 | | 0.026% |
| | 2025 | 0.001 | 0.00056 | | 0.028% |
| Thallium (Tl), Annual | 2021 | 0.000375 | 0.00027 | 1 | 0.027% |
| | 2022 | 0.000 | 0.00030 | | 0.030% |
| | 2023 | 0.000 | 0.00027 | | 0.027% |
| | 2024 | 0.000 | 0.00026 | | 0.026% |
| | 2025 | 0.000 | 0.00028 | | 0.028% |
| Thallium (Tl), 1-hour | 2021 | 0.00525 | [redacted] | 30 | 0.018% |
| | 2022 | 0.00525 | | | 0.018% |
| | 2023 | 0.00552 | | | 0.018% |
| | 2024 | 0.00452 | | | 0.015% |
| | 2025 | 0.00487 | | | 0.016% |
| Vanadium (V), 24 hour | 2021 | 0.180 | [redacted] | 1 | **18.04%** |
| | 2022 | 0.165 | | | **16.53%** |
| | 2023 | 0.179 | | | **17.88%** |
| | 2024 | 0.163 | | | **16.26%** |
| | 2025 | 0.173 | | | **17.35%** |
| Zinc (as Zinc Oxide), Annual | 2021 | 0.038 | 0.02671 | 50 | 0.075% |
| | 2022 | 0.042 | 0.02987 | | 0.084% |
| | 2023 | 0.038 | 0.02725 | | 0.076% |
| | 2024 | 0.037 | 0.02627 | | 0.074% |
| | 2025 | 0.039 | 0.02762 | | 0.078% |
| Zinc (as Zinc Oxide), 1 hour | 2021 | 0.525 | [redacted] | 1,000 | 0.053% |
| | 2022 | 0.525 | | | 0.053% |
| | 2023 | 0.552 | | | 0.055% |
| | 2024 | 0.452 | | | 0.045% |
| | 2025 | 0.487 | | | 0.049% |

3.1.4. It can be seen from the data in Table 14, that the impact of the Installation varies depending on the pollutant considered.

3.1.5. At Stage 1 screening, long-term concentrations of the following pollutants are potentially significant and require further assessment:

- $NO_2$;
- $PM_{10}$;
- $PM_{2.5}$;
- VOC (as benzene);
- As;

- Cd;
- Co;
- Cu;
- Pb;
- Mn;
- Hg; and
- Ni.

3.1.6. At Stage 1 screening, short-term concentrations of the following pollutants are potentially significant and require further assessment:

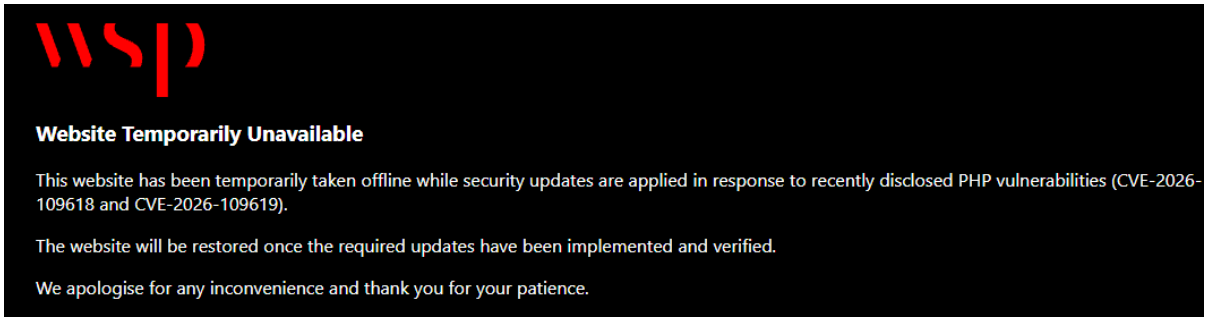
- $NO_2$;
- $PM_{10}$;
- VOC ( as 1,3, butadiene);
- HCl;
- Cd; and
- V.

3.1.7. All other pollutants can be considered not significant, Consequently, no further assessment is required for them.

## 3.2. Stage 2 Screening – Long Term

3.2.1. It should be noted that the background concentrations are currently (at time of witing) not available. It would appear there are PHP vulnerabilities with the Defra website used for obtaining background concentrations (see Figure 7), consequently, ECL have reviewed historical report and used the best case fit data. As this report is due for submission 31st October 2026, even If the data becomes available, there will be insufficient time to update the background data prior to submission. Any significant changes to background concentrations will be updated as soon as practicable.

**Figure 7: Defra Website Unavailable**




3.2.2. PECs for the long term potentially significant pollutants are provided in Table 15. Impact descriptors from the IAQM guidance have been used.

**Table 15: PECs of Pollutants – Stage 2 Screening – Lont Term**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background (µg/m³) | Max PEC (µg/m³) | PEC as % of AQS | IAQM Impact Descriptor |
|---|---|---|---|---|---|---|---|---|---|
| $NO_2$ (Annual Mean) | 2021 | 9.99 | 4.981 | 40 | **12.45%** | 12.57[a] | 17.55 | 43.88% | Moderate |
| | 2022 | 11.18 | 5.576 | | **13.94%** | | 18.15 | 45.36% | Moderate |
| | 2023 | 9.73 | 4.851 | | **12.13%** | | 17.42 | 43.55% | Moderate |
| | 2024 | 9.48 | 4.726 | | **11.81%** | | 17.30 | 43.24% | Moderate |
| | 2025 | 10.07 | 5.021 | | **12.55%** | | 17.59 | 43.98% | Moderate |
| Particulate Matter, as $PM_{10}$ (Annual) | 2021 | 2.98 | 2.123 | 40 | **5.31%** | 12.13[b] | 14.25 | 35.63% | Slight |
| | 2022 | 2.57 | 1.832 | | **4.58%** | | 13.96 | 34.90% | Negligible |
| | 2023 | 2.90 | 2.066 | | **5.16%** | | 14.20 | 35.49% | Slight |
| | 2024 | 2.90 | 2.069 | | **5.17%** | | 14.20 | 35.50% | Slight |
| | 2025 | 2.97 | 2.117 | | **5.29%** | | 14.25 | 35.62% | Slight |
| Particulate Matter, as $PM_{2.5}$ (Annual) | 2021 | 2.98 | 2.123 | 20 | **10.62%** | 6.56[b] | 9.54 | 47.71% | Moderate |
| | 2022 | 2.57 | 1.832 | | **9.16%** | | 9.13 | 45.66% | Slight |
| | 2023 | 2.90 | 2.066 | | **10.33%** | | 9.46 | 47.30% | Moderate |
| | 2024 | 2.90 | 2.069 | | **10.34%** | | 9.46 | 47.32% | Moderate |
| | 2025 | 2.97 | 2.117 | | **10.58%** | | 9.53 | 47.66% | Moderate |
| VOC (as benzene), Annual | 2021 | 0.38 | 0.267 | 5 | **5.34%** | 0.35[a] | 0.62 | 12.34% | Slight |
| | 2022 | 0.42 | 0.299 | | **5.97%** | | 0.65 | 12.97% | Slight |
| | 2023 | 0.38 | 0.272 | | **5.45%** | | 0.62 | 12.45% | Slight |
| | 2024 | 0.37 | 0.263 | | **5.25%** | | 0.61 | 12.25% | Slight |
| | 2025 | 0.39 | 0.276 | | **5.52%** | | 0.63 | 12.52% | Slight |
| Arsenic (As), Annual | 2021 | 0.0075 | 0.00534 | 0.006 | **89.04%** | 0.00324[c] | 0.0086 | 143.04% | Substantial |
| | 2022 | 0.0084 | 0.00597 | | **99.57%** | | 0.0092 | 153.57% | Substantial |
| | 2023 | 0.0076 | 0.00545 | | **90.82%** | | 0.0087 | 144.82% | Substantial |
| | 2024 | 0.0074 | 0.00525 | | **87.56%** | | 0.0085 | 141.56% | Substantial |
| | 2025 | 0.0078 | 0.00552 | | **92.08%** | | 0.0088 | 146.08% | Substantial |

**Table15: PECs of Pollutants – Stage 2 Screening – Lont Term (cont)**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background (µg/m³) | Max PEC (µg/m³) | PEC as % of AQS | IAQM Impact Descriptor |
|---|---|---|---|---|---|---|---|---|---|
| Cadmium (Cd), Annual | 2021 | 0.0038 | 0.00267 | 0.005 | **53.42%** | 0.000637[C] | 0.0044 | 87.74% | Moderate |
| | 2022 | 0.0042 | 0.00299 | | **59.74%** | | 0.0048 | 96.61% | Substantial |
| | 2023 | 0.0038 | 0.00272 | | **54.49%** | | 0.0045 | 89.24% | Moderate |
| | 2024 | 0.0037 | 0.00263 | | **52.54%** | | 0.0043 | 86.49% | Moderate |
| | 2025 | 0.0039 | 0.00276 | | **55.25%** | | 0.0045 | 90.30% | Moderate |
| Cobalt (Co), Annual | 2021 | 0.00390 | 0.00278 | 0.2 | **1.39%** | 0.000257[C] | 0.00304 | 1.52% | Negligible |
| | 2022 | 0.00436 | 0.00310 | | **1.55%** | | 0.00336 | 1.68% | Negligible |
| | 2023 | 0.00376 | 0.00268 | | **1.34%** | | 0.00293 | 1.47% | Negligible |
| | 2024 | 0.00362 | 0.00258 | | **1.29%** | | 0.00284 | 1.42% | Negligible |
| | 2025 | 0.00390 | 0.00278 | | **1.39%** | | 0.00304 | 1.52% | Negligible |
| Copper (Cu), 24 hour | 2021 | 0.039 | 0.02780 | 0.05 | **55.59%** | 0.00572[d] | 0.0335 | 67.03% | Moderate |
| | 2022 | 0.044 | 0.03102 | | **62.05%** | | 0.0367 | 73.49% | Moderate |
| | 2023 | 0.038 | 0.02676 | | **53.51%** | | 0.0325 | 64.95% | Moderate |
| | 2024 | 0.036 | 0.02580 | | **51.60%** | | 0.0315 | 63.04% | Moderate |
| | 2025 | 0.039 | 0.02778 | | **55.57%** | | 0.0335 | 67.01% | Moderate |
| Lead (Pb), Annual | 2021 | 0.004 | 0.00267 | 0.25 | **1.07%** | 0.0222[c] | 0.0249 | 9.95% | Negligible |
| | 2022 | 0.004 | 0.00299 | | **1.19%** | | 0.0252 | 10.07% | Negligible |
| | 2023 | 0.004 | 0.00272 | | **1.09%** | | 0.0249 | 9.97% | Negligible |
| | 2024 | 0.004 | 0.00263 | | **1.05%** | | 0.0248 | 9.93% | Negligible |
| | 2025 | 0.004 | 0.00276 | | **1.10%** | | 0.0250 | 9.98% | Negligible |
| Manganese (Mn), Annual | 2021 | 0.038 | 0.02671 | 0.15 | **17.81%** | 0.0271[e] | 0.0538 | 35.87% | Moderate |
| | 2022 | 0.042 | 0.02987 | | **19.91%** | | 0.0570 | 37.98% | Moderate |
| | 2023 | 0.038 | 0.02725 | | **18.16%** | | 0.0543 | 36.23% | Moderate |
| | 2024 | 0.037 | 0.02627 | | **17.51%** | | 0.0534 | 35.58% | Moderate |
| | 2025 | 0.039 | 0.02762 | | **18.42%** | | 0.0547 | 36.48% | Moderate |

**Table15: PECs of Pollutants – Stage 2 Screening – Lont Term (cont)**

| Pollutant | Met Year | Max PC (µg/m³) | Converted PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background (µg/m³) | Max PEC (µg/m³) | PEC as % of AQS | IAQM Impact Descriptor |
|---|---|---|---|---|---|---|---|---|---|
| Mercury (Hg), Annual - 24 hour | 2021 | 0.00390 | 0.00278 | 0.06 | **4.63%** | 0.00143[f] | 0.00421 | 7.01% | Negligible |
| | 2022 | 0.00436 | 0.00310 | | **5.17%** | | 0.00 | 7.55% | Slight |
| | 2023 | 0.00376 | 0.00268 | | **4.46%** | | 0.00 | 6.84% | Negligible |
| | 2024 | 0.00362 | 0.00258 | | **4.30%** | | 0.00 | 6.68% | Negligible |
| | 2025 | 0.00390 | 0.00278 | | **4.63%** | | 0.00 | 7.01% | Negligible |
| Nickel (Ni), Annual | 2021 | 0.00750 | 0.00534 | 0.02 | **26.71%** | 0.00136[c] | 0.00670 | 33.51% | Moderate |
| | 2022 | 0.00839 | 0.00597 | | **29.87%** | | 0.00733 | 36.67% | Moderate |
| | 2023 | 0.00765 | 0.00545 | | **27.25%** | | 0.00681 | 34.05% | Moderate |
| | 2024 | 0.00738 | 0.00525 | | **26.27%** | | 0.00661 | 33.07% | Moderate |
| | 2025 | 0.00776 | 0.00552 | | **27.62%** | | 0.00688 | 34.42% | Moderate |

Notes to Table:

a) Obtained from Defra Mapped data for x=352500, y=385500

b) Obtained from Defra Mapped data for x=352500, y=384500

c) Data from Scunthorpe Low Stanton 2022 – Obtained from ECL Historic Reports due to Website Security Issues

d) Data from Scunthorpe Low Stanton 2017 – Obtained from ECL Historic Reports due to Website Security Issues

e) Data from 2024 PM10 bound Mn concentration from Shefield Tinsley from ECL Historic Reports due to Website Security Issues

f) Obtained from UK EAP Mercury Chilbolton 2024 - – Obtained from ECL Historic Reports due to Website Security Issues

3.2.3. The data in Table 15 indicates that, for the long-term averaging periods the impacts are either negligible, slight or moderate for most pollutants assessed.

3.2.4. Impacts for cadmium are generally classed as moderate, with the exception of met year 2022 where the impacts are classed as substantial, however, it should be noted that this does not breach the long-term AQS.

3.2.5. For arsenic, all impacts are classed as substantial. The highest PC is 99.57% of the AQS, therefore together with the assumed background, the PEC is 154% of the AQS. It should be noted, however, that the arsenic result is based on a conservative sensitivity assessment assuming a continuous emission concentration of 0.10 mg/Nm³ for 24 hours a day, 5 days a week 52 weeks a year. This concentration has been adopted as a precautionary modelling assumption in the absence of representative process-specific emissions data and does not represent a proposed emission limit value or the anticipated concentration of arsenic in the treated process exhaust.

3.2.6. The assessment therefore demonstrates the outcome that would arise if arsenic were continuously emitted at the assumed concentration. Given the nature of the proposed process, comprising low-temperature dissolution of black mass in nitric acid at low temperature, it is considered unlikely that arsenic would be emitted at this concentration.

3.2.7. On further review of the process, it is considered that releases are more likely to occur 8 hours a day, 5 days a week, 50 weeks a year. Consequently, the adjusted long term PC would therefore be 0.00191µg/m$^3$ or 32% of the AQS. Therefore, the PEC would be 0.0052µg/m$^3$ or 86% of the AQS, and consequently would be described as moderate and would not cause a breach of the AQS.

## 3.3. Stage 2 Screening – Short Term

3.3.1. An assessment of the short term potentially significant pollutants is provided in Table 16. Impact descriptors from the IAQM guidance have been used.

