RISK & HAZARD MANAGEMENT

Planning Environmental Statement

Air Quality Assessment

Unifrax, Widnes

June 2022

Safety Risk Business Risk Environment Risk

Version	Issue	Date	Notes	Author	Reviewer
1	Draft	28/03/22	Internal draft	J. Carroll	C. Nicholls
2	1	14/04/22	Draft issued to site/Heatons	J. Carroll	C. Nicholls
3	2	05/05/22	Final report issued as part of permit variation, with client involvement and review.	J. Carroll	C. Nicholls R. Nibbs J. Jessup
4	3	21/06/22	Minor updates in light of an additional stack and revised coordinates. Includes an updated building/stack location map based on the latest layout drawing provided by Heatons.	R. Ritchie	C. Nicholls
5	4	30/06/22	Minor updates to coordinates of emissions points A2, A5, A6, A11, A12a and A12b.	R. Ritchie	C. Nicholls

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1 Air Quality Assessment

1.1 Introduction

This chapter of the Environmental Statement assesses the likely significant effects of the site on nearby sensitive human health and ecological receptors in respect to air quality.

1.2 Policy Context

The following documents/policies are of importance to the nature of the application.

1.2.1 Halton Delivery and Allocations Local Plan (incorporating remaining policies from the Core Strategy Local Plan)

Policy CS(R)19: Sustainable Development and Climate Change

This policy ensures that all new development should be sustainable and be designed to have regard to climate change through various principles which includes ensuring that development is sustainable and appropriate to location and aiming to reduce CO2 emissions through the incorporation of the building design.

Policy CS23: Managing Pollution and Risk

Proposals should aim to minimise all forms of emissions as well as odour, water, noise, and light pollution. Prior to commencement of development, land should be made suitable for its intended use (if contaminated). Proposals for new and expanded hazardous installations are to be carefully considered in terms of their environmental, social, and economic factors. The Policy also covers flood risk management.

Policy HE7: Pollution and Nuisance

This policy ensures that where the development has identified risks that would negatively impact on the quality of the environment i.e., air pollution, noise, land and soil contamination, etc. the application is accompanied by an appropriate assessment detailing mitigation measure where necessary.

1.2.2 National Planning Policy Framework (July 2021)

NPPF includes guidance at Paragraph 154 encouraging new development to help reduce greenhouse gas emissions through location, orientation and design in a bid to mitigate and adapt to climate change.

Paragraph 167 focuses on reducing flood risk, stated that applications should ensure that the proposal does not increase flood risk elsewhere.

NPPF includes guidance at paragraph 174 on conserving and enhancing the natural environment, including by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability. Proposals should also minimise impacts on biodiversity and provide for net gains for biodiversity.

Technical guidance on dust and air quality is provided in more detail in Planning Practice Guidance for Air Quality (2014, last updated November 2019).

1.2.3 Emissions and Air Quality Standards

The pollutants considered in the assessment include the oxides of nitrogen (NOx), particulates (PM10) and Dioxins. There is currently no formal guidance in the UK on the assessment of health risks associated with exposure to emissions from facilities that may emit dioxins, and in England and Wales the Environment Agency's Air Quality Management and Assessment Unit (AQMAU) have accepted the use of the US EPA methodology as appropriate. However where the USEPA methodology appears to make assumptions that are unlikely to be valid for the UK (Widnes) situation, alternative calculations are submitted.

Oxides of Nitrogen

The oxides of nitrogen comprise principally of nitric oxide (NO) and nitrogen dioxide (NO_2). The oxides of nitrogen (NOx) in combustion processes may be formed from the oxidation of nitrogen in the fuel or from the reaction of nitrogen and oxygen at high temperatures. The majority of NOx is emitted from combustion processes as NO (typically over 90%), a relatively innocuous substance that rapidly oxidises to NO_2 in ambient air. Health based standards for NOx generally relate to NO_2.

There are two types of air quality standards for nitrogen dioxide applicable in the UK including:

- Air Quality Strategy objectives
- European Union Daughter Directive air quality standards

Air quality limits and objectives (from the Air Quality Strategy/Daughter Directive) for the oxides of nitrogen in the UK are summarised in Table 1 below.

Table 1 Oxides of Nitrogen limits

Averaging period	Air Quality Standard (µg/m^3)
1-hour mean not to be exceeded more than 18 times per calendar year (99.79 Percentile)	200
Annual mean	40

For protected conservation areas, the limits are provided in the table below:

Table 2 Oxides of Nitrogen as NO_2 limits

Averaging period	Target (µg/m^3)
Annual mean	30
Daily mean	75

Particulates

The UK Air Quality Standards for particulates are summarised in Table 3 below.

Table 3 Particulate limits

Averaging period	Air Quality Standard (µg/m^3)
Annual mean	40
24 hr short-term mean (90.41 Percentile)	50

1.3 Scope of assessment

This assessment includes a quantitative prediction of the effects during the operational phase of the plant with lines 2 to 4 in operation, comparing these effects with the relevant AQS objectives. Principal emissions during the operational phase are those from the emission points (stacks) on the site.

The assessment also includes a section on mitigation options selected by the site to mitigate against emissions.

1.4 Assessment methodology

1.4.1 The Dispersion Model

There are a number of point sources of emissions to air (stacks) at the site. In order to assess the effects of the changing emissions through these stacks, the ADMS version 5.2 model has been used.

ADMS is a new generation Gaussian plume air dispersion model which means that the atmospheric boundary layer properties are characterised by two parameters, rather than in terms of the single parameter Pasquill-Gifford class:

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

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).

1.4.2 ADMS Validation

CERC models are continually validated against available measured data obtained from real world situations, field campaigns and wind tunnel experiments.