**Table 16: Stage 2 Screening – Short Term**

| Pollutant | Met Year | Max PC (µg/m$^3$) | AQS (µg/m$^3$) | PC as a % of AQS | IAQM Impact Descriptor |
|---|---|---|---|---|---|
| $NO_2$ (99.79th percentile) | 2021 | 79.49 | 200 | **13.91%** | Small |
| | 2022 | 68.43 | | **11.97%** | Small |
| | 2023 | 69.08 | | **12.09%** | Small |
| | 2024 | 69.68 | | **12.19%** | Small |
| | 2025 | 67.65 | | **11.84%** | Small |
| Particulate Matter, as $PM_{10}$ (24 hr) - 90.41 percentile | 2021 | 5.72 | 50 | **11.43%** | Small |
| | 2022 | 5.21 | | **10.42%** | Small |
| | 2023 | 5.35 | | **10.71%** | Small |
| | 2024 | 5.32 | | **10.64%** | Small |
| | 2025 | 5.51 | | **11.03%** | Small |

**Table16: Stage 2 Screening – Short Term (cont)**

| Pollutant | Met Year | Max PC (µg/m³) | AQS (µg/m³) | PC as a % of AQS | IAQM Impact Descriptor |
|---|---|---|---|---|---|
| VOC (as 1,3-butadiene), 24 hour | 2021 | 1.80 | 2.25 | **80.16%** | Large |
| | 2022 | 1.65 | | **73.46%** | Large |
| | 2023 | 1.79 | | **79.47%** | Large |
| | 2024 | 1.63 | | **72.28%** | Large |
| | 2025 | 1.73 | | **77.11%** | Large |
| Hydrogen Chloride (HCL), 1 hour | 2021 | 99.56 | 750 | **13.27%** | Small |
| | 2022 | 103.08 | | **13.74%** | Small |
| | 2023 | 96.36 | | **12.85%** | Small |
| | 2024 | 98.58 | | **13.14%** | Small |
| | 2025 | 95.99 | | **12.80%** | Small |
| Cadmium (Cd), 24 hour mean | 2021 | 0.018 | 0.03 | **60.12%** | Large |
| | 2022 | 0.017 | | **55.10%** | Large |
| | 2023 | 0.018 | | **59.60%** | Large |
| | 2024 | 0.016 | | **54.21%** | Large |
| | 2025 | 0.017 | | **57.83%** | Large |
| Copper (Cu), 24 hour | 2021 | 0.039 | 0.05 | **55.59%** | Moderate |
| | 2022 | 0.044 | | **62.05%** | Moderate |
| | 2023 | 0.038 | | **53.51%** | Moderate |
| | 2024 | 0.036 | | **51.60%** | Moderate |
| | 2025 | 0.039 | | **55.57%** | Moderate |
| Nickel (Ni), 1 hour | 2021 | 0.105 | 0.7 | **15.01%** | Small |
| | 2022 | 0.105 | | **15.00%** | Small |
| | 2023 | 0.110 | | **15.78%** | Small |
| | 2024 | 0.090 | | **12.91%** | Small |
| | 2025 | 0.097 | | **13.92%** | Small |
| Vanadium (V), 24 hour | 2021 | 0.180 | 1 | **18.04%** | Small |
| | 2022 | 0.165 | | **16.53%** | Small |
| | 2023 | 0.179 | | **17.88%** | Small |
| | 2024 | 0.163 | | **16.26%** | Small |
| | 2025 | 0.173 | | **17.35%** | Small |

3.3.2. For the short-term averaging periods, impacts can be described as negligible to large. Large impacts are seen for cadmium and VOC as 1,3 butadiene, however the max GLC does not breach the AQS.

## 3.4. Isopleths

3.4.1. Isopleths have been prepared for every pollutant for the worst-case met year. Long term pollutants are as follows:

- $NO_2$ – 2022;
- $PM_{10}$ and $PM_{2.5}$ - 2021;
- VOC (as benzene) - 2022;
- Cd and Hg – 2022,
- Co and Pb - 2022;
- Mn - 2022;
- Cu – 2022; and
- As and Ni - 2022.

3.4.2. Short-term isopleths have been prepared for:

- $NO_2$ – 2021;
- $PM_{10}$ - 2021;
- VOC ( as 1,3, butadiene) - 2021;
- HCl - 2022; and
- Cd – 2021; and
- V – 2021.

3.4.3. These maybe found as Figures 8-21.

**Figure 8: Isopleth for Annual Mean $NO_2$ – Met Year 2022**

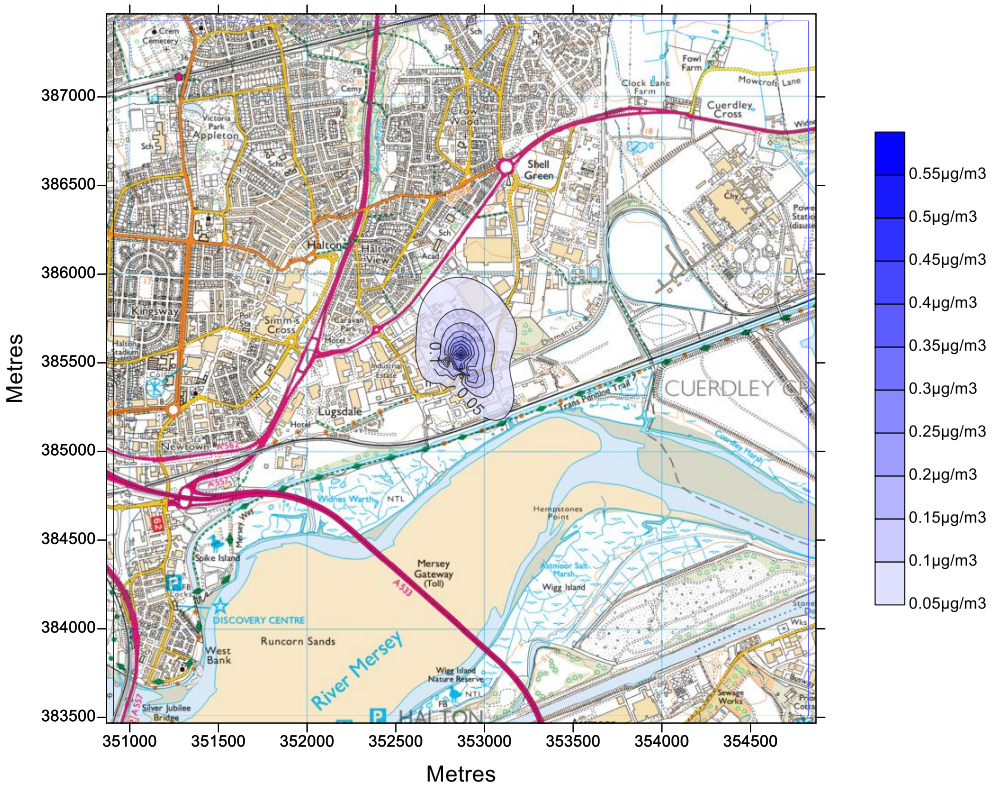


**Figure 9: Isopleth for Annual Mean $PM_{10}$ and $PM_{2.5}$ – Met Year 2021**

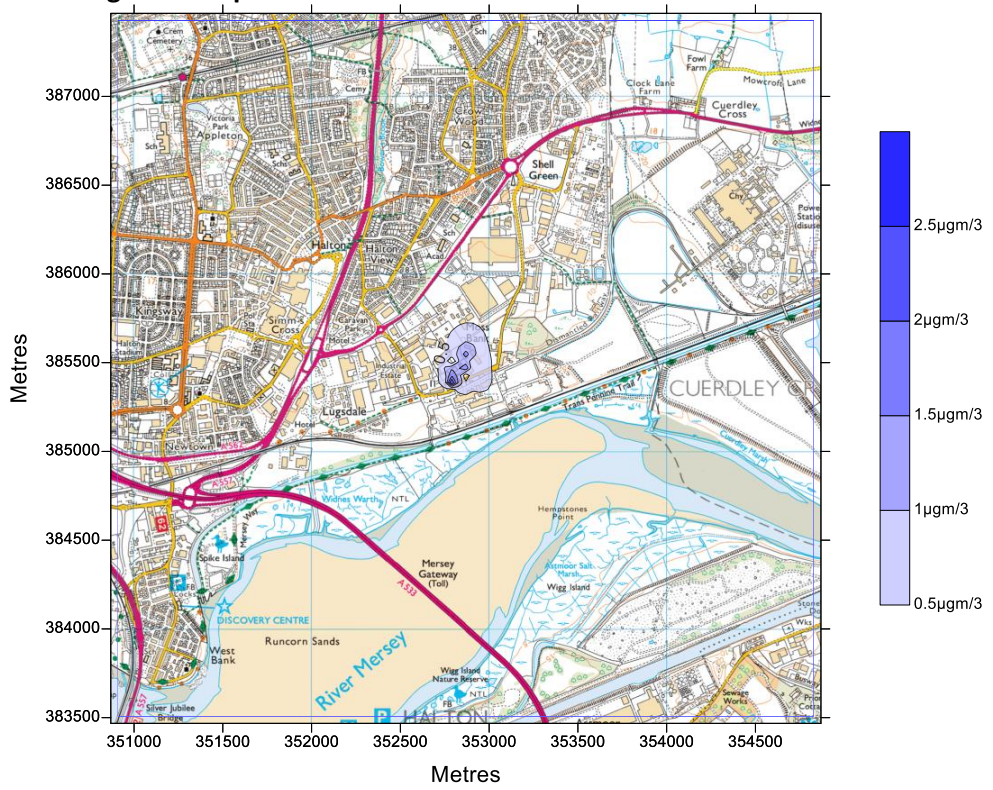



**Figure 10: Isopleth for Annual Mean VOC (as benzene) – Met Year 2022**

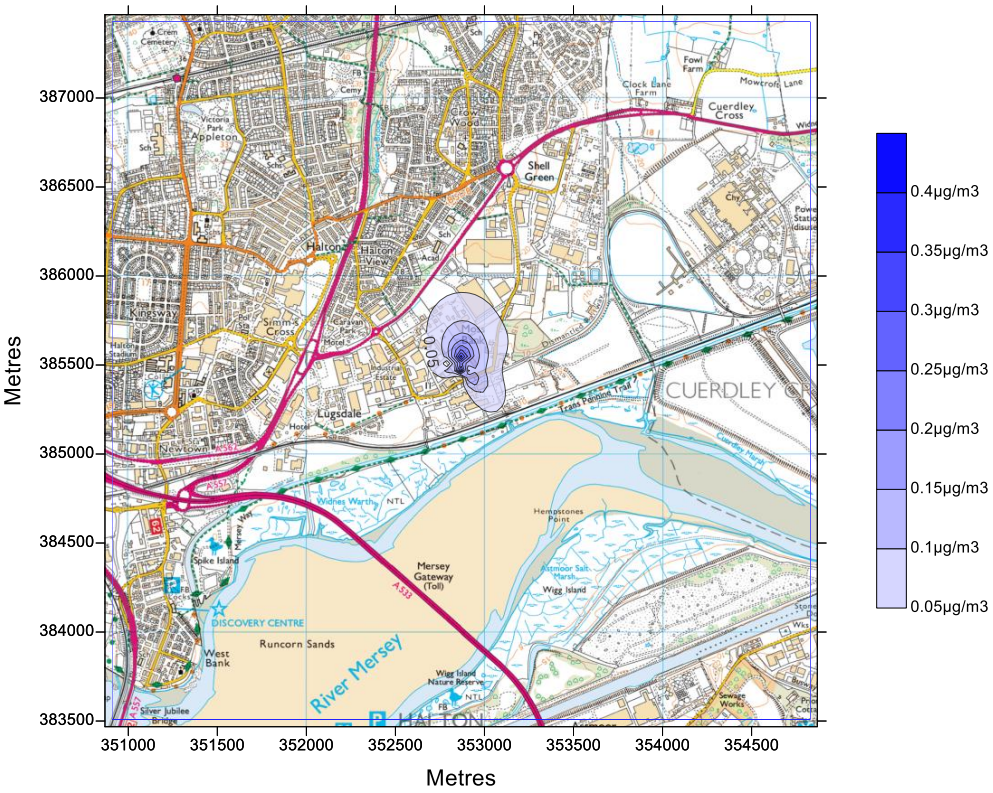


**Figure 11: Isopleth for Annual Mean Cd and Hg– Met Year 2022**

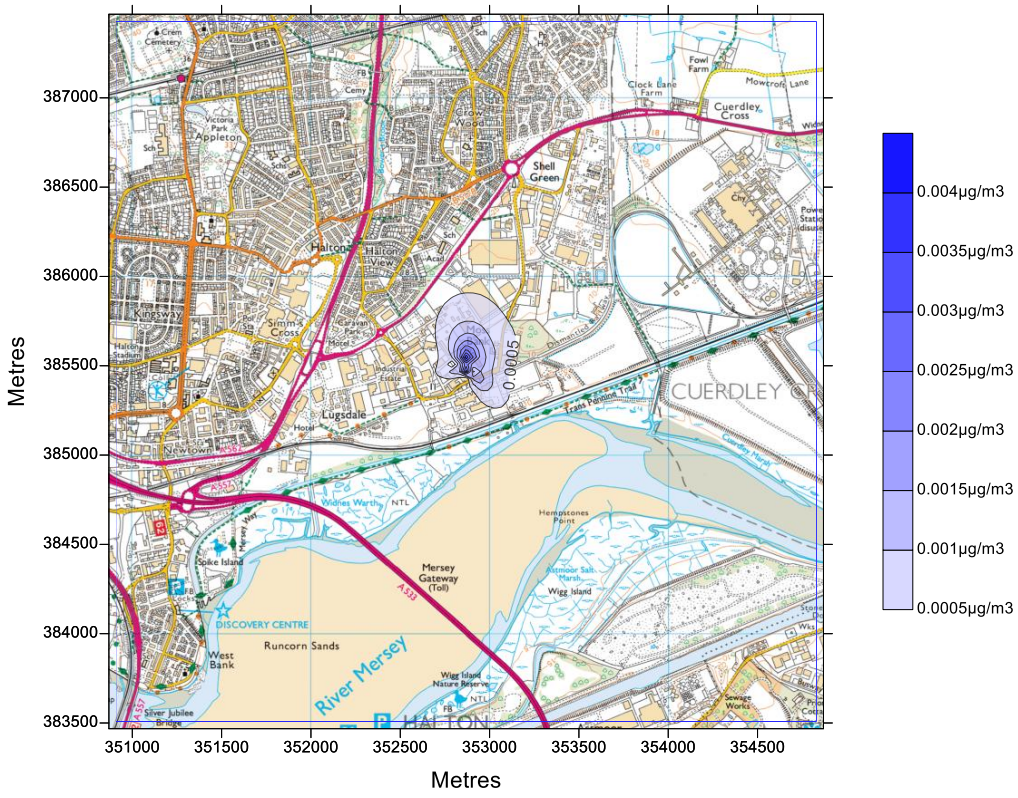



**Figure 12: Isopleth for Annual Mean Co and Pb – Met Year 2022**

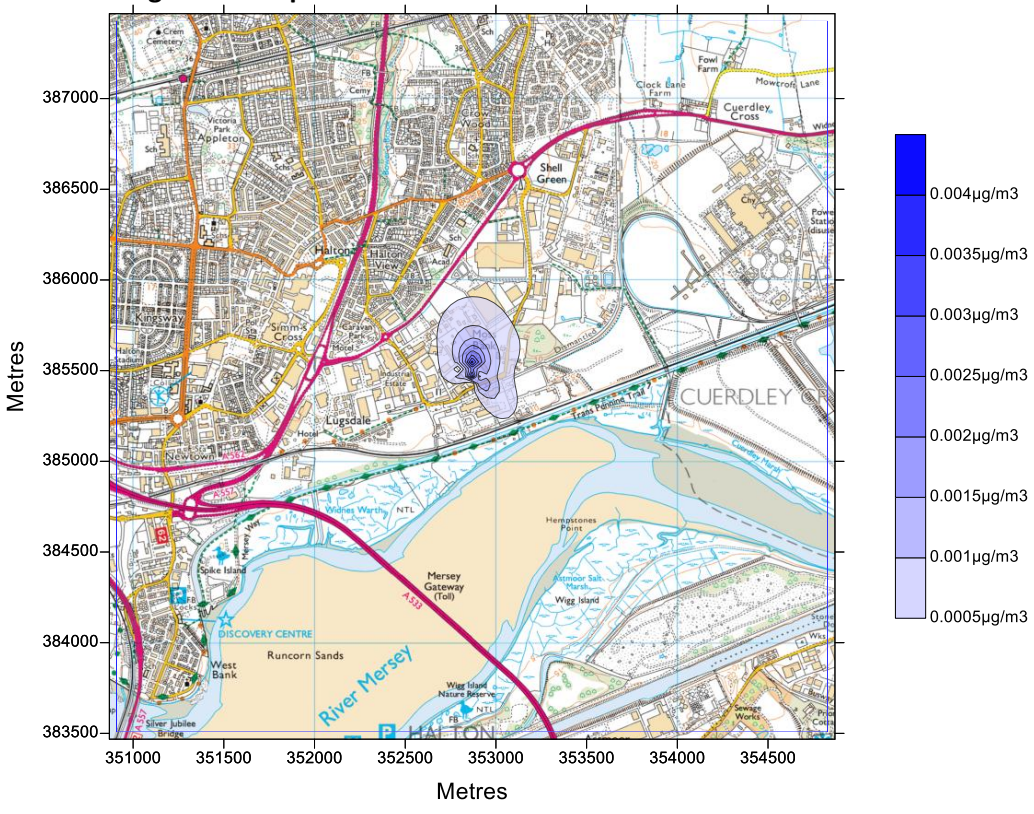


**Figure 13: Isopleth for Annual Mean Mn – Met Year 2022**

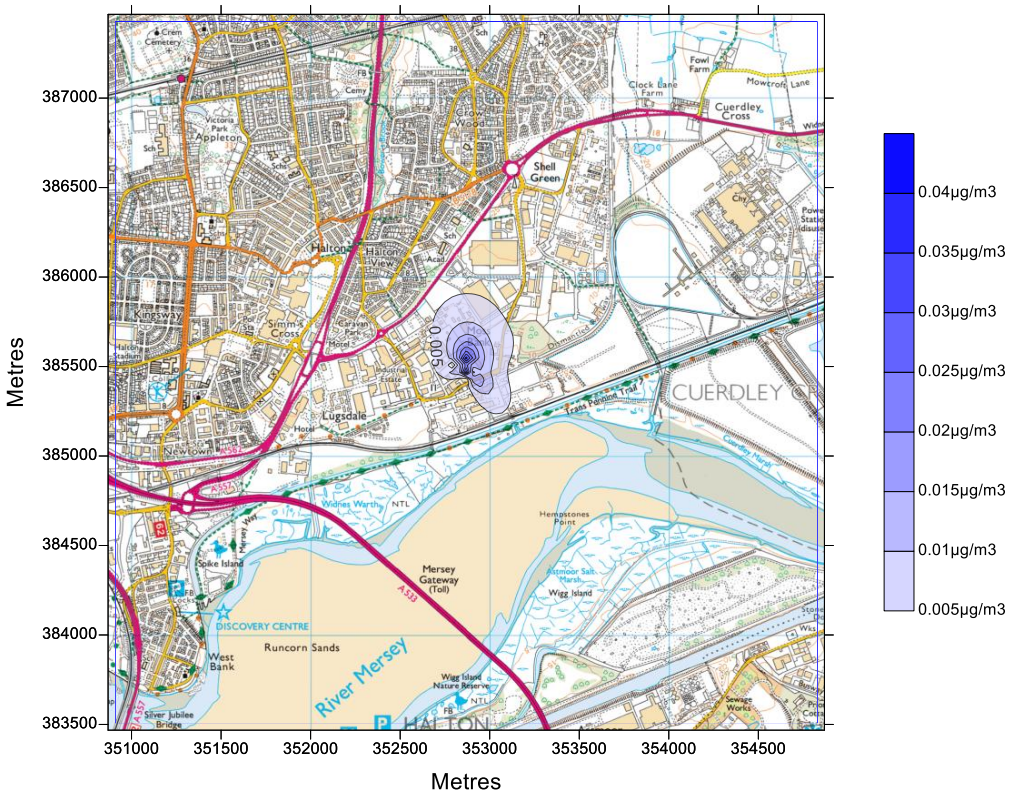



**Figure 14: Isopleth for Annual Mean Cu – Met Year 2022**

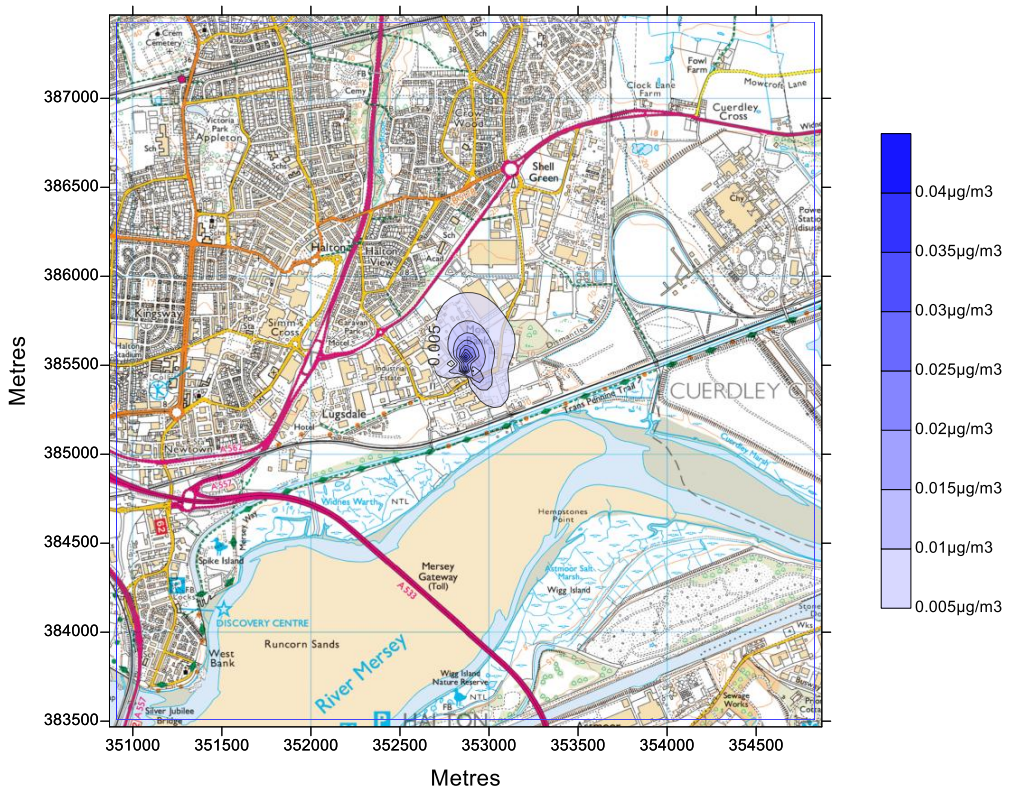


**Figure 15: Isopleth for Annual Mean As and Ni – Met Year 2022**

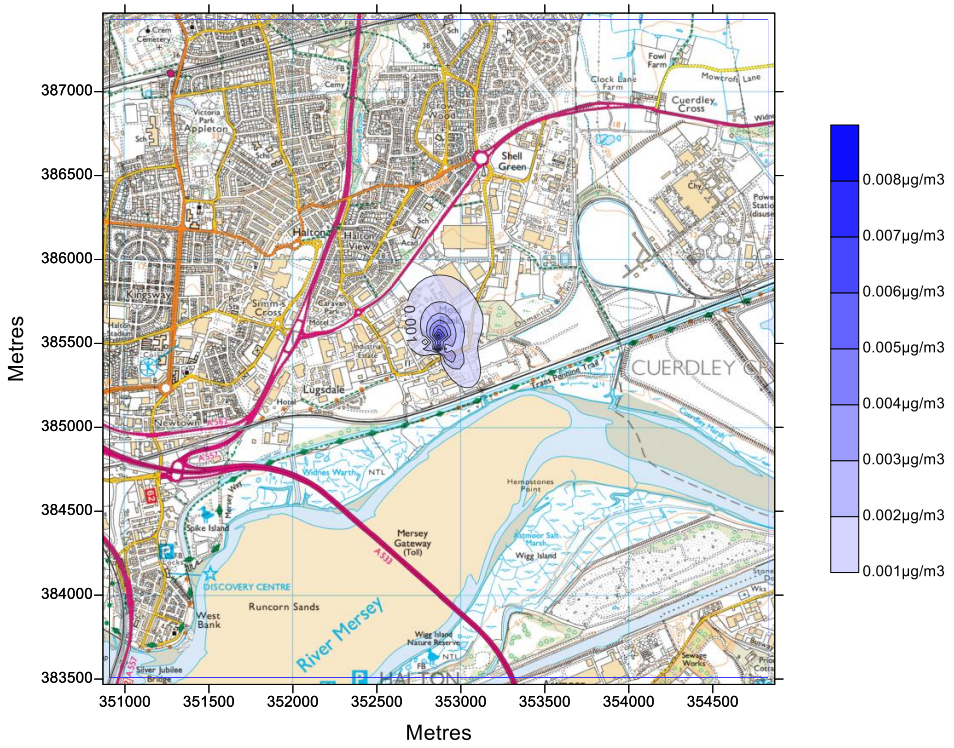



**Figure 16: Isopleth for Short Term $NO_2$ – Met Year 2021**

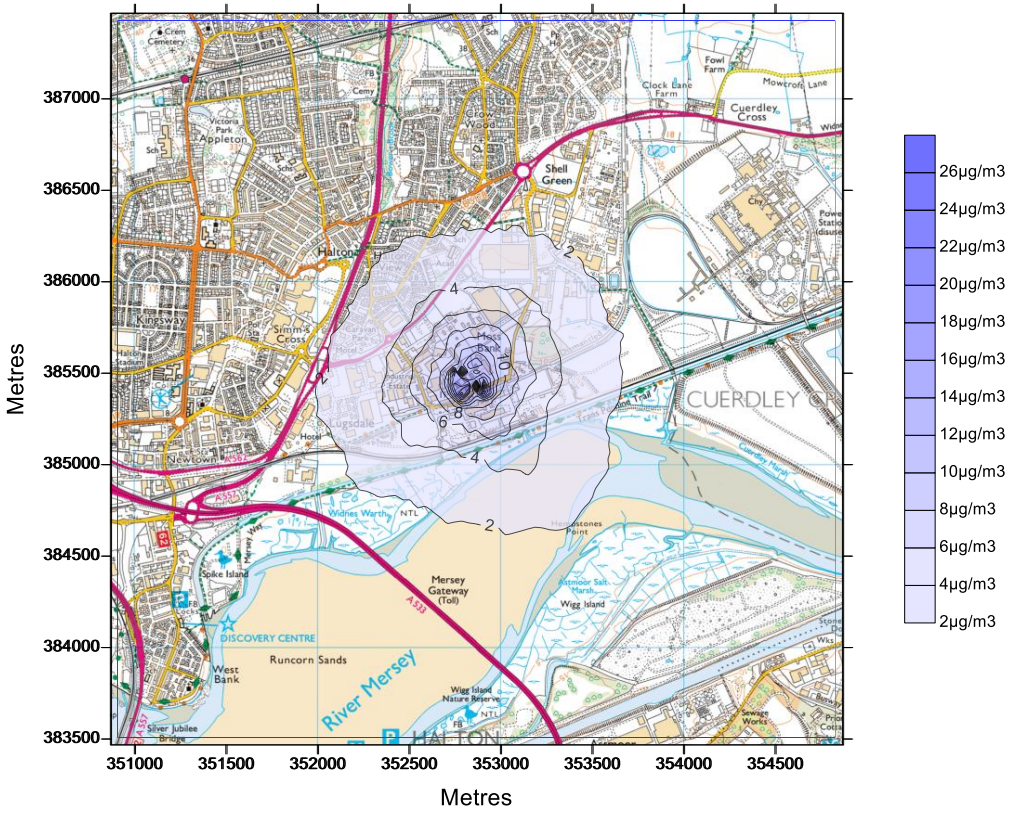


**Figure 17: Isopleth for Short Term $PM_{10}$ – Met Year 2021**

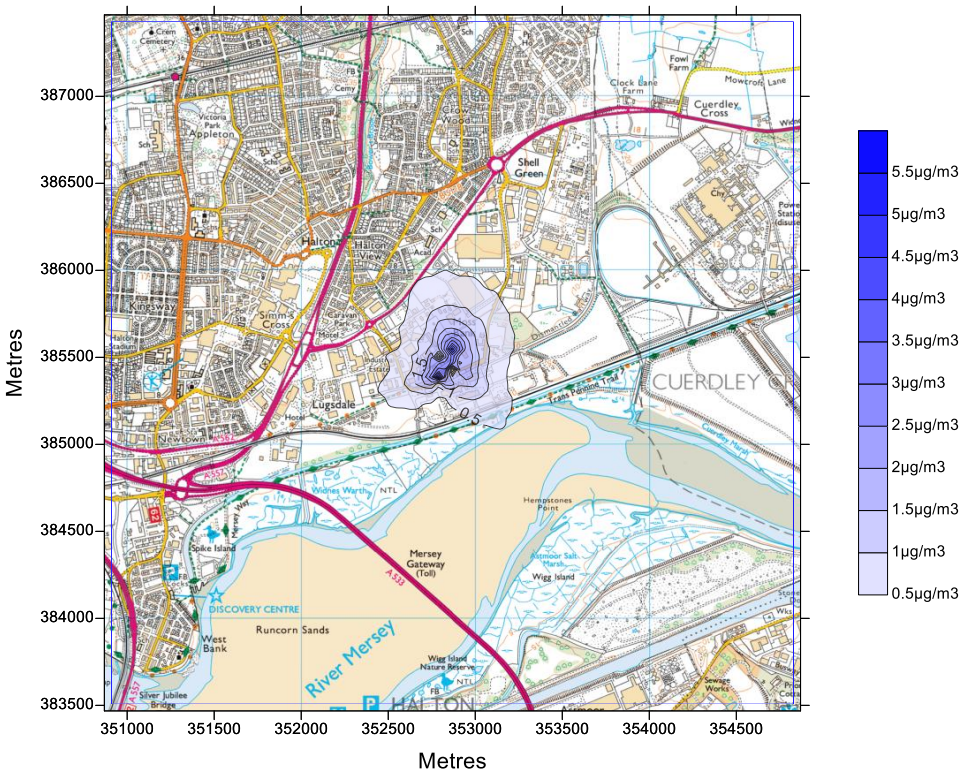



**Figure 18: Isopleth for Short Term VOC (as 1,3-butadiene) – Met Year 2021**

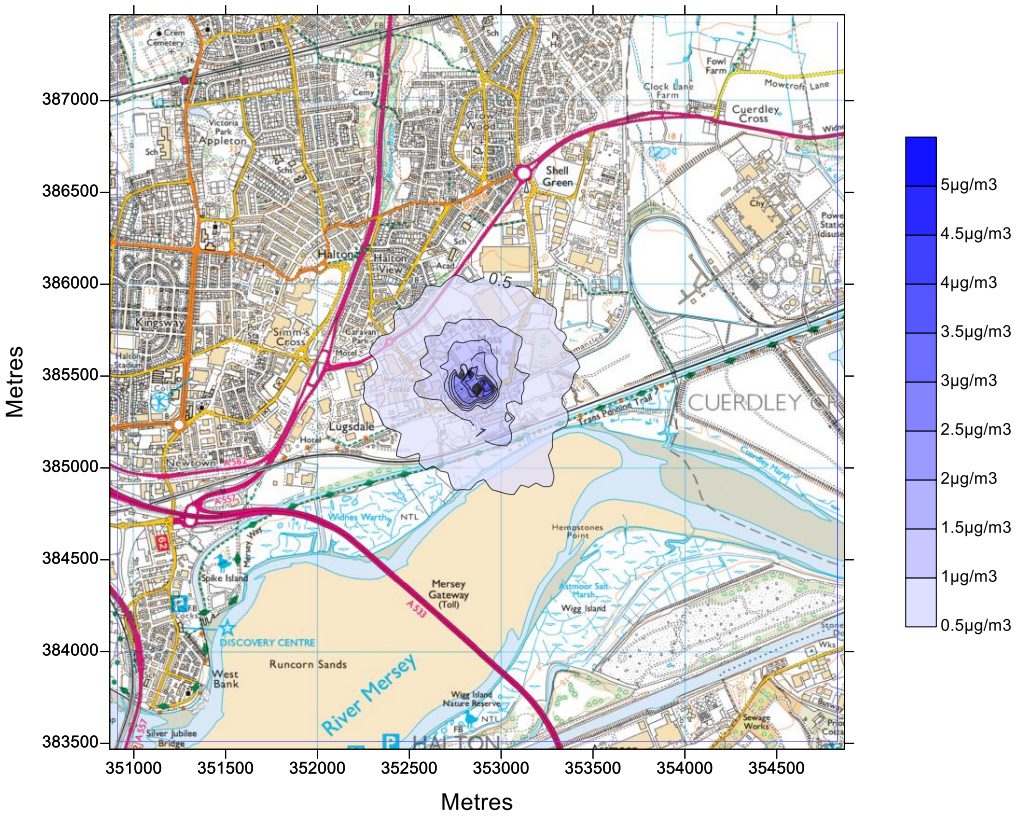


**Figure 19: Isopleth for Short Term HCl – Met Year 2022**

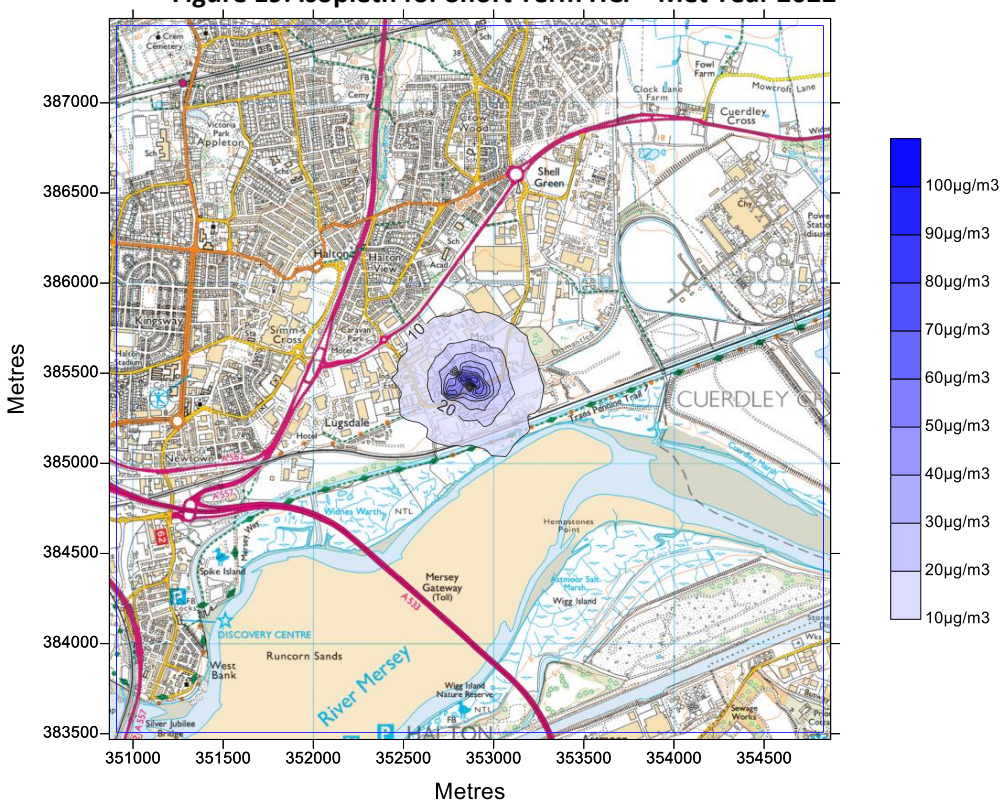



**Figure 20: Isopleth for Short Term Cd – Met Year 2021**

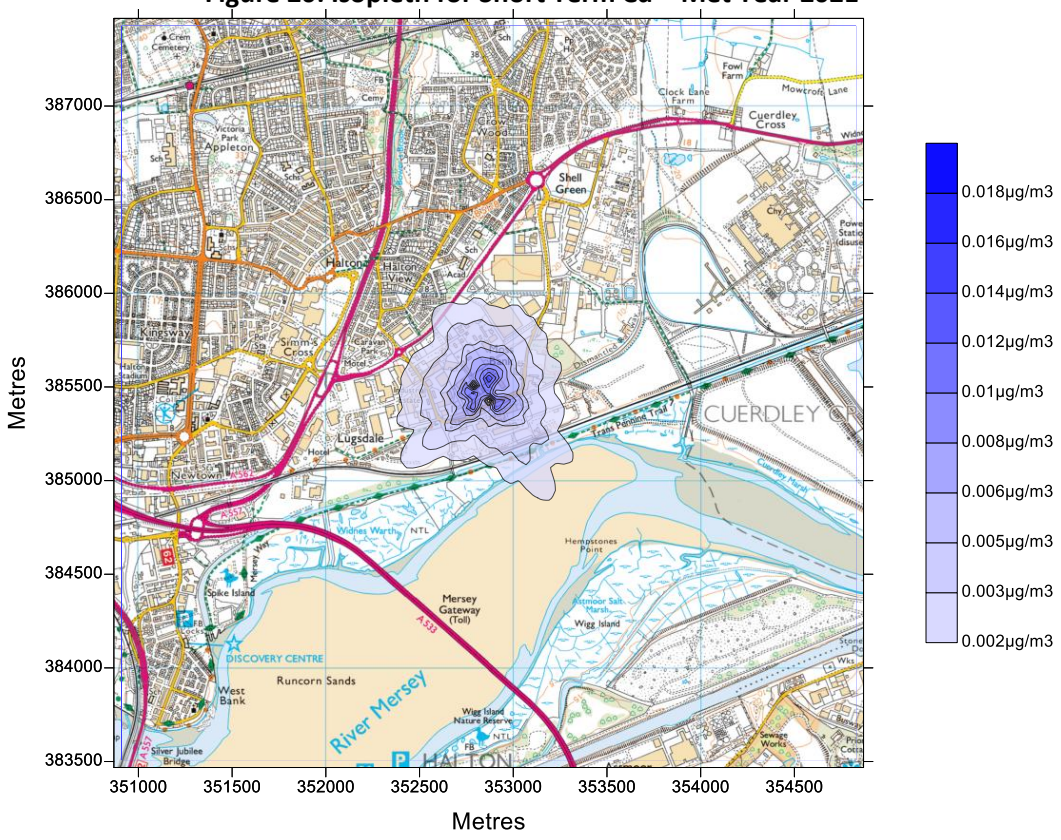
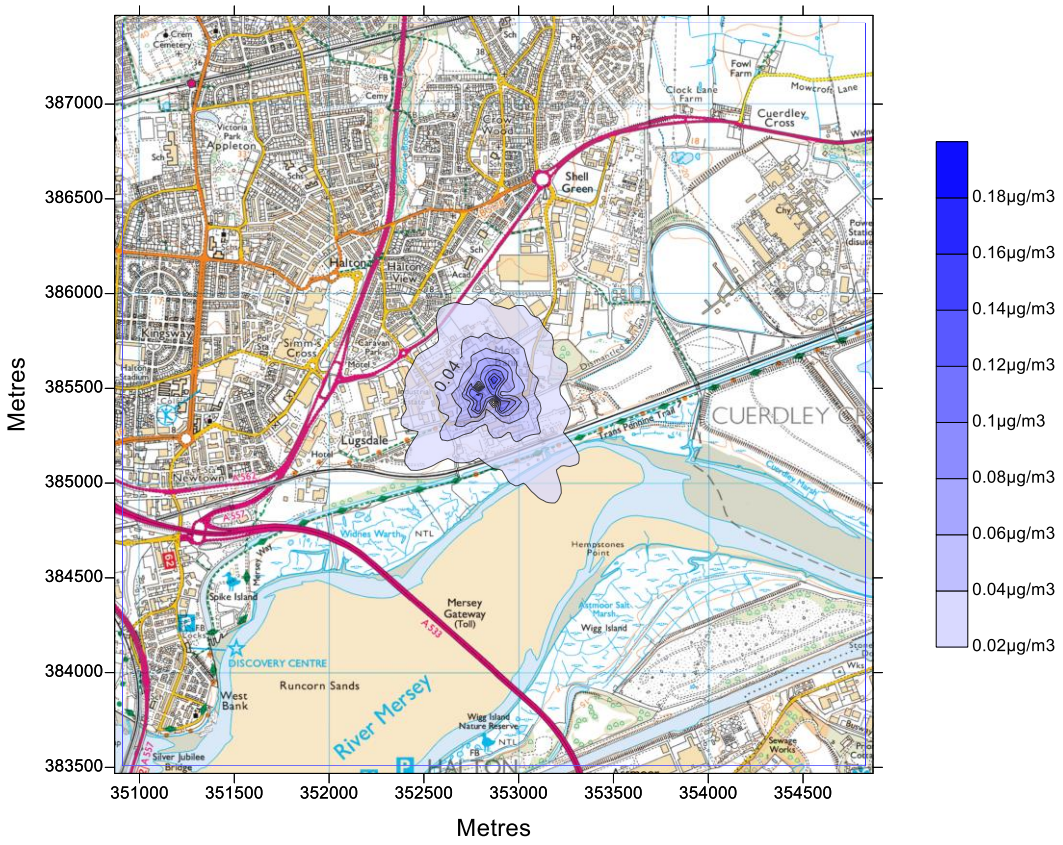


**Figure 21: Isopleth for Short Term V – Met Year 2021**



# 4. ASSESSMENT OF AIR QUALITY IMPACTS – POTENTIALLY SENSITIVE HUMAN RECEPTOR LOCATIONS

## 4.1. Results

4.1.1. The predicted PCs for each of the pollutants considered in the assessment at the locations of all potentially sensitive receptors are presented in Table 17.

4.1.2. It should be noted that for long-term concentrations, the maximum PC has been adjusted in accordance with the EA's guidance on operating modes. It is assumed that the Installation will operate a maximum of 24 hours a day, 5 days a week for 52 weeks per year, i.e. 6,240 hours out of 8,760.

4.1.3. Maximum concentrations are considered potentially significant if the long-term prediction is greater than 1% of the long-term AQS. For short-term predictions, a potentially significant concentration would be greater than 10% of the short-term AQS. In Table 17, any PCs that are above these significance criteria are indicated in bold type.

**Table 17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³)[(a)] | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2021 | 2022 | 2023 | 2024 | 2025 | | | | | | | | |
| $NO_2$ (annual mean) | HR1 | 1.993 | 2.702 | 2.390 | 2.714 | 3.340 | 3.340 | **1.666** | 40 | **4.2%** | 12.57 | 14.2 | 36% | Negligible |
| | HR2 | 3.507 | 3.529 | 3.398 | 3.823 | 3.041 | 3.823 | **1.906** | | **4.8%** | | 14.5 | 36% | Negligible |
| | HR3 | 1.027 | 0.615 | 0.857 | 0.917 | 1.193 | 1.193 | **0.595** | | **1.5%** | | 13.2 | 33% | Negligible |
| | HR4 | 0.490 | 0.308 | 0.404 | 0.457 | 0.561 | 0.561 | 0.280 | | 0.70% | | 12.8 | 32% | Negligible |