Validation of the ADMS dispersion models has been performed using many experimental datasets that test different aspects of the models, for instance: ground/high level sources, passive and buoyant releases, buildings, complex terrain, chemistry, deposition and plume visibility. These studies are both short-term as well as annual and involve tracer gases or specific pollutants of interest.

ADMS has been formally validated and is widely used in the UK and internationally for regulatory purposes. It has been used in a wide number of Air Quality studies, dating from the present, back to 2006, all of which can be found on the CERC website[1] .

[1] https://www.cerc.co.uk/environmental-software/model-validation.html

1.4.3 Process emissions

The following table presents the parameters used within the ADMS modelling and have been approved by the client. The location of the stacks included in the model is shown in the map in the Appendix.

Table 4 Model Parameters

Parameter	A2	A3	A4	A5	A6	A7	A9	A11	A12a	A12b	A13	A14
Source	Line 1 dust collection	Line 2 heat treatment	Line 2 dust collection	Line 3 heat treatment	Line 3 dust collection	Boilers	Boilers	Line 4 heat treatment	Line 4 dust collection (general process dust extraction)	Line 4 dust collection (fibre picking, shredding and milling)	Boilers	Indirect gas firing – heat treatment
Emissions	PM10	Dioxins	PM10	Dioxins	PM10	NOx	NOx	Dioxins	PM10	PM10	NOx	NOx
Total Flow (m^3/hr)	35,604	43,708	29,886	49,431	47,338	2,893	7,890	55,610	47,338	47,338	7,890	6,405
Exit Temp (^{0}C)	23	49	32	45	40	140	150	45	40	40	150	125
Height (m)	14.5	40	8.15	40	20	30	30	40	20	20	30	30
Diameter (m)	0.98	1.5	0.93	1.5	0.93	0.6	0.6	1.5	0.93	0.93	0.6	0.47
OS Grid Reference	352922 385322	352868 385336	352917 385346	352923 385285	352978 385299	352942 385328	352942 385328	352951 385254	353043 385288	353021 385278	352942 385328	352933 385247
Pollutant emission rates (g/s)	1.04E-02	2.44E-09	7.56E-03	1.21E-09	1.40E-02	9.58E-02	2.03E-01	1.36E-09	1.40E-02	1.40E-02	2.03E-01	8.90E-02
Pollutant emission rates (g/s) at ELV	4.94E-02	3.64E-09	4.15E-02	4.12E-09	6.57E-02	1.13E-01	2.19E-01	4.63E-09	6.57E-02	6.57E-02	2.19E-01	1.78E-01
Volumetric flow rate (m^3/s)	9.89	12.14	8.30	13.73	13.15	-	-	15.45	13.15	13.15	-	-
Mass flux (kg/s)	-	-	-	-	-	1.0009	2.73	-	-	-	2.73	2.22

Note: only one of volumetric flow rate or mass flux need to be input into ADMS.

1.4.4 Meteorology

For meteorological data to be suitable for dispersion modelling purposes several meteorological parameters need to be measured, on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made. In the UK, all these sites are quality controlled by the Met Office.

The most important climatological parameters governing the atmospheric dispersion of pollutants are as follows.

- Wind direction determines the broad transport of the release and the sector of the compass into which the release is dispersed.
- Wind speed will affect low-level releases by increasing the initial dilution of pollutants in the release.
- Atmospheric stability is a measure of the turbulence, particularly of the vertical motions present.

The nearest station to the site with full data suitable for dispersion modelling as informed by the Met Office is located at Rostherne, 20 km to the east of the site. This is considered the most representative of conditions in the vicinity of the site and three years of annual hourly-sequential meteorological data for this observing station have been obtained from the Met Office, who specifically provide weather data sets for use in ADMS modelling. Within the previous dispersion modelling carried out for the site and approved by the EA, weather data from Manchester Ringway was obtained and used. The Met Office were asked for data from the same station for this assessment for consistency but that station is no longer available and Rostherne was provided as the best alternative. Wind roses from the previous assessment and the wind roses for the Rostherne data have been compared and generally show the same dominant wind direction.

Data for the years 2017 to 2019 have been obtained, and the following parameters included for each hour:

- Wind speed (at 10 m)
- Wind direction (degrees)
- Cloud cover (oktas)
- Temperature (degrees Celsius)
- Sensible heat flux (W/m^2)
- Boundary layer depth (m)
- Precipitation rate (mm/h)
- Relative humidity (percentage)

Wind roses for each year between 2017 and 2019 are shown below.

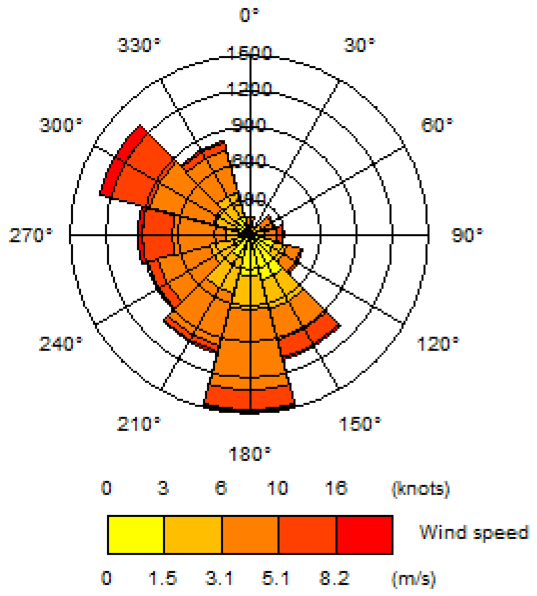


Figure 1 2017 Wind Rose

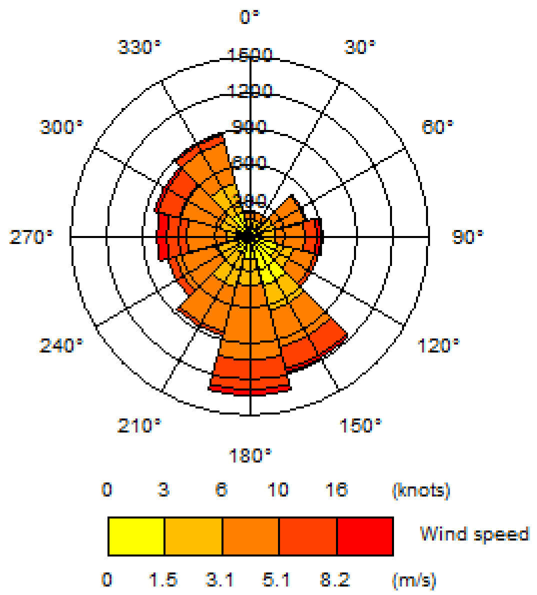


Figure 2 2018 Wind Rose

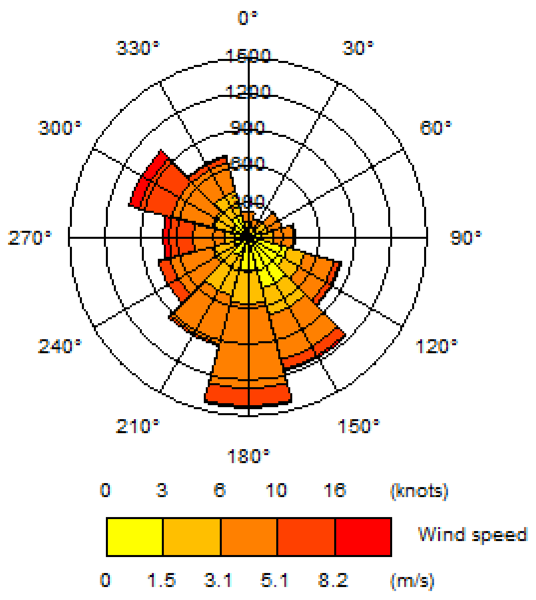


Figure 3 2019 Wind Rose

The ADMS model was run independently for each year of meteorological data in order to obtain results from each year for comparison to the emission limits to ensure the results are representative of more long-term weather conditions and any peaks which may be missed by only using one year of data are captured.

1.4.5 Terrain/Buildings

There are no significant terrain features in the area surrounding the site, therefore stack dispersion is unlikely to be influenced by the effects of elevated terrain and the digital terrain model within ADMS has not been used.

Emissions from stacks may be influenced by significantly sized buildings in the vicinity of the dispersion. The locations and dimensions of the buildings considered, including parameters such as size, shape and position relative to the stacks are presented in the table below and shown on a map in the Appendix. The effect of buildings on dispersion was modelled using the ADMS advanced 'Buildings' option.

Table 5 Building Data

Building	Shape	Location of building centre		Height (m)	Length/ Diameter (m)	Width (m)	Angle (°)
		Easting x (m)	Northing y (m)				
Line 2	Rectangular	352857	385309	10	115	25	73.0
Line 3/4 including extension	Rectangular	352964	385283	12	152	26	73.0
Preparation	Rectangular	352843	385282	24	15	15	163.0
Warehouse	Rectangular	352939	385361	12	25	25	73.0
Line 2 extension	Rectangular	352933	385337	10	48	16	73.0

The boiler house, bag house and new solutions building are considered too small to have any significant effect on dispersion, especially given the height of the majority of the stacks onsite and their locations.

1.4.6 Receptors

This section sets out the details of discrete receptors and the x and y co-ordinates used within ADMS to assess the impact at these locations.

Ecological Receptors

The Environment Agency's Air Emissions Risk (AER) Guidance provides the following detail regarding consideration of ecological receptors:

Check if there are any of the following within 10 km of your site:

- Special Protection Areas (SPAs)
- Special Areas of Conservation (SACs)
- Ramsar Sites (protected wetlands)

Check if there are any of the following within 2 km of your site:

- Sites of Special Scientific Interest (SSSIs)
- Local Nature Sites (ancient woods, local wildlife sites, Sites of Nature Conservation)
- Importance (SNCIs) and national and local nature reserves)

The table below provides details of the receptors considered within the assessment, which have been derived using Magic Maps and buffering the 10 km and 2 km distances from the site.

Table 6 Ecological Receptors

Receptors	Distance from site (m)	Designation	Easting, x (m)	Northing, y (m)	Height above ground, z (m)
St Helens canal/Widnes Warth	~ 90	Local wildlife site	352980	385170	0
Randle Reed Bed	~ 1,100	Biodiversity Action Plan Priority Habitat	353880	384450	0
Wigg Island	~ 1,300	LNR	353330	383550	0
Mersey Estuary	~ 2,600	Ramsar, SPA, SSSI	350990	383730	0

Human Receptors

The nearest human receptors are people working in the commercial premises adjacent to the site. These people will only be exposed during their working day and not for all hours of the year.

The table below provides details of the human receptors considered within the assessment, which are the nearest commercial and residential areas to the site.

Table 7 Human Receptors

Receptors	Easting, x (m)	Northing, y (m)	Height above ground, z (m)
Houses off French Street	352610	385970	1.8
New Housing estate to the west of the site	352625	385211	1.8
Caravans at the Warrington Road Site	352320	385680	1.8
Nearest commercial premises	352870	385420	1.8

Halton Borough Council have declared two Air Quality Management Areas (AQMAs) where road traffic emissions may cause exceedance of the air quality standard for NOx.[2]

These have been included within the assessment also.

These receptors in relation to the site are all presented on a map in the Appendix.