| | HR5 | 0.546 | 0.582 | 0.643 | 0.635 | 0.683 | 0.683 | 0.341 | | 0.85% | | 12.9 | 32% | Negligible |
| | HR6 | 0.393 | 0.426 | 0.361 | 0.343 | 0.392 | 0.426 | 0.213 | | 0.53% | | 12.8 | 32% | Negligible |
| | HR7 | 0.097 | 0.066 | 0.084 | 0.079 | 0.120 | 0.120 | 0.060 | | 0.15% | | 12.6 | 32% | Negligible |
| $NO_2$ (1 hour, 99.79th percentile) | HR1 | 43.570 | 46.276 | 47.694 | 44.774 | 51.553 | 51.553 | 18.044 | 200 | 9.0% | [redacted] | | | |
| | HR2 | 34.309 | 34.440 | 34.576 | 35.267 | 33.871 | 35.267 | 12.343 | | 6.2% | | | | |
| | HR3 | 21.496 | 21.410 | 21.055 | 21.356 | 21.541 | 21.541 | 7.539 | | 3.8% | | | | |
| | HR4 | 13.209 | 13.167 | 13.193 | 13.467 | 12.963 | 13.467 | 4.714 | | 2.4% | | | | |
| | HR5 | 11.056 | 10.624 | 11.376 | 10.547 | 11.613 | 11.613 | 4.065 | | 2.0% | | | | |
| | HR6 | 5.394 | 5.142 | 5.307 | 5.029 | 5.436 | 5.436 | 1.903 | | 0.95% | | | | |
| | HR7 | 3.770 | 3.334 | 3.323 | 3.487 | 3.820 | 3.820 | 1.337 | | 0.67% | | | | |
| $PM_{10}$ (annual) | HR1 | 0.968 | 1.135 | 1.019 | 1.046 | 1.156 | 1.156 | 0.824 | 40 | **2.1%** | 12.13 | 13.0 | 32% | Negligible |
| | HR2 | 0.706 | 0.693 | 0.694 | 0.773 | 0.612 | 0.773 | 0.551 | | **1.4%** | | 12.7 | 32% | Negligible |
| | HR3 | 0.377 | 0.246 | 0.327 | 0.322 | 0.443 | 0.443 | 0.316 | | 0.79% | | 12.4 | 31% | Negligible |
| | HR4 | 0.120 | 0.077 | 0.100 | 0.110 | 0.140 | 0.140 | 0.099 | | 0.25% | | 12.2 | 31% | Negligible |
| | HR5 | 0.115 | 0.122 | 0.132 | 0.130 | 0.140 | 0.140 | 0.099 | | 0.25% | | 12.2 | 31% | Negligible |
| | HR6 | 0.075 | 0.081 | 0.069 | 0.066 | 0.075 | 0.081 | 0.058 | | 0.14% | | 12.2 | 30% | Negligible |
| | HR7 | 0.019 | 0.013 | 0.017 | 0.016 | 0.024 | 0.024 | 0.017 | | 0.04% | | 12.1 | 30% | Negligible |
| $PM_{10}$ (90.41st Percentile 24hour) | HR1 | 2.269 | 2.426 | 2.378 | 2.415 | 2.518 | 2.518 | 2.518 | 50 | 5.04% | [redacted] | | | |
| | HR2 | 2.089 | 2.281 | 2.258 | 2.329 | 2.032 | 2.329 | 2.329 | | 4.66% | | | | |
| | HR3 | 2.206 | 0.993 | 1.637 | 1.442 | 2.232 | 2.232 | 2.232 | | 4.46% | | | | |
| | HR4 | 0.704 | 0.205 | 0.454 | 0.528 | 0.640 | 0.704 | 0.704 | | 1.41% | | | | |
| | HR5 | 0.351 | 0.377 | 0.404 | 0.455 | 0.427 | 0.455 | 0.455 | | 0.91% | | | | |
| | HR6 | 0.239 | 0.224 | 0.220 | 0.204 | 0.217 | 0.239 | 0.239 | | 0.48% | | | | |
| | HR7 | 0.093 | 0.052 | 0.069 | 0.057 | 0.112 | 0.112 | 0.112 | | 0.22% | | | | |
| $PM_{2.5}$ (annual) | HR1 | 0.968 | 1.135 | 1.019 | 1.046 | 1.156 | 1.156 | 0.824 | 20 | **4.1%** | 6.56 | 7.38 | 37% | Negligible |
| | HR2 | 0.706 | 0.693 | 0.694 | 0.773 | 0.612 | 0.773 | 0.551 | | **2.8%** | | 7.11 | 36% | Negligible |
| | HR3 | 0.377 | 0.246 | 0.327 | 0.322 | 0.443 | 0.443 | 0.316 | | **1.6%** | | 6.88 | 34% | Negligible |
| | HR4 | 0.120 | 0.077 | 0.100 | 0.110 | 0.140 | 0.140 | 0.099 | | 0.50% | | 6.66 | 33% | Negligible |
| | HR5 | 0.115 | 0.122 | 0.132 | 0.130 | 0.140 | 0.140 | 0.099 | | 0.50% | | 6.66 | 33% | Negligible |
| | HR6 | 0.075 | 0.081 | 0.069 | 0.066 | 0.075 | 0.081 | 0.058 | | 0.29% | | 6.62 | 33% | Negligible |
| | HR7 | 0.019 | 0.013 | 0.017 | 0.016 | 0.024 | 0.024 | 0.017 | | 0.08% | | 6.58 | 33% | Negligible |