[2] AQMAs Declared by Halton Borough Council, https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=116 (accessed October 2021).

2 Impact Assessment

This section sets out the assessment of impact from the site on both environmental receptors and human receptors from each of the substances not screened out within the H1 Risk Assessment, particulates (PM10), NOx and dioxins in turn.

2.1 Human receptors

The significance of effects has been assessed on the basis of the EPUK & IAQM guidance 'Land-use planning and development control planning for air quality' (v1.2, 2017), which presents a matrix to establish the magnitude of impact on individual receptors based upon the percentage change relative to the Air Quality Assessment Level (AQAL) / AQO. The impact significance at an individual receptor identified as 'negligible', 'slight', 'moderate' or 'substantial'. The impact significance can be either 'adverse' (due to concentration increase) or 'beneficial' (due to concentration decrease).

The impact significance at individual receptors is predominantly dependent upon the long-term average pollutant concentration at the receptor in the assessment year and the percentage change relative to the AQAL / EAL. This is shown in the table below:

Sensitivity of Receptor/Long-Term Average Concentration at Receptor	**Percentage change in Long-Term Concentration to AQAL**				
	<0.5%	**1%**	**2-5%**	**6-10%**	**>10%**
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

AQAL = Air Quality Assessment Level, which may be an AQS objective, EU limit or target value, or an Environment Agency Assessment Level (EAL).

The impact significance for short-term concentrations is provided in the table below, but there is less reliance on these than long-term impact:

Impact significance	**Percentage change in short-term concentrations**
Substantial	>50%
Moderate	20-50%
Slight	10-20%
Negligible	<10%

The predicted impacts will be used to determine the significance of the overall effect which is dependent on a number of factors. Therefore, professional judgement will be applied to determine the likely significance of effects, with the following factors considered:

- the existing and future air quality in the absence of the development, notably whether the AQOs are likely to be met or the scale of exceedances in the long-term and short-term mean concentrations;
- the extent of current and future population exposure to the predicted impacts, notably the number of properties and/or people present and the scale of impact (e.g. whether the majority of the local population is subject to substantial or slight magnitude impacts); and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts, such as establishing a worst-case scenario for sensitive receptors.

If the overall impact is described as 'substantial', or there is a predicted exceedance of any considered AQAL at a location of relevant exposure, the predicted effect on air quality is considered as "significant".

2.2 Ecological receptors

In addition to the AERA guidance, the EA's Operational Instruction 66_1210 details how the air quality impacts on ecological sites should be assessed. This guidance provides risk-based screening criteria to determine whether impacts will have 'no likely significant effects (alone and in-combination)' for European sites, 'no likely damage' for SSSIs.

- PC does not exceed 1% long-term Critical Level and/or Critical Load or that the PEC does not exceed 70% long term Critical Level and/or Critical Load for European sites and SSSIs; and
- PC does not exceed 10% short-term Critical Level for NOx for European sites and SSSIs;

Where impacts cannot be classified as resulting in 'no likely significant effect', more detailed assessment may be required depending on the sensitivity of the feature in accordance with EA's Operational Instruction 67_1211. This can require the consideration of the potential for in-combination effects, the actual distribution of sensitive features within the site, and local factors (such as the water table).

The guidance provides the following further criteria:

- if the PEC does not exceed 100% of the appropriate limit it can be assumed there will be no adverse effect;
- if the background is below the limit, but a small PC leads to an exceedance – decision based on local considerations;
- if the background is currently above the limit and the additional PC will cause a small increase – decision based on local considerations;
- if the background is below the limit, but a significant PC leads to an exceedance – cannot conclude no adverse effect; and
- if the background is currently above the limit and the additional PC is large - cannot conclude no adverse effect.

2.3 Ambient and Background Levels

The purpose of this section is to provide an assessment of the background air quality for the general location.

The most recent available background concentration data for Particulates and NO_2 were obtained using the UK Air Quality Archive website. Predicted 2019 levels for the Alkegen area, as shown in the table below. 2019 has been selected as a worst-case pre-pandemic background concentration.

Table 8 NO_2 long term background levels

Feature	Grid Reference	Background level grid reference used	Level (µg/m^3)
Offsite	352870, 385420	352500, 385500	16.06
Sensitive receptor			
St Helens canal/Widnes Warth	352980, 385170	352500, 385500	16.06
Reed Bed	353880, 384450	353500, 383500	15.37
Houses off French Street	352610, 385970	352500, 385500	16.06
New Housing estate to the west of the site	352625, 385211	352500, 385500	16.06
Caravans at the Warrington Road Site	352320, 385680	352500, 385500	16.06
AQMA 1	351920, 385600	351500, 386500	14.67
AQMA 2	351890, 386040	351500, 386500	14.67
Wigg Island	353330, 383550	352500, 383500	13.71
Mersey Estuary	350990, 383730	350500, 383500	14.88

Table 9 PM10 Long term background levels

Feature	Grid Reference	Background level grid reference used	Level (µg/m^3)
Offsite	352870, 385420	352500, 385500	12.78
Sensitive receptor			
St Helens canal/Widnes Warth	352980, 385170	352500, 385500	12.78
Reed Bed	353880, 384450	353500, 383500	11.56
Houses off French Street	352610, 385970	352500, 385500	12.78
New Housing estate to the west of the site	352625, 385211	352500, 385500	12.78
Caravans at the Warrington Road Site	352320, 385680	352500, 385500	12.78
AQMA 1	351920, 385600	351500, 385500	13.56
AQMA 2	351890, 386040	351500, 386500	13.02
Wigg Island	353330, 383550	352500, 383500	11.34
Mersey Estuary	350990, 383730	350500, 383500	12.96

It should be noted that existing site emissions will have contributed to the predictions of background concentrations.

The above values are used for modelling of Long Term emissions, modelling of Short Term emissions use a value of double the Long Term average background value.

Background concentration of dioxins is based on the most recently available TOMPs network data (2010) for Manchester and is assessed as 5.00E-05 ngTEQ/m^3 for the Widnes area.

2.4 Assessment results

2.4.1 Particulates

Detailed Air Dispersion Modelling was carried out using the ADMS 5.2 model to assess the short term and long term concentrations of particulates (PM10). Meteorological data from 2017 to 2019 was used and results are presented for all years of meteorological data.

The Process Contribution (PC) from modelling for both short and long term has been added to the background levels for each sensitive location, and then compared with the relevant air quality standard (EAL). These have also been assessed in line with the significance for planning criteria specified in Sections 2.1 and 2.2.

Short Term

Table 10 Short Term PM10 (2017)

Receptor	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.19	25.56	25.76	50	0.39%	52%	No adverse effect
Randle Reed Bed	0.07	23.11	23.18	50	0.14%	46%	No adverse effect
Mersey Estuary	0.001	25.92	25.92	50	0.002%	52%	No adverse effect
Wigg Island LNR	0.01	22.69	22.70	50	0.02%	45%	No adverse effect
Nearest working population (offsite)	0.48	25.56	26.04	50	0.96%	52%	Negligible
New Housing estate to the west of the site	0.01	25.56	25.57	50	0.02%	51%	Negligible
Houses off French St	0.10	25.56	25.66	50	0.22%	51%	Negligible
Caravans at the Warrington Road site	0.04	25.56	25.60	50	0.08%	51%	Negligible
AQMA 1	0.01	27.12	27.13	50	0.02%	54%	No adverse effect
AQMA 2	0.03	26.05	26.07	50	0.06%	52%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.97	25.56	26.53	50	1.9%	53%	No adverse effect
Randle Reed Bed	0.33	23.11	23.44	50	0.7%	47%	No adverse effect
Mersey Estuary	0.01	25.92	25.93	50	0.01%	52%	No adverse effect
Wigg Island LNR	0.05	22.69	22.74	50	0.1%	45%	No adverse effect
Nearest working population (offsite)	2.56	25.56	28.12	50	5.1%	56%	Negligible
New Housing estate to the west of the site	0.04	25.56	25.60	50	0.1%	51%	Negligible
Houses off French St	0.51	25.56	26.07	50	1.0%	52%	Negligible
Caravans at the Warrington Road site	0.20	25.56	25.76	50	0.4%	52%	Negligible
AQMA 1	0.04	27.12	27.16	50	0.1%	54%	No adverse effect
AQMA 2	0.14	26.05	26.19	50	0.3%	52%	No adverse effect

Table 11 Short Term PM10 (2018)

	PC from ADMS modelling (μg/m³)	Background (μg/m³)	Total Concentration (PEC) (μg/m³)	EAL (μg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.23	25.56	25.79	50	0.5%	52%	No adverse effect
Randle Reed Bed	0.07	23.11	23.18	50	0.1%	46%	No adverse effect
Mersey Estuary	0.01	25.92	25.93	50	0.02%	52%	No adverse effect
Wigg Island LNR	0.01	22.69	22.70	50	0.02%	45%	No adverse effect
Nearest working population (offsite)	0.54	25.56	26.10	50	1.1%	52%	Negligible
New Housing estate to the west of the site	0.24	25.56	25.80	50	0.5%	52%	Negligible
Houses off French St	0.12	25.56	25.68	50	0.2%	51%	Negligible
Caravans at the Warrington Road site	0.05	25.56	25.61	50	0.1%	51%	Negligible
AQMA 1	0.03	27.12	27.15	50	0.1%	54%	No adverse effect
AQMA 2	0.03	26.05	26.08	50	0.1%	52%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	1.17	25.56	26.73	50	2.3%	54%	No adverse effect
Randle Reed Bed	0.34	23.11	23.46	50	0.7%	47%	No adverse effect
Mersey Estuary	0.06	25.92	25.98	50	0.1%	52%	No adverse effect
Wigg Island LNR	0.06	22.69	22.75	50	0.1%	45%	No adverse effect
Nearest working population (offsite)	2.83	25.56	28.39	50	5.7%	57%	Negligible
New Housing estate to the west of the site	1.18	25.56	26.74	50	2.4%	54%	Negligible
Houses off French St	0.56	25.56	26.12	50	1.1%	52%	Negligible
Caravans at the Warrington Road site	0.27	25.56	25.83	50	0.5%	52%	Negligible
AQMA 1	0.16	27.12	27.27	50	0.3%	55%	No adverse effect
AQMA 2	0.15	26.05	26.20	50	0.3%	52%	No adverse effect

Table 12 Short Term PM10 (2019)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.18	25.56	25.74	50	0.4%	51%	No adverse effect
Randle Reed Bed	0.07	23.11	23.18	50	0.1%	46%	No adverse effect
Mersey Estuary	0.01	25.92	25.93	50	0.01%	52%	No adverse effect
Wigg Island LNR	0.01	22.69	22.70	50	0.02%	45%	No adverse effect
Nearest working population (offsite)	0.61	25.56	26.17	50	1.2%	52%	Negligible
New Housing estate to the west of the site	0.07	25.56	25.63	50	0.1%	51%	Negligible
Houses off French St	0.11	25.56	25.67	50	0.2%	51%	Negligible
Caravans at the Warrington Road site	0.07	25.56	25.63	50	0.1%	51%	Negligible
AQMA 1	0.04	27.12	27.16	50	0.1%	54%	No adverse effect
AQMA 2	0.04	26.05	26.09	50	0.1%	52%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.87	25.56	26.43	50	1.7%	53%	No adverse effect
Randle Reed Bed	0.34	23.11	23.46	50	0.7%	47%	No adverse effect
Mersey Estuary	0.04	25.92	25.96	50	0.1%	52%	No adverse effect
Wigg Island LNR	0.05	22.69	22.74	50	0.1%	45%	No adverse effect
Nearest working population (offsite)	3.16	25.56	28.72	50	6.3%	57%	Negligible
New Housing estate to the west of the site	0.32	25.56	25.88	50	0.6%	52%	Negligible
Houses off French St	0.55	25.56	26.11	50	1.1%	52%	Negligible
Caravans at the Warrington Road site	0.36	25.56	25.92	50	0.7%	52%	Negligible
AQMA 1	0.21	27.12	27.32	50	0.4%	55%	No adverse effect
AQMA 2	0.21	26.05	26.26	50	0.4%	53%	No adverse effect