**Table17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors (cont)**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³) | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VOC (as benzene) (annual) | HR1 | 0.092 | 0.125 | 0.110 | 0.125 | 0.154 | 0.154 | 0.110 | 5 | 2.20% | 0.350 | 0.460 | 9.2% | Negligible |
| | HR2 | 0.144 | 0.145 | 0.142 | 0.159 | 0.126 | 0.159 | 0.114 | | 2.27% | | 0.464 | 9.3% | Negligible |
| | HR3 | 0.043 | 0.026 | 0.036 | 0.038 | 0.050 | 0.050 | 0.036 | | 0.72% | | 0.386 | 7.7% | Negligible |
| | HR4 | 0.020 | 0.013 | 0.017 | 0.019 | 0.024 | 0.024 | 0.017 | | 0.34% | | 0.367 | 7.3% | Negligible |
| | HR5 | 0.022 | 0.024 | 0.026 | 0.026 | 0.028 | 0.028 | 0.020 | | 0.39% | | 0.370 | 7.4% | Negligible |
| | HR6 | 0.016 | 0.017 | 0.014 | 0.014 | 0.016 | 0.017 | 0.012 | | 0.24% | | 0.362 | 7.2% | Negligible |
| | HR7 | 0.004 | 0.003 | 0.003 | 0.003 | 0.005 | 0.005 | 0.003 | | 0.07% | | 0.353 | 7.1% | Negligible |
| VOC (as benzene) (24 hour 100th percentile) | HR1 | 1.170 | 1.082 | 1.165 | 1.218 | 1.351 | 1.351 | 1.351 | 30 | 4.50% | [redacted] | | | |
| | HR2 | 1.113 | 1.064 | 0.799 | 0.852 | 0.986 | 1.113 | 1.113 | | 3.71% | | | | |
| | HR3 | 0.728 | 0.498 | 0.568 | 0.594 | 0.620 | 0.728 | 0.728 | | 2.43% | | | | |
| | HR4 | 0.368 | 0.345 | 0.264 | 0.324 | 0.272 | 0.368 | 0.368 | | 1.23% | | | | |
| | HR5 | 0.176 | 0.165 | 0.220 | 0.216 | 0.183 | 0.220 | 0.220 | | 0.73% | | | | |
| | HR6 | 0.086 | 0.097 | 0.081 | 0.074 | 0.105 | 0.105 | 0.105 | | 0.35% | | | | |
| | HR7 | 0.054 | 0.059 | 0.065 | 0.060 | 0.063 | 0.065 | 0.065 | | 0.22% | | | | |
| VOC (as 1,3-butadiene) (24 hour 100th percentile) | HR1 | 1.170 | 1.082 | 1.165 | 1.218 | 1.351 | 1.351 | 1.351 | 2.25 | **60%** | | | | Large |
| | HR2 | 1.113 | 1.064 | 0.799 | 0.852 | 0.986 | 1.113 | 1.113 | | **49%** | | | | Medium |
| | HR3 | 0.728 | 0.498 | 0.568 | 0.594 | 0.620 | 0.728 | 0.728 | | **32%** | | | | Medium |
| | HR4 | 0.368 | 0.345 | 0.264 | 0.324 | 0.272 | 0.368 | 0.368 | | **16%** | | | | Small |
| | HR5 | 0.176 | 0.165 | 0.220 | 0.216 | 0.183 | 0.220 | 0.220 | | 9.8% | | | | N/A <10% |
| | HR6 | 0.086 | 0.097 | 0.081 | 0.074 | 0.105 | 0.105 | 0.105 | | 4.6% | | | | N/A <10% |
| | HR7 | 0.054 | 0.059 | 0.065 | 0.060 | 0.063 | 0.065 | 0.065 | | 2.9% | | | | N/A <10% |
| Ammonia (annual) | HR1 | 0.717 | 0.868 | 0.733 | 0.768 | 0.877 | 0.877 | 0.625 | 180 | 0.35% | | | | |
| | HR2 | 0.509 | 0.495 | 0.495 | 0.578 | 0.450 | 0.578 | 0.412 | | 0.23% | | | | |
| | HR3 | 0.179 | 0.108 | 0.149 | 0.154 | 0.208 | 0.208 | 0.148 | | 0.082% | | | | |
| | HR4 | 0.068 | 0.042 | 0.056 | 0.061 | 0.078 | 0.078 | 0.055 | | 0.031% | | | | |
| | HR5 | 0.063 | 0.069 | 0.073 | 0.074 | 0.079 | 0.079 | 0.056 | | 0.031% | | | | |
| | HR6 | 0.043 | 0.046 | 0.039 | 0.038 | 0.043 | 0.046 | 0.033 | | 0.018% | | | | |
| | HR7 | 0.010 | 0.007 | 0.009 | 0.008 | 0.012 | 0.012 | 0.009 | | 0.0048% | | | | |
| Ammonia (1-hour) | HR1 | 11.463 | 12.843 | 13.598 | 9.540 | 12.323 | 13.598 | 13.598 | 2500 | 0.54% | | | | |
| | HR2 | 5.357 | 5.433 | 5.534 | 5.555 | 5.466 | 5.555 | 5.555 | | 0.22% | | | | |
| | HR3 | 3.652 | 3.800 | 3.886 | 3.828 | 3.858 | 3.886 | 3.886 | | 0.16% | | | | |
| | HR4 | 1.734 | 1.861 | 1.905 | 1.953 | 1.893 | 1.953 | 1.953 | | 0.08% | | | | |
| | HR5 | 1.181 | 1.193 | 1.217 | 1.202 | 1.262 | 1.262 | 1.262 | | 0.050% | | | | |
| | HR6 | 0.458 | 0.522 | 0.520 | 0.507 | 0.530 | 0.530 | 0.530 | | 0.021% | | | | |
| | HR7 | 0.337 | 0.323 | 0.326 | 0.325 | 0.329 | 0.337 | 0.337 | | 0.013% | | | | |

**Table 17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors (cont)**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³) | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hydrogen Chloride (1-hour) | HR1 | 76.623 | 68.349 | 79.124 | 80.510 | 69.711 | 80.510 | 80.510 | 750 | **11%** | [redacted] | | | Small |
| | HR2 | 45.615 | 49.766 | 51.992 | 46.480 | 45.269 | 51.992 | 51.992 | | 6.9% | | | | N/A <10% |
| | HR3 | 24.161 | 25.263 | 25.335 | 25.526 | 24.291 | 25.526 | 25.526 | | 3.4% | | | | N/A <10% |
| | HR4 | 11.603 | 11.328 | 10.679 | 11.241 | 10.981 | 11.603 | 11.603 | | 1.5% | | | | N/A <10% |
| | HR5 | 6.891 | 7.029 | 7.131 | 7.126 | 7.206 | 7.206 | 7.206 | | 0.96% | | | | N/A <10% |
| | HR6 | 2.752 | 3.309 | 3.190 | 3.166 | 3.362 | 3.362 | 3.362 | | 0.45% | | | | N/A <10% |
| | HR7 | 2.136 | 2.077 | 1.785 | 2.042 | 1.872 | 2.136 | 2.136 | | 0.28% | | | | N/A <10% |
| Hydrogen Fluoride (monthly) | HR1 | 0.082 | 0.114 | 0.096 | 0.081 | 0.138 | 0.138 | 0.09837 | 16 | 0.61% | | | | |
| | HR2 | 0.103 | 0.103 | 0.092 | 0.088 | 0.084 | 0.103 | 0.07367 | | 0.46% | | | | |
| | HR3 | 0.083 | 0.047 | 0.047 | 0.079 | 0.073 | 0.083 | 0.05934 | | 0.37% | | | | |
| | HR4 | 0.040 | 0.027 | 0.025 | 0.042 | 0.035 | 0.042 | 0.02968 | | 0.19% | | | | |
| | HR5 | 0.015 | 0.019 | 0.012 | 0.023 | 0.017 | 0.023 | 0.01631 | | 0.10% | | | | |
| | HR6 | 0.008 | 0.011 | 0.007 | 0.006 | 0.014 | 0.014 | 0.00963 | | 0.060% | | | | |
| | HR7 | 0.005 | 0.006 | 0.004 | 0.006 | 0.008 | 0.008 | 0.00574 | | 0.036% | | | | |
| Hydrogen Fluoride (1-hour) | HR1 | 0.995 | 1.030 | 1.105 | 0.775 | 0.974 | 1.105 | 1.10450 | 160 | 0.69% | | | | |
| | HR2 | 0.323 | 0.351 | 0.352 | 0.347 | 0.340 | 0.352 | 0.35241 | | 0.22% | | | | |
| | HR3 | 0.210 | 0.216 | 0.217 | 0.217 | 0.204 | 0.217 | 0.21749 | | 0.14% | | | | |
| | HR4 | 0.132 | 0.145 | 0.139 | 0.158 | 0.139 | 0.158 | 0.15843 | | 0.10% | | | | |
| | HR5 | 0.111 | 0.115 | 0.119 | 0.118 | 0.117 | 0.119 | 0.11945 | | 0.075% | | | | |
| | HR6 | 0.049 | 0.059 | 0.057 | 0.055 | 0.060 | 0.060 | 0.06016 | | 0.038% | | | | |
| | HR7 | 0.036 | 0.036 | 0.034 | 0.036 | 0.035 | 0.036 | 0.03638 | | 0.023% | | | | |
| Antimony (annual) | HR1 | 0.000918 | 0.001247 | 0.001099 | 0.001254 | 0.001545 | 0.001545 | 0.00110 | 5 | 0.022% | | | | |
| | HR2 | 0.001445 | 0.001450 | 0.001417 | 0.001594 | 0.001264 | 0.001594 | 0.00114 | | 0.023% | | | | |
| | HR3 | 0.000429 | 0.000261 | 0.000357 | 0.000379 | 0.000504 | 0.000504 | 0.00036 | | 0.0072% | | | | |
| | HR4 | 0.000204 | 0.000130 | 0.000169 | 0.000191 | 0.000235 | 0.000235 | 0.00017 | | 0.0034% | | | | |
| | HR5 | 0.000222 | 0.000236 | 0.000261 | 0.000257 | 0.000276 | 0.000276 | 0.00020 | | 0.0039% | | | | |
| | HR6 | 0.000156 | 0.000168 | 0.000143 | 0.000136 | 0.000155 | 0.000168 | 0.00012 | | 0.0024% | | | | |
| | HR7 | 0.000039 | 0.000026 | 0.000034 | 0.000031 | 0.000048 | 0.000048 | 0.00003 | | 0.0007% | | | | |
| Antimony (1-hour) | HR1 | 0.04976 | 0.05152 | 0.05523 | 0.03875 | 0.04871 | 0.05523 | 0.05523 | 150 | 0.037% | | | | |
| | HR2 | 0.01614 | 0.01754 | 0.01762 | 0.01735 | 0.01698 | 0.01762 | 0.01762 | | 0.012% | | | | |
| | HR3 | 0.01048 | 0.01080 | 0.01085 | 0.01087 | 0.01018 | 0.01087 | 0.01087 | | 0.0072% | | | | |
| | HR4 | 0.00660 | 0.00726 | 0.00693 | 0.00792 | 0.00696 | 0.00792 | 0.00792 | | 0.0053% | | | | |
| | HR5 | 0.00555 | 0.00576 | 0.00597 | 0.00589 | 0.00585 | 0.00597 | 0.00597 | | 0.0040% | | | | |
| | HR6 | 0.00247 | 0.00294 | 0.00287 | 0.00276 | 0.00301 | 0.00301 | 0.00301 | | 0.0020% | | | | |
| | HR7 | 0.00182 | 0.00178 | 0.00169 | 0.00179 | 0.00173 | 0.00182 | 0.00182 | | 0.0012% | | | | |