Modelling shows that predicted short term concentrations are likely to be below the EAL for all receptors resulting in no adverse effect, with a maximum of 54% at AQMA 1 for predicted emissions for all years of meteorological data, and a maximum of 58% at the nearest offsite working population at ELV using 2019 meteorological data. It should be noted that the background concentrations at all locations are the significant contributor to the total concentration, with the site contribution being significantly less than any background level.

Long Term

Table 13 Long Term PM10 (2017)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.05	12.78	12.83	40	0.12%	32%	No adverse effect
Randle Reed Bed	0.02	11.56	11.58	40	0.05%	29%	No adverse effect
Mersey Estuary	0.001	12.96	12.96	40	0.003%	32%	No adverse effect
Wigg Island LNR	0.003	11.34	11.35	40	0.01%	28%	No adverse effect
Nearest working population (offsite)	0.14	12.78	12.92	40.00	0.35%	32%	Negligible
New Housing estate to the west of the site	0.02	12.78	12.80	40	0.05%	32%	Negligible
Houses off French St	0.03	12.78	12.81	40	0.08%	32%	Negligible
Caravans at the Warrington Road site	0.01	12.78	12.79	40	0.03%	32%	Negligible
AQMA 1	0.01	13.56	13.56	40	0.01%	34%	No adverse effect
AQMA 2	0.01	13.02	13.03	40	0.02%	33%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.24	12.78	13.02	40	0.61%	33%	No adverse effect
Randle Reed Bed	0.10	11.56	11.66	40	0.25%	29%	No adverse effect
Mersey Estuary	0.01	12.96	12.97	40	0.02%	32%	No adverse effect
Wigg Island LNR	0.01	11.34	11.36	40	0.03%	28%	No adverse effect
Nearest working population (offsite)	0.73	12.78	13.51	40.00	1.83%	34%	Negligible
New Housing estate to the west of the site	0.10	12.78	12.88	40.00	0.24%	32%	Negligible
Houses off French St	0.15	12.78	12.93	40.00	0.38%	32%	Negligible
Caravans at the Warrington Road site	0.06	12.78	12.84	40	0.15%	32%	Negligible
AQMA 1	0.03	13.56	13.59	40	0.07%	34%	No adverse effect
AQMA 2	0.04	13.02	13.06	40	0.09%	33%	No adverse effect

Table 14 Long Term PM10 (2018)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.06	12.78	12.84	40	0.14%	32%	No adverse effect
Randle Reed Bed	0.02	11.56	11.58	40	0.05%	29%	No adverse effect
Mersey Estuary	0.003	12.96	12.96	40	0.01%	32%	No adverse effect
Wigg Island LNR	0.003	11.34	11.35	40	0.01%	28%	No adverse effect
Nearest working pop (offsite)	0.17	12.78	12.95	40	0.43%	32%	Negligible
New Housing estate to the west of the site	0.05	12.78	12.83	40	0.13%	32%	Negligible
Houses off French St	0.03	12.78	12.81	40	0.08%	32%	Negligible
Caravans at the Warrington Road site	0.02	12.78	12.80	40	0.04%	32%	Negligible
AQMA 1	0.01	13.56	13.57	40	0.02%	34%	No adverse effect
AQMA 2	0.01	13.02	13.03	40	0.02%	33%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.28	12.78	13.06	40.00	0.70%	33%	No adverse effect
Randle Reed Bed	0.09	11.56	11.65	40.00	0.23%	29%	No adverse effect
Mersey Estuary	0.02	12.96	12.98	40.00	0.04%	32%	No adverse effect
Wigg Island LNR	0.02	11.34	11.36	40.00	0.04%	28%	No adverse effect
Nearest working population (offsite)	0.86	12.78	13.64	40.00	2.15%	34%	Negligible
New Housing estate to the west of the site	0.26	12.78	13.04	40.00	0.66%	33%	Negligible
Houses off French St	0.16	12.78	12.94	40.00	0.40%	32%	Negligible
Caravans at the Warrington Road site	0.08	12.78	12.86	40.00	0.21%	32%	Negligible
AQMA 1	0.04	13.56	13.60	40.00	0.11%	34%	No adverse effect
AQMA 2	0.05	13.02	13.07	40.00	0.12%	33%	No adverse effect