**Table 17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors (cont)**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³) | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic (annual) | HR1 | 0.00184 | 0.00249 | 0.00220 | 0.00251 | 0.00309 | 0.00309 | 0.00220 | 0.006 | **37%** | 0.003240 | 0.00544 | 91% | Moderate |
| | HR2 | 0.00289 | 0.00290 | 0.00283 | 0.00319 | 0.00253 | 0.00319 | 0.00227 | | **38%** | | 0.00551 | 92% | Moderate |
| | HR3 | 0.00086 | 0.00052 | 0.00071 | 0.00076 | 0.00101 | 0.00101 | 0.00072 | | **12%** | | 0.00396 | 66% | Moderate |
| | HR4 | 0.00041 | 0.00026 | 0.00034 | 0.00038 | 0.00047 | 0.00047 | 0.00034 | | **5.6%** | | 0.00358 | 60% | Slight |
| | HR5 | 0.00044 | 0.00047 | 0.00052 | 0.00051 | 0.00055 | 0.00055 | 0.00039 | | **6.5%** | | 0.00363 | 61% | Slight |
| | HR6 | 0.00031 | 0.00034 | 0.00029 | 0.00027 | 0.00031 | 0.00034 | 0.00024 | | **4.0%** | | 0.00348 | 58% | Negligible |
| | HR7 | 0.00008 | 0.00005 | 0.00007 | 0.00006 | 0.00010 | 0.00010 | 0.00007 | | **1.1%** | | 0.00331 | 55% | Negligible |
| Cadmium (annual) | HR1 | 0.00092 | 0.00125 | 0.00110 | 0.00125 | 0.00154 | 0.00154 | 0.00110 | 0.005 | **22%** | 0.000637 | 0.001737 | 35% | Moderate |
| | HR2 | 0.00144 | 0.00145 | 0.00142 | 0.00159 | 0.00126 | 0.00159 | 0.00114 | | **23%** | | 0.00177 | 35% | Moderate |
| | HR3 | 0.00043 | 0.00026 | 0.00036 | 0.00038 | 0.00050 | 0.00050 | 0.00036 | | **7.2%** | | 0.00100 | 20% | Slight |
| | HR4 | 0.00020 | 0.00013 | 0.00017 | 0.00019 | 0.00024 | 0.00024 | 0.00017 | | **3.4%** | | 0.000805 | 16% | Negligible |
| | HR5 | 0.00022 | 0.00024 | 0.00026 | 0.00026 | 0.00028 | 0.00028 | 0.00020 | | **3.9%** | | 0.000833 | 17% | Negligible |
| | HR6 | 0.00016 | 0.00017 | 0.00014 | 0.00014 | 0.00016 | 0.00017 | 0.00012 | | **2.4%** | | 0.000757 | 15% | Negligible |
| | HR7 | 0.00004 | 0.00003 | 0.00003 | 0.00003 | 0.00005 | 0.00005 | 0.00003 | | 0.68% | | 0.000671 | 13% | Negligible |
| Cadmium (24 hour 100th percentile) | HR1 | 0.01170 | 0.01082 | 0.01165 | 0.01218 | 0.01351 | 0.01351 | 0.01351 | 0.03 | **45%** | [redacted] | | | Medium |
| | HR2 | 0.01113 | 0.01064 | 0.00799 | 0.00852 | 0.00986 | 0.01113 | 0.01113 | | **37%** | | | | Medium |
| | HR3 | 0.00728 | 0.00498 | 0.00568 | 0.00594 | 0.00620 | 0.00728 | 0.00728 | | **24%** | | | | Medium |
| | HR4 | 0.00368 | 0.00345 | 0.00264 | 0.00324 | 0.00272 | 0.00368 | 0.00368 | | **12%** | | | | Small |
| | HR5 | 0.00176 | 0.00165 | 0.00220 | 0.00216 | 0.00183 | 0.00220 | 0.00220 | | 7.3% | | | | N/A <10% |
| | HR6 | 0.00086 | 0.00097 | 0.00081 | 0.00074 | 0.00105 | 0.00105 | 0.00105 | | 3.5% | | | | N/A <10% |
| | HR7 | 0.00054 | 0.00059 | 0.00065 | 0.00060 | 0.00063 | 0.00065 | 0.00065 | | 2.2% | | | | N/A <10% |
| Cr (III) (24hr - long-term) | HR1 | 0.00088 | 0.00111 | 0.00104 | 0.00118 | 0.00146 | 0.00146 | 0.00104 | 2 | 0.052% | | | | |
| | HR2 | 0.00141 | 0.00149 | 0.00139 | 0.00161 | 0.00131 | 0.00161 | 0.00114 | | 0.057% | | | | |
| | HR3 | 0.00046 | 0.00027 | 0.00039 | 0.00038 | 0.00049 | 0.00049 | 0.00035 | | 0.018% | | | | |
| | HR4 | 0.00022 | 0.00013 | 0.00018 | 0.00019 | 0.00023 | 0.00023 | 0.00017 | | 0.0083% | | | | |
| | HR5 | 0.00019 | 0.00020 | 0.00023 | 0.00025 | 0.00025 | 0.00025 | 0.00018 | | 0.0090% | | | | |
| | HR6 | 0.00016 | 0.00017 | 0.00014 | 0.00014 | 0.00016 | 0.00017 | 0.00012 | | 0.0060% | | | | |
| | HR7 | 0.00004 | 0.00003 | 0.00004 | 0.00003 | 0.00005 | 0.00005 | 0.00003 | | 0.0017% | | | | |
| Cobalt (annual) | HR1 | 0.00092 | 0.00125 | 0.00110 | 0.00125 | 0.00154 | 0.00154 | 0.00110 | 0.2 | 0.55% | | | | |
| | HR2 | 0.00144 | 0.00145 | 0.00142 | 0.00159 | 0.00126 | 0.00159 | 0.00114 | | 0.57% | | | | |
| | HR3 | 0.00043 | 0.00026 | 0.00036 | 0.00038 | 0.00050 | 0.00050 | 0.00036 | | 0.18% | | | | |
| | HR4 | 0.00020 | 0.00013 | 0.00017 | 0.00019 | 0.00024 | 0.00024 | 0.00017 | | 0.084% | | | | |
| | HR5 | 0.00022 | 0.00024 | 0.00026 | 0.00026 | 0.00028 | 0.00028 | 0.00020 | | 0.10% | | | | |
| | HR6 | 0.00016 | 0.00017 | 0.00014 | 0.00014 | 0.00016 | 0.00017 | 0.00012 | | 0.060% | | | | |
| | HR7 | 0.00004 | 0.00003 | 0.00003 | 0.00003 | 0.00005 | 0.00005 | 0.00003 | | 0.017% | | | | |

**Table 17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors (cont)**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³) | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt (1-hour) | HR1 | 0.04976 | 0.05152 | 0.05523 | 0.03875 | 0.04871 | 0.05523 | 0.05523 | 6 | 0.92% | [redacted] | | | |
| | HR2 | 0.01614 | 0.01754 | 0.01762 | 0.01735 | 0.01698 | 0.01762 | 0.01762 | | 0.29% | | | | |
| | HR3 | 0.01048 | 0.01080 | 0.01085 | 0.01087 | 0.01018 | 0.01087 | 0.01087 | | 0.18% | | | | |
| | HR4 | 0.00660 | 0.00726 | 0.00693 | 0.00792 | 0.00696 | 0.00792 | 0.00792 | | 0.13% | | | | |
| | HR5 | 0.00555 | 0.00576 | 0.00597 | 0.00589 | 0.00585 | 0.00597 | 0.00597 | | 0.10% | | | | |
| | HR6 | 0.00247 | 0.00294 | 0.00287 | 0.00276 | 0.00301 | 0.00301 | 0.00301 | | 0.050% | | | | |
| | HR7 | 0.00182 | 0.00178 | 0.00169 | 0.00179 | 0.00173 | 0.00182 | 0.00182 | | 0.030% | | | | |
| Cu (24hr - long-term) | HR1 | 0.00880 | 0.01107 | 0.01044 | 0.01177 | 0.01464 | 0.01464 | 0.01043 | 0.05 | **21%** | 0.005725 | 0.0162 | 32% | Moderate |
| | HR2 | 0.01411 | 0.01491 | 0.01387 | 0.01607 | 0.01311 | 0.01607 | 0.01144 | | **23%** | | 0.0172 | 34% | Moderate |
| | HR3 | 0.00456 | 0.00267 | 0.00388 | 0.00380 | 0.00493 | 0.00493 | 0.00351 | | **7.0%** | | 0.00924 | 18% | Slight |
| | HR4 | 0.00222 | 0.00133 | 0.00182 | 0.00193 | 0.00232 | 0.00232 | 0.00165 | | **3.3%** | | 0.00738 | 15% | Negligible |
| | HR5 | 0.00190 | 0.00199 | 0.00232 | 0.00252 | 0.00247 | 0.00252 | 0.00179 | | **3.6%** | | 0.00752 | 15% | Negligible |
| | HR6 | 0.00161 | 0.00167 | 0.00143 | 0.00141 | 0.00155 | 0.00167 | 0.00119 | | **2.4%** | | 0.00692 | 14% | Negligible |
| | HR7 | 0.00041 | 0.00028 | 0.00037 | 0.00032 | 0.00046 | 0.00046 | 0.00033 | | 0.66% | | 0.00606 | 12% | Negligible |
| Lithium - 8hr TWA | HR1 | 0.02027 | 0.01475 | 0.02018 | 0.01674 | 0.02003 | 0.02027 | 0.02027 | 200 | 0.010% | [redacted] | | | |
| | HR2 | 0.01217 | 0.01240 | 0.01205 | 0.01330 | 0.01209 | 0.01330 | 0.01330 | | 0.0067% | | | | |
| | HR3 | 0.00836 | 0.00681 | 0.00746 | 0.00751 | 0.00685 | 0.00836 | 0.00836 | | 0.0042% | | | | |
| | HR4 | 0.00439 | 0.00553 | 0.00475 | 0.00409 | 0.00457 | 0.00553 | 0.00553 | | 0.0028% | | | | |
| | HR5 | 0.00361 | 0.00263 | 0.00401 | 0.00394 | 0.00386 | 0.00401 | 0.00401 | | 0.0020% | | | | |
| | HR6 | 0.00132 | 0.00135 | 0.00116 | 0.00124 | 0.00135 | 0.00135 | 0.00135 | | 0.00068% | | | | |
| | HR7 | 0.00108 | 0.00110 | 0.00086 | 0.00102 | 0.00098 | 0.00110 | 0.00110 | | 0.00055% | | | | |
| Lithium - (15 min STEL) | HR1 | 0.05228 | 0.05310 | 0.05720 | 0.04012 | 0.05025 | 0.05720 | 0.05720 | 20 | 0.29% | | | | |
| | HR2 | 0.01696 | 0.01944 | 0.01899 | 0.01904 | 0.01866 | 0.01944 | 0.01944 | | 0.10% | | | | |
| | HR3 | 0.01272 | 0.01303 | 0.01287 | 0.01465 | 0.01176 | 0.01465 | 0.01465 | | 0.073% | | | | |
| | HR4 | 0.01047 | 0.01018 | 0.01024 | 0.01203 | 0.00957 | 0.01203 | 0.01203 | | 0.060% | | | | |
| | HR5 | 0.00890 | 0.00859 | 0.00882 | 0.00888 | 0.00902 | 0.00902 | 0.00902 | | 0.045% | | | | |
| | HR6 | 0.00404 | 0.00459 | 0.00435 | 0.00413 | 0.00467 | 0.00467 | 0.00467 | | 0.023% | | | | |
| | HR7 | 0.00312 | 0.00281 | 0.00290 | 0.00285 | 0.00293 | 0.00312 | 0.00312 | | 0.016% | | | | |
| Lead (annual) | HR1 | 0.00092 | 0.00125 | 0.00110 | 0.00125 | 0.00154 | 0.00154 | 0.00110 | 0.25 | 0.44% | | | | |
| | HR2 | 0.00144 | 0.00145 | 0.00142 | 0.00159 | 0.00126 | 0.00159 | 0.00114 | | 0.45% | | | | |
| | HR3 | 0.00043 | 0.00026 | 0.00036 | 0.00038 | 0.00050 | 0.00050 | 0.00036 | | 0.14% | | | | |
| | HR4 | 0.00020 | 0.00013 | 0.00017 | 0.00019 | 0.00024 | 0.00024 | 0.00017 | | 0.067% | | | | |
| | HR5 | 0.00022 | 0.00024 | 0.00026 | 0.00026 | 0.00028 | 0.00028 | 0.00020 | | 0.079% | | | | |
| | HR6 | 0.00016 | 0.00017 | 0.00014 | 0.00014 | 0.00016 | 0.00017 | 0.00012 | | 0.048% | | | | |
| | HR7 | 0.00004 | 0.00003 | 0.00003 | 0.00003 | 0.00005 | 0.00005 | 0.00003 | | 0.014% | | | | |

**Table 17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors (cont)**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³) | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manganese (annual) | HR1 | 0.00918 | 0.01247 | 0.01099 | 0.01254 | 0.01545 | 0.01545 | 0.01100 | | **7.3%** | | 0.0381 | 25% | Slight |
| | HR2 | 0.01445 | 0.01450 | 0.01417 | 0.01594 | 0.01264 | 0.01594 | 0.01136 | | **7.6%** | | 0.0385 | 26% | Slight |
| | HR3 | 0.00429 | 0.00261 | 0.00357 | 0.00379 | 0.00505 | 0.00505 | 0.00359 | | **2.4%** | | 0.0307 | 20% | Negligible |
| | HR4 | 0.00204 | 0.00130 | 0.00169 | 0.00191 | 0.00235 | 0.00235 | 0.00168 | 0.15 | **1.1%** | 0.0271 | 0.0288 | 19% | Negligible |
| | HR5 | 0.00222 | 0.00236 | 0.00261 | 0.00257 | 0.00276 | 0.00276 | 0.00196 | | **1.3%** | | 0.0291 | 19% | Negligible |
| | HR6 | 0.00156 | 0.00168 | 0.00143 | 0.00136 | 0.00155 | 0.00168 | 0.00120 | | 0.80% | | 0.0283 | 19% | Negligible |
| | HR7 | 0.00039 | 0.00026 | 0.00034 | 0.00031 | 0.00048 | 0.00048 | 0.00034 | | 0.23% | | 0.0274 | 18% | Negligible |
| Manganese (1-hour) | HR1 | 0.49760 | 0.51523 | 0.55225 | 0.38754 | 0.48706 | 0.55225 | 0.55225 | | 0.037% | [redacted] | | | |
| | HR2 | 0.16139 | 0.17542 | 0.17621 | 0.17347 | 0.16983 | 0.17621 | 0.17621 | | 0.012% | | | | |
| | HR3 | 0.10485 | 0.10797 | 0.10848 | 0.10875 | 0.10184 | 0.10875 | 0.10875 | | 0.0072% | | | | |
| | HR4 | 0.06601 | 0.07259 | 0.06935 | 0.07921 | 0.06961 | 0.07921 | 0.07921 | 1500 | 0.0053% | | | | |
| | HR5 | 0.05550 | 0.05760 | 0.05972 | 0.05891 | 0.05847 | 0.05972 | 0.05972 | | 0.0040% | | | | |
| | HR6 | 0.02472 | 0.02945 | 0.02873 | 0.02761 | 0.03008 | 0.03008 | 0.03008 | | 0.0020% | | | | |
| | HR7 | 0.01819 | 0.01781 | 0.01693 | 0.01788 | 0.01729 | 0.01819 | 0.01819 | | 0.0012% | | | | |
| Mercury (24hr - LT) | HR1 | 0.00088 | 0.00111 | 0.00104 | 0.00118 | 0.00146 | 0.00146 | 0.00104 | | **1.7%** | | 0.00247 | 4.1% | Negligible |
| | HR2 | 0.00141 | 0.00149 | 0.00139 | 0.00161 | 0.00131 | 0.00161 | 0.00114 | | **1.9%** | | 0.00257 | 4.3% | Negligible |
| | HR3 | 0.00046 | 0.00027 | 0.00039 | 0.00038 | 0.00049 | 0.00049 | 0.00035 | | 0.59% | | 0.00178 | 3.0% | Negligible |
| | HR4 | 0.00022 | 0.00013 | 0.00018 | 0.00019 | 0.00023 | 0.00023 | 0.00017 | 0.06 | 0.28% | 0.00143 | 0.00160 | 2.7% | Negligible |
| | HR5 | 0.00019 | 0.00020 | 0.00023 | 0.00025 | 0.00025 | 0.00025 | 0.00018 | | 0.30% | | 0.00161 | 2.7% | Negligible |
| | HR6 | 0.00016 | 0.00017 | 0.00014 | 0.00014 | 0.00016 | 0.00017 | 0.00012 | | 0.20% | | 0.00155 | 2.6% | Negligible |
| | HR7 | 0.00004 | 0.00003 | 0.00004 | 0.00003 | 0.00005 | 0.00005 | 0.00003 | | 0.06% | | 0.00146 | 2.4% | Negligible |
| Mercury (1-hour) | HR1 | 0.04976 | 0.05152 | 0.05523 | 0.03875 | 0.04871 | 0.05523 | 0.05523 | | 9.2% | [redacted] | | | |
| | HR2 | 0.01614 | 0.01754 | 0.01762 | 0.01735 | 0.01698 | 0.01762 | 0.01762 | | 2.9% | | | | |
| | HR3 | 0.01048 | 0.01080 | 0.01085 | 0.01087 | 0.01018 | 0.01087 | 0.01087 | | 1.8% | | | | |
| | HR4 | 0.00660 | 0.00726 | 0.00693 | 0.00792 | 0.00696 | 0.00792 | 0.00792 | 0.6 | 1.3% | | | | |
| | HR5 | 0.00555 | 0.00576 | 0.00597 | 0.00589 | 0.00585 | 0.00597 | 0.00597 | | 1.00% | | | | |
| | HR6 | 0.00247 | 0.00294 | 0.00287 | 0.00276 | 0.00301 | 0.00301 | 0.00301 | | 0.50% | | | | |
| | HR7 | 0.00182 | 0.00178 | 0.00169 | 0.00179 | 0.00173 | 0.00182 | 0.00182 | | 0.30% | | | | |
| Mo (8hr TWA) | HR1 | 0.02027 | 0.01475 | 0.02018 | 0.01674 | 0.02003 | 0.02027 | 0.02027 | | 0.41% | [redacted] | | | |
| | HR2 | 0.01217 | 0.01240 | 0.01205 | 0.01330 | 0.01209 | 0.01330 | 0.01330 | | 0.27% | | | | |
| | HR3 | 0.00836 | 0.00681 | 0.00746 | 0.00751 | 0.00685 | 0.00836 | 0.00836 | | 0.17% | | | | |
| | HR4 | 0.00439 | 0.00553 | 0.00475 | 0.00409 | 0.00457 | 0.00553 | 0.00553 | 5 | 0.11% | | | | |
| | HR5 | 0.00361 | 0.00263 | 0.00401 | 0.00394 | 0.00386 | 0.00401 | 0.00401 | | 0.080% | | | | |
| | HR6 | 0.00132 | 0.00135 | 0.00116 | 0.00124 | 0.00135 | 0.00135 | 0.00135 | | 0.027% | | | | |
| | HR7 | 0.00108 | 0.00110 | 0.00086 | 0.00102 | 0.00098 | 0.00110 | 0.00110 | | 0.022% | | | | |

**Table 17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors (cont)**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³) | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mo (15 min STEL) | HR1 | 0.05228 | 0.05310 | 0.05720 | 0.04012 | 0.05025 | 0.05720 | 0.05720 | 10 | 0.57% | [redacted] | | | |
| | HR2 | 0.01696 | 0.01944 | 0.01899 | 0.01904 | 0.01866 | 0.01944 | 0.01944 | | 0.19% | | | | |
| | HR3 | 0.01272 | 0.01303 | 0.01287 | 0.01465 | 0.01176 | 0.01465 | 0.01465 | | 0.15% | | | | |
| | HR4 | 0.01047 | 0.01018 | 0.01024 | 0.01203 | 0.00957 | 0.01203 | 0.01203 | | 0.12% | | | | |
| | HR5 | 0.00890 | 0.00859 | 0.00882 | 0.00888 | 0.00902 | 0.00902 | 0.00902 | | 0.090% | | | | |
| | HR6 | 0.00404 | 0.00459 | 0.00435 | 0.00413 | 0.00467 | 0.00467 | 0.00467 | | 0.047% | | | | |
| | HR7 | 0.00312 | 0.00281 | 0.00290 | 0.00285 | 0.00293 | 0.00312 | 0.00312 | | 0.031% | | | | |
| Nickel (annual) | HR1 | 0.00184 | 0.00249 | 0.00220 | 0.00251 | 0.00309 | 0.00309 | 0.00220 | 0.02 | **11%** | 0.00136 | 0.00356 | 18% | Moderate |
| | HR2 | 0.00289 | 0.00290 | 0.00283 | 0.00319 | 0.00253 | 0.00319 | 0.00227 | | **11%** | | 0.00363 | 18% | Moderate |
| | HR3 | 0.00086 | 0.00052 | 0.00071 | 0.00076 | 0.00101 | 0.00101 | 0.00072 | | **3.6%** | | 0.00208 | 10% | Negligible |
| | HR4 | 0.00041 | 0.00026 | 0.00034 | 0.00038 | 0.00047 | 0.00047 | 0.00034 | | **1.7%** | | 0.00170 | 8.5% | Negligible |
| | HR5 | 0.00044 | 0.00047 | 0.00052 | 0.00051 | 0.00055 | 0.00055 | 0.00039 | | **2.0%** | | 0.00175 | 8.8% | Negligible |
| | HR6 | 0.00031 | 0.00034 | 0.00029 | 0.00027 | 0.00031 | 0.00034 | 0.00024 | | **1.2%** | | 0.00160 | 8.0% | Negligible |
| | HR7 | 0.00008 | 0.00005 | 0.00007 | 0.00006 | 0.00010 | 0.00010 | 0.00007 | | 0.34% | | 0.00143 | 7.1% | Negligible |
| Selenium (24hr - LT) | HR1 | 0.00018 | 0.00022 | 0.00021 | 0.00024 | 0.00029 | 0.00029 | 0.00021 | 2 | 0.010% | [redacted] | | | |
| | HR2 | 0.00028 | 0.00030 | 0.00028 | 0.00032 | 0.00026 | 0.00032 | 0.00023 | | 0.011% | | | | |
| | HR3 | 0.00009 | 0.00005 | 0.00008 | 0.00008 | 0.00010 | 0.00010 | 0.00007 | | 0.0035% | | | | |
| | HR4 | 0.00004 | 0.00003 | 0.00004 | 0.00004 | 0.00005 | 0.00005 | 0.00003 | | 0.0017% | | | | |
| | HR5 | 0.00004 | 0.00004 | 0.00005 | 0.00005 | 0.00005 | 0.00005 | 0.00004 | | 0.0018% | | | | |
| | HR6 | 0.00003 | 0.00003 | 0.00003 | 0.00003 | 0.00003 | 0.00003 | 0.00002 | | 0.0012% | | | | |
| | HR7 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | | 0.00033% | | | | |
| Thallium (annual) | HR1 | 0.00009 | 0.00012 | 0.00011 | 0.00013 | 0.00015 | 0.00015 | 0.00011 | 1 | 0.011% | | | | |
| | HR2 | 0.00014 | 0.00015 | 0.00014 | 0.00016 | 0.00013 | 0.00016 | 0.00011 | | 0.011% | | | | |
| | HR3 | 0.00004 | 0.00003 | 0.00004 | 0.00004 | 0.00005 | 0.00005 | 0.00004 | | 0.0036% | | | | |
| | HR4 | 0.00002 | 0.00001 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | | 0.0017% | | | | |
| | HR5 | 0.00002 | 0.00002 | 0.00003 | 0.00003 | 0.00003 | 0.00003 | 0.00002 | | 0.0020% | | | | |
| | HR6 | 0.00002 | 0.00002 | 0.00001 | 0.00001 | 0.00002 | 0.00002 | 0.00001 | | 0.0012% | | | | |
| | HR7 | 0.000004 | 0.000003 | 0.000003 | 0.000003 | 0.000005 | 0.000005 | 0.00000 | | 0.00034% | | | | |
| Thallium (1-hour) | HR1 | 0.00498 | 0.00515 | 0.00552 | 0.00388 | 0.00487 | 0.00552 | 0.00552 | 30 | 0.018% | | | | |
| | HR2 | 0.00161 | 0.00175 | 0.00176 | 0.00173 | 0.00170 | 0.00176 | 0.00176 | | 0.0059% | | | | |
| | HR3 | 0.00105 | 0.00108 | 0.00108 | 0.00109 | 0.00102 | 0.00109 | 0.00109 | | 0.0036% | | | | |
| | HR4 | 0.00066 | 0.00073 | 0.00069 | 0.00079 | 0.00070 | 0.00079 | 0.00079 | | 0.0026% | | | | |
| | HR5 | 0.00055 | 0.00058 | 0.00060 | 0.00059 | 0.00058 | 0.00060 | 0.00060 | | 0.0020% | | | | |
| | HR6 | 0.00025 | 0.00029 | 0.00029 | 0.00028 | 0.00030 | 0.00030 | 0.00030 | | 0.0010% | | | | |
| | HR7 | 0.00018 | 0.00018 | 0.00017 | 0.00018 | 0.00017 | 0.00018 | 0.00018 | | 0.0006% | | | | |

**Table 17: Predicted Maximum GLCs at Potentially Sensitive Human Receptors (cont)**

| Pollutant | HSR | Met Year | | | | | Maximum PC (µg/m³) | Max PC (with any relevant adjustments) (µg/m³) | AQS (µg/m³) | PC as a % of AQS | Background Concentration (µg/m³) | Maximum PEC (µg/m³) | PEC as a % of AQS | IAQM Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vanadium (24-hour 100th %ile) | HR1 | 0.11705 | 0.10819 | 0.11650 | 0.12181 | 0.13507 | 0.13507 | 0.13507 | 1 | **13%** | [redacted] | | | Small |
| | HR2 | 0.11132 | 0.10640 | 0.07987 | 0.08519 | 0.09862 | 0.11132 | 0.11132 | | **11%** | | | | Small |
| | HR3 | 0.07281 | 0.04984 | 0.05679 | 0.05939 | 0.06195 | 0.07281 | 0.07281 | | 7.3% | | | | N/A <10% |
| | HR4 | 0.03678 | 0.03451 | 0.02644 | 0.03238 | 0.02722 | 0.03678 | 0.03678 | | 3.7% | | | | N/A <10% |
| | HR5 | 0.01756 | 0.01651 | 0.02200 | 0.02159 | 0.01831 | 0.02200 | 0.02200 | | 2.2% | | | | N/A <10% |
| | HR6 | 0.00860 | 0.00973 | 0.00809 | 0.00741 | 0.01045 | 0.01045 | 0.01045 | | 1.0% | | | | N/A <10% |
| | HR7 | 0.00538 | 0.00588 | 0.00655 | 0.00600 | 0.00633 | 0.00655 | 0.00655 | | 0.65% | | | | N/A <10% |
| Zinc (as zinc oxide) (annual) | HR1 | 0.00918 | 0.01247 | 0.01099 | 0.01254 | 0.01545 | 0.01545 | 0.01100 | 50 | 0.022% | | | | |
| | HR2 | 0.01445 | 0.01450 | 0.01417 | 0.01594 | 0.01264 | 0.01594 | 0.01136 | | 0.023% | | | | |
| | HR3 | 0.00429 | 0.00261 | 0.00357 | 0.00379 | 0.00505 | 0.00505 | 0.00359 | | 0.0072% | | | | |
| | HR4 | 0.00204 | 0.00130 | 0.00169 | 0.00191 | 0.00235 | 0.00235 | 0.00168 | | 0.0034% | | | | |
| | HR5 | 0.00222 | 0.00236 | 0.00261 | 0.00257 | 0.00276 | 0.00276 | 0.00196 | | 0.0039% | | | | |
| | HR6 | 0.00156 | 0.00168 | 0.00143 | 0.00136 | 0.00155 | 0.00168 | 0.00120 | | 0.0024% | | | | |
| | HR7 | 0.00039 | 0.00026 | 0.00034 | 0.00031 | 0.00048 | 0.00048 | 0.00034 | | 0.0007% | | | | |
| Zinc (as zinc oxide) (1-hour) | HR1 | 0.49760 | 0.51523 | 0.55225 | 0.38754 | 0.48706 | 0.55225 | 0.55225 | 1000 | 0.055% | | | | |
| | HR2 | 0.16139 | 0.17542 | 0.17621 | 0.17347 | 0.16983 | 0.17621 | 0.17621 | | 0.018% | | | | |
| | HR3 | 0.10485 | 0.10797 | 0.10848 | 0.10875 | 0.10184 | 0.10875 | 0.10875 | | 0.011% | | | | |
| | HR4 | 0.06601 | 0.07259 | 0.06935 | 0.07921 | 0.06961 | 0.07921 | 0.07921 | | 0.0079% | | | | |
| | HR5 | 0.05550 | 0.05760 | 0.05972 | 0.05891 | 0.05847 | 0.05972 | 0.05972 | | 0.0060% | | | | |
| | HR6 | 0.02472 | 0.02945 | 0.02873 | 0.02761 | 0.03008 | 0.03008 | 0.03008 | | 0.0030% | | | | |
| | HR7 | 0.01819 | 0.01781 | 0.01693 | 0.01788 | 0.01729 | 0.01819 | 0.01819 | | 0.0018% | | | | |

Note to Table

(a) See Table 15 for Background source data

4.1.4. The data in Table 17 indicates that, for the long-term averaging periods, the impacts are either negligible, slight or moderate. No breaches of the long term AQSs occur.

4.1.5. For the short-term averaging periods, impacts can be described as small or medium. Large impacts are only seen for HR1 for and VOC as 1,3 butadiene. No breaches of the short term VOC's occur.

# 5. ASSESSMENT OF AIR QUALITY IMPACTS - IMPACT ON HABITAT SITES – CRITICAL LEVELS

## 5.1. Introduction

5.1.1. The following assessments (outlined in Sections 5.2. – 5.4.) consider the effect of emissions from the Installation on critical levels for the habitat sites identified in Table 2.

5.1.2. In accordance with the EA guidance, the significance of the impacts has been determined using the 100% criteria for long and short-term predictions for local nature sites (see Section 2.21. of this document).

## 5.2. Comparison of Maximum Predicted Pollutant Ground Level Concentrations with Critical Levels for the Protection of Vegetation and Ecosystems - Oxides of Nitrogen

5.2.1. A summary of maximum predicted GLCs of oxides of nitrogen at the identified sensitive habitat sites is presented in Table 18. Any significant impacts are highlighted in bold.