Table 15 Long Term PM10 (2019)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.04	12.78	12.82	40	0.10%	32%	No adverse effect
Randle Reed Bed	0.02	11.56	11.58	40	0.05%	29%	No adverse effect
Mersey Estuary	0.002	12.96	12.96	40	0.005%	32%	No adverse effect
Wigg Island LNR	0.003	11.34	11.35	40	0.01%	28%	No adverse effect
Nearest working population (offsite)	0.17	12.78	12.95	40.00	0.43%	32%	Negligible
New Housing estate to the west of the site	0.03	12.78	12.81	40	0.06%	32%	Negligible
Houses off French St	0.03	12.78	12.81	40	0.08%	32%	Negligible
Caravans at the Warrington Road site	0.02	12.78	12.80	40	0.05%	32%	Negligible
AQMA 1	0.01	13.56	13.57	40	0.03%	34%	No adverse effect
AQMA 2	0.01	13.02	13.03	40	0.03%	33%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.20	12.78	12.98	40.00	0.51%	32%	No adverse effect
Randle Reed Bed	0.09	11.56	11.65	40.00	0.22%	29%	No adverse effect
Mersey Estuary	0.01	12.96	12.97	40.00	0.02%	32%	No adverse effect
Wigg Island LNR	0.01	11.34	11.36	40.00	0.04%	28%	No adverse effect
Nearest working pop (offsite)	0.90	12.78	13.68	40.00	2.26%	34%	Negligible
New Housing estate to the west of the site	0.13	12.78	12.91	40.00	0.32%	32%	Negligible
Houses off French St	0.16	12.78	12.94	40.00	0.40%	32%	Negligible
Caravans at the Warrington Road site	0.10	12.78	12.88	40.00	0.26%	32%	Negligible
AQMA 1	0.05	13.56	13.61	40.00	0.12%	34%	No adverse effect
AQMA 2	0.06	13.02	13.08	40.00	0.14%	33%	No adverse effect

Modelling shows that predicted long term concentrations are likely to be below the EAL, with a maximum of 34% at AQMA 1 for predicted emissions, and a maximum of 34% at the nearest offsite working population at ELV. It should be noted that the background concentrations at all locations are the significant contributor to the total concentration, with the site contribution being significantly less than any background level.

2.4.2 Nitrogen Oxides

Detailed Air Dispersion Modelling was carried out using the ADMS 5.2 model to assess the concentrations of NO_2. Meteorological data from 2017 to 2019 was used and results are presented for all years of meteorological data.

The Process Contribution (PC) from modelling for both short and long term has been added to the background levels for each sensitive location, and then compared with the relevant air quality standard (EAL). These have also been assessed in line with the criteria specified in Sections 2.1 and 2.2.

Boiler emissions of nitrogen oxides are treated as if they are all as NO_2. In practice the actual emission is expected to be about 10% NO_2 and 90% NO. At the NO concentration in these emissions, the half-life for conversion of NO to NO_2 in the atmosphere is reported to be about half an hour. For receptors close to the source, only a fraction of the NO will have reacted in the atmosphere to NO_2 so the modelling will over-predict NO_2 concentrations in the immediate area around the site.

Note: there is expected to be a small amount of NOx released from emission point A11 due to gas burning in the high temperature kiln used in this operation, but this is expected to be insignificant versus the overall emissions from the boilers.

Short Term

Table 16 Short Term NO_2 (2017)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	3.32	32.12	35.44	75	4.43%	47%	No adverse effect
Randle Reed Bed	1.06	30.74	31.80	75	1.41%	42%	No adverse effect
Mersey Estuary	0.33	29.76	30.09	75	0.44%	40%	No adverse effect
Wigg Island LNR	0.39	27.42	27.82	75	0.53%	37%	No adverse effect
Nearest working population (offsite)	11.71	32.12	43.83	200	5.86%	22%	Negligible
New Housing estate to the west of the site	6.04	32.12	38.16	200	3.02%	19%	Negligible
Houses off French St	3.65	32.12	35.77	200	1.83%	18%	Negligible
Caravans at the Warrington Road site	3.43	32.12	35.55	200	1.72%	18%	Negligible
AQMA 1	2.26	29.34	31.60	75	3.01%	42%	No adverse effect
AQMA 2	2.05	29.34	31.39	75	2.73%	42%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	3.67	32.12	35.79	75	4.89%	48%	No adverse effect
Randle Reed Bed	1.17	30.74	31.91	75	1.56%	43%	No adverse effect
Mersey Estuary	0.36	29.76	30.12	75	0.48%	40%	No adverse effect
Wigg Island LNR	0.43	27.42	27.86	75	0.58%	37%	No adverse effect
Nearest working population (offsite)	13.06	32.12	45.18	200	6.53%	23%	Negligible
New Housing estate to the west of the site	6.66	32.12	38.78	200	3.33%	19%	Negligible
Houses off French St	4.03	32.12	36.15	200	2.02%	18%	Negligible
Caravans at the Warrington Road site	3.77	32.12	35.89	200	1.89%	18%	Negligible
AQMA 1	2.49	29.34	31.83	75	3.32%	42%	No adverse effect
AQMA 2	2.26	29.34	31.60	75	3.01%	42%	No adverse effect

Table 17 Short Term NO_2 (2018)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	3.48	32.12	35.60	75	4.64%	47%	No adverse effect
Randle Reed Bed	0.80	30.74	31.54	75	1.07%	42%	No adverse effect
Mersey Estuary	0.39	29.76	30.15	75	0.52%	40%	No adverse effect
Wigg Island LNR	0.41	27.42	27.83	75	0.55%	37%	No adverse effect
Nearest working population (offsite)	16.96	32.12	49.08	200	8.48%	25%	Negligible
New Housing estate to the west of the site	7.67	32.12	39.79	200	3.84%	20%	Negligible
Houses off French St	3.70	32.12	35.82	200	1.85%	18%	Negligible
Caravans at the Warrington Road site	3.47	32.12	35.59	200	1.74%	18%	Negligible
AQMA 1	2.58	29.34	31.92	75	3.44%	43%	No adverse effect
AQMA 2	2.24	29.34	31.58	75	2.99%	42%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	3.73	32.12	35.85	75	4.97%	48%	No adverse effect
Randle Reed Bed	0.92	30.74	31.66	75	1.23%	42%	No adverse effect
Mersey Estuary	0.42	29.76	30.18	75	0.56%	40%	No adverse effect
Wigg Island LNR	0.46	27.42	27.88	75	0.61%	37%	No adverse effect
Nearest working population (offsite)	18.77	32.12	50.89	200	9.39%	25%	Negligible
New Housing estate to the west of the site	8.44	32.12	40.56	200	4.22%	20%	Negligible
Houses off French St	4.08	32.12	36.20	200	2.04%	18%	Negligible
Caravans at the Warrington Road site	3.82	32.12	35.94	200	1.91%	18%	Negligible
AQMA 1	2.84	29.34	32.18	75	3.79%	43%	No adverse effect
AQMA 2	2.46	29.34	31.80	75	3.28%	42%	No adverse effect