**Table 18: Comparison of Maximum Predicted Oxides of Nitrogen Ground Level Concentrations (PCs) with Critical Levels at Sensitive Habitat Sites – SPAs, Ramsars and LWS**

| | Pollutant | $NO_X$ (annual mean) | $NO_X$ (24-hour mean) |
|---|---|---|---|
| | **Critical Level** | 30 | 75 |
| | **Maximum PC (µg/m³)** | 0.534 | 9.16 |
| | **Max PC as % of Critical Level** | 1.78% | 12.2% |
| ER1 | St Helens Canal - LWS | 0.534 | 9.16 |
| ER2 | Widnes Warth Saltmarsh - LWS | 0.195 | 5.47 |
| ER3 | Upper Mersey Estuary Intertidal Area and Mudflats - LWS | 0.0413 | 1.75 |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | 0.0529 | 1.20 |
| ER5 | Wigg Island - LNR + LWS | 0.0439 | 0.961 |
| ER6 | St Helens Canal Disused - LWS | 0.0309 | 1.12 |
| ER7 | Manchester Ship Canal Bank, Astmoor - LWS | 0.0532 | 1.14 |
| ER8 | Upper Mersey Estuary - LWS | 0.0481 | 0.632 |
| ER9 | Haddocks Wood - LWS | 0.0541 | 0.734 |
| ER10 | Haystack Lodge - LWS | 0.0367 | 0.565 |
| ER11 | Mersey Estuary - SPA/Ramsar | 0.0192 | 0.788 |

5.2.2. It can be seen from the data in Table 18 that the annual and daily mean oxides of nitrogen PCs are all less 100% of the respective critical level and therefore are not significant at all LWS considered and less that 1% of the long term and 10% of the short term at the SPA/Ramsar.

## 5.3. Comparison of Maximum Predicted Pollutant Ground Level Concentrations with Critical Levels for the Protection of Vegetation and Ecosystems - Ammonia

5.3.1. A summary of maximum predicted GLCs of ammonia at the identified sensitive habitat sites are presented in Table in Table 19. In accordance with the guidance (see Section 2.21), the significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs, and 100% for LWSs. Any significant impacts are highlighted in bold. It should be noted that as it was unknown if lichens are present, the critical value of 1µg/m$^3$ was used to ensure a conservative assessment.

**Table 19: Comparison of Maximum Predicted Ammonia Ground Level Concentrations (PCs) with Critical Levels at Sensitive Habitat Sites**

| Receptor Ref | Receptor Name | Long Term PC (µg/m$^3$) | Long Term Critical Level (CL) (µg/m$^3$) | Long Term PC as a % of the CL (µg/m$^3$) |
|---|---|---|---|---|
| ER1 | St Helens Canal - LWS | 0.0856 | | 8.56% |
| ER2 | Widnes Warth Saltmarsh - LWS | 0.0310 | | 3.10% |
| ER3 | Upper Mersey Estuary Intertidal Area and Mudflats - LWS | 0.00597 | | 0.60% |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | 0.00659 | | 0.66% |
| **ER5** | Wigg Island - LNR + LWS | 0.00544 | | 0.54% |
| **ER6** | St Helens Canal Disused - LWS | 0.00392 | 1 | 0.39% |
| **ER7** | Manchester Ship Canal Bank, Astmoor - LWS | 0.00637 | | 0.64% |
| **ER8** | Upper Mersey Estuary - LWS | 0.00654 | | 0.65% |
| **ER9** | Haddocks Wood - LWS | 0.00665 | | 0.66% |
| **ER10** | Haystack Lodge - LWS | 0.00474 | | 0.47% |
| **ER11** | Mersey Estuary - SPA/Ramsar | 0.00217 | | 0.22% |

5.3.2. It can be seen from the data in Table 19 that the annual mean ammonia PCs are all less than 100% of the critical level at all LWSs sites assessed and less than 1% at the Ramsar assessed. Consequently, it can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

## 5.4. Comparison of Maximum Predicted Pollutant Ground Level Concentrations with Critical Levels for the Protection of Vegetation and Ecosystems - Hydrogen Fluoride

5.4.1. A summary of maximum predicted GLCs of hydrogen fluoride at the identified sensitive habitat sites are presented in Table 20. Any significant impacts are highlighted in bold.

**Table 20: Comparison of Maximum Predicted Hydrogen Fluoride Ground Level Concentrations (PCs) with Critical Levels at Sensitive Habitat Sites**

| | Pollutant | HF (weekly mean) | HF (daily mean) |
|---|---|---|---|
| | **Critical Level (µg/m³)** | 0.5 | 5 |
| | **Maximum PC (µg/m³)** | 0.0214 | 0.0692 |
| | **Max PC as % of Critical Level** | 4.28% | 1.38% |
| ER1 | St Helens Canal - LWS | 0.0214 | 0.0692 |
| ER2 | Widnes Warth Saltmarsh - LWS | 0.0134 | 0.0414 |
| ER3 | Upper Mersey Estuary intertidal Area and Mudflats - LWS | 0.00384 | 0.0136 |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | 0.00318 | 0.00970 |
| ER5 | Wigg Island - LNR + LWS | 0.00287 | 0.00774 |
| ER6 | St Helens Canal Disused - LWS | 0.00379 | 0.00869 |
| ER7 | Manchester Ship Canal Bank, Astmoor - LWS | 0.00271 | 0.00924 |
| ER8 | Upper Mersey Estuary - LWS | 0.00257 | 0.00514 |
| ER9 | Haddocks Wood - LWS | 0.00238 | 0.00597 |
| ER10 | Haystack Lodge - LWS | 0.00207 | 0.00455 |
| ER11 | Mersey Estuary - SPA/Ramsar | 0.00214 | 0.00629 |

5.4.2. It can be seen from the data in Table 20 that the annual and daily mean HF PCs are all less than 100% of the respective critical level at the LWS and less than 1% of the long term critical level and 10% of the short term critical level at SPA/Ramsar assessed. Consequently, emissions of HF are not significant at all habitat sites considered not significant.

# 6. ASSESSMENT OF AIR QUALITY IMPACTS - IMPACT ON HABITAT SITES - DEPOSITION

## 6.1. Introduction

6.1.1. The following assessments (outlined in Sections 6.2. and 6.3.) consider the effect of emissions from the Installation on critical loads for the habitat sites identified in Table 2.

## 6.2. Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads – European Sites and SSSIs

6.2.1. A summary of maximum predicted nutrient nitrogen deposition rates at the identified ecological sites are presented in Table 21. Habitat Interests considered are as specified in Table 6 of Section 2.7., with the deposition velocities for grassland (as outlined in Table 9 of Section 2.9.) utilised for all ecological sites assessed.

6.2.2. In Table 21, any PCs less than 100% of the critical load can be screened out (i.e., it can be assumed there will be no significant pollution – as per the EA guidance detailed in Section 2.21.). Any PCs greater than 100% of the critical load will be highlighted in bold.

**Table 21: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites**

| ADMS Ref. | Site Details | Lower Critical Load (kgN/ha/yr) | Upper Critical Load (kgN/ha/yr) | Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr) | PC as a % of Lower Critical Load | PC as a % of Upper Critical Load |
|---|---|---|---|---|---|---|
| ER1 | St Helens Canal - LWS | 10 | 20 | 0.371 | 3.71% | 1.85% |
| ER2 | Widnes Warth Saltmarsh - LWS | 10 | 20 | 0.135 | 1.35% | 0.67% |
| ER3 | Upper Mersey Estuary intertidal Area and Mudflats - LWS | 10 | 20 | 0.0263 | 0.26% | 0.13% |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | 10 | 20 | 0.0297 | 0.30% | 0.15% |
| ER5 | Wigg Island - LNR + LWS | 10 | 20 | 0.0246 | 0.25% | 0.12% |
| ER6 | St Helens Canal Disused - LWS | 10 | 20 | 0.0176 | 0.18% | 0.09% |
| ER7 | Manchester Ship Canal Bank, Astmoor - LWS | 10 | 20 | 0.0289 | 0.29% | 0.14% |
| ER8 | Upper Mersey Estuary - LWS | 10 | 20 | 0.0291 | 0.29% | 0.15% |
| ER9 | Haddocks Wood - LWS | 10 | 20 | 0.0301 | 0.30% | 0.15% |
| ER10 | Haystack Lodge - LWS | 10 | 20 | 0.0212 | 0.21% | 0.11% |
| ER11 | Mersey Estuary - SPA/Ramsar | 10 | 20 | 0.0100 | 0.10% | 0.05% |

Notes to Table

(a) Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).

6.2.3. It can be seen from the data in Table 21 that there are no predicted exceedances for nitrogen deposition at any of the modelled points. Consequently, no further assessment is required.

## 6.3. Comparison of Maximum Predicted Acid Deposition Rates with Critical Loads

6.3.1. A summary of maximum predicted acid deposition rates at the identified ecological sites are presented in Table 22. Habitat Interests considered are as specified in Table 5 of Section 2.7., with the deposition velocities for grassland (as outlined in Table 8 of Section 2.9.) utilised for all ecological sites assessed.

6.3.2. In Table 22, any PCs less than 100% of the critical load can be screened out (i.e., it can be assumed there will be no significant pollution – as per the EA guidance detailed in Section 2.21.). Any PCs greater than 100% of the critical load will be highlighted in bold.

**Table 22: Comparison of Maximum Predicted Acid Deposition Rates with Critical Loads at Sensitive Habitat Sites**

| ADMS Ref. | Site Details | PC N (keq/Ha/yr) | BG N (keq/ha/yr) | PC S (keq/Ha/yr) | BG S (keq/ha/yr) | CL MinN (keq/ha/yr) | CLMaxN (keq/ha/yr) | CLMaxS (keq/ha/yr) | PEC N (keq/ha/yr) | PEC S (keq/ha/yr) | PC as % of CL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ER1 | St Helens Canal - LWS | 0.0280 | 1.17 | 0.00593 | 0.24 | 1.071 | 5.071 | 4.00 | 1.198 | 0.246 | 0.67% |
| ER2 | Widnes Warth Saltmarsh - LWS | 0.0101 | 1.17 | 0.00224 | 0.24 | 1.071 | 5.071 | 4.00 | 1.180 | 0.242 | 0.24% |
| ER3 | Upper Mersey Estuary Intertidal Area and Mudflats - LWS | 0.00199 | 1.20 | 0.000473 | 0.24 | 1.071 | 5.071 | 4.00 | 1.202 | 0.240 | 0.05% |
| ER4 | Astmoor Saltmarsh and Swamp - LWS | 0.00227 | 1.21 | 0.000512 | 0.24 | 0.357 | 11.126 | 10.77 | 1.212 | 0.241 | 0.03% |
| ER5 | Wigg Island - LNR + LWS | 0.00188 | 1.24 | 0.000420 | 0.24 | 1.071 | 5.071 | 4.00 | 1.242 | 0.240 | 0.05% |
| ER6 | St Helens Canal Disused - LWS | 0.00134 | 1.18 | 0.000304 | 0.24 | 1.071 | 5.071 | 4.00 | 1.181 | 0.240 | 0.03% |
| ER7 | Manchester Ship Canal Bank, Astmoor - LWS | 0.00222 | 1.24 | 0.000509 | 0.24 | 1.071 | 5.071 | 4.00 | 1.242 | 0.241 | 0.05% |
| ER8 | Upper Mersey Estuary - LWS | 0.00221 | 1.22 | 0.000547 | 0.23 | 0.357 | 11.126 | 10.77 | 1.222 | 0.231 | 0.02% |
| ER9 | Haddocks Wood - LWS | 0.00230 | 1.25 | 0.000543 | 0.23 | 0.856 | 4.856 | 4.00 | 1.252 | 0.231 | 0.06% |

**Table22: Comparison of Maximum Predicted Acid Deposition Rates with Critical Loads at Sensitive Habitat Sites (Cont)**

| ADMS Ref. | Site Details | PC N (keq/Ha/yr) | BG N (keq/ha/yr) | PC S (keq/Ha/yr) | BG S (keq/ha/yr) | CL MinN (keq/ha/yr) | CLMaxN (keq/ha/yr) | CLMaxS (keq/ha/yr) | PEC N (keq/ha/yr) | PEC S (keq/ha/yr) | PC as % of CL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ER10 | Haystack Lodge - LWS | 0.00162 | 1.22 | 0.000395 | 0.23 | 0.357 | 11.126 | 10.77 | 1.222 | 0.230 | 0.02% |
| ER11 | Mersey Estuary - SPA/Ramsar | 0.000765 | 1.18 | 0.000175 | 0.24 | 1.071 | 5.071 | 4.00 | 1.181 | 0.240 | 0.02% |

Notes to Table
PC N = Process contribution from Nitrogen and Ammonia (dry deposition only)
PC S = Process contribution from Hydrogen Chloride only (wet and dry deposition)
PEC = Predicted environmental concentration
BG = Background concentration
CL = Critical Load

6.3.3. It can be seen from the data in Table 22 that there are no predicted exceedances for acid deposition at any of the modelled points. Consequently, no further assessment is required.

# 7. CONCLUSIONS

## 7.1. Summary

7.1.1. An assessment has been carried out to determine the local air quality impacts associated with the emissions from ICoNiChem's metals salts Installation located at Moss Bank Road, Widnes, Cheshire, WA8 0RU.

7.1.2. Detailed air quality modelling using the ADMS dispersion model has been undertaken to predict the impacts associated with stack emissions from the Installation. As a worst-case, emissions from the Installation's stacks have been assumed to be released at the maximum ELVs twenty-four hours a day, 365 days of the year for those pollutants with short-term averaging periods; and released at the maximum ELVs for 24 hours a day, 5 days a week, 52 weeks a year for those pollutants with long-term averaging periods. This represents a conservative assessment of the impact since the actual emissions from the site are likely to be significantly lower during normal operation.

7.1.3. Long-term process PCs, adjusted for the operating mode of 24 hours a day, 5 days a week, 52 weeks a year, are below the AQSs for all pollutants. PECs are below 75% of the AQS for all pollutants except cadmium (maximum 96.6% of the AQS) and arsenic. For arsenic, the conservative sensitivity case (continuous emission at 0.10 mg/Nm³) gives a PC of up to 99.6% and a PEC of up to 153.6% of the AQS, which would constitute a breach. However, based on the more realistic release pattern for the process (8 hours a day, 5 days a week, 50 weeks a year), the adjusted PC is 0.00191 µg/m³ (32% of the AQS) and the PEC is 0.0052 µg/m³ (86% of the AQS), which is described as moderate and does not breach the AQS.

7.1.4. Short-term impacts range from small to large. Large impacts are predicted for cadmium (24-hour PC up to 60.1% of the AQS) and VOC as 1,3-butadiene (up to 80.2% of the AQS), but none of the short-term AQSs are breached. The 1,3-butadiene result is based on an assumed concentration of 5 µg/m³, unlikely and speciated VOC testing should be undertaken on the process emissions.

7.1.5. For the sensitive habitat sites assessed, predicted oxides of nitrogen, ammonia and hydrogen fluoride concentrations are below the critical levels at all LWSs and are not significant at the Mersey Estuary SPA/Ramsar (below 1% of the long-term and 10% of the short-term criteria).

7.1.6. There are no predicted exceedances of the critical loads for nutrient nitrogen or acid deposition at any modelled point. It has therefore been demonstrated that emissions from the Installation are unlikely to have a detrimental effect on these sites.

7.1.7. In summary, it can be concluded that the proposed black mass process at the Installation will not have a detrimental impact on local air quality, human health or sensitive habitat sites, with no breaches of the AQSs predicted at the point of maximum impact or at the human receptors under the assessed operating assumptions. This is subject to confirmation, through the further emissions testing set out in Section 7.2, that arsenic is not released at the conservative concentration assumed in the sensitivity case.

## 7.2. Recommendations

7.2.1. As the process is still in its infancy, once the process is fully operational, further air emissions testing will be undertaken, for all pollutants considered in the modelling assessment, including utilising a Top 20 screen for VOCs to confirm the model assumptions.