Table 18 Short Term NO_2 (2019)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	2.56	32.12	34.68	75	3.4%	46%	No adverse effect
Randle Reed Bed	0.85	30.74	31.59	75	1.1%	42%	No adverse effect
Mersey Estuary	0.35	29.76	30.11	75	0.5%	40%	No adverse effect
Wigg Island LNR	0.33	27.42	27.75	75	0.4%	37%	No adverse effect
Nearest working population (offsite)	12.12	32.12	44.24	200	6.1%	22%	Negligible
New Housing estate to the west of the site	6.99	32.12	39.11	200	3.5%	20%	Negligible
Houses off French St	3.72	32.12	35.84	200	1.9%	18%	Negligible
Caravans at the Warrington Road site	3.56	32.12	35.68	200	1.8%	18%	Negligible
AQMA 1	2.47	29.34	31.81	75	3.3%	42%	No adverse effect
AQMA 2	2.08	29.34	31.42	75	2.8%	42%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	2.82	32.12	34.94	75	3.76%	47%	No adverse effect
Randle Reed Bed	0.93	30.74	31.67	75	1.24%	42%	No adverse effect
Mersey Estuary	0.39	29.76	30.15	75	0.52%	40%	No adverse effect
Wigg Island LNR	0.37	27.42	27.79	75	0.49%	37%	No adverse effect
Nearest working population (offsite)	13.47	32.12	45.59	200	6.74%	23%	Negligible
New Housing estate to the west of the site	7.69	32.12	39.81	200	3.85%	20%	Negligible
Houses off French St	4.09	32.12	36.21	200	2.05%	18%	Negligible
Caravans at the Warrington Road site	3.91	32.12	36.03	200	1.96%	18%	Negligible
AQMA 1	2.71	29.34	32.05	75	3.61%	43%	No adverse effect
AQMA 2	2.29	29.34	31.63	75	3.05%	42%	No adverse effect

Modelling shows that predicted short term concentrations are likely to be below the EAL, with a maximum of 47% at St Helens canal/Widnes Warth for predicted emissions, and a maximum of 48% at St Helens canal/Widnes Warth at ELV, both using 2017 and 2018 meteorological data. It should be noted that the background concentrations at the majority of locations are the significant contributor to the total concentration, with the site contribution being significantly less than any background level. In other cases, the background and site contributions are roughly equal, with the highest totals still being well below the EAL. It is also worth noting that the background levels will include a contribution from the existing processes at the site.

Long Term

Table 19 Long Term NO_2 (2017)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.09	16.06	16.15	30	0.30%	54%	No adverse effect
Randle Reed Bed	0.11	15.37	15.48	30	0.36%	52%	No adverse effect
Mersey Estuary	0.01	14.88	14.89	30	0.02%	50%	No adverse effect
Wigg Island LNR	0.01	13.71	13.72	30	0.03%	46%	No adverse effect
Nearest working population (offsite)	0.07	16.06	16.13	40	0.18%	40%	Negligible
New Housing estate to the west of the site	0.07	16.06	16.13	40	0.18%	40%	Negligible
Houses off French St	0.14	16.06	16.20	40	0.36%	41%	Negligible
Caravans at the Warrington Road site	0.05	16.06	16.11	40	0.13%	40%	Negligible
AQMA 1	0.03	14.67	14.70	30	0.10%	49%	No adverse effect
AQMA 2	0.03	14.67	14.70	30	0.10%	49%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.10	16.06	16.16	30	0.33%	54%	No adverse effect
Randle Reed Bed	0.12	16.06	16.18	30	0.39%	54%	No adverse effect
Mersey Estuary	0.01	15.37	15.38	30	0.03%	51%	No adverse effect
Wigg Island LNR	0.02	14.88	14.90	30	0.06%	50%	No adverse effect
Nearest working population (offsite)	0.08	13.71	13.79	40	0.20%	34%	Negligible
New Housing estate to the west of the site	0.08	16.06	16.14	40	0.20%	40%	Negligible
Houses off French St	0.16	16.06	16.22	40	0.39%	41%	Negligible
Caravans at the Warrington Road site	0.06	16.06	16.12	40	0.14%	40%	Negligible
AQMA 1	0.03	16.06	16.09	30	0.11%	54%	No adverse effect
AQMA 2	0.03	14.67	14.70	30	0.12%	49%	No adverse effect

Table 20 Long Term NO_2 (2018)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.14	16.06	16.20	30	0.47%	54%	No adverse effect
Randle Reed Bed	0.09	15.37	15.46	30	0.30%	52%	No adverse effect
Mersey Estuary	0.02	14.88	14.90	30	0.05%	50%	No adverse effect
Wigg Island LNR	0.02	13.71	13.73	30	0.06%	46%	No adverse effect
Nearest working population (offsite)	0.11	16.06	16.17	40	0.28%	40%	Negligible
New Housing estate to the west of the site	0.22	16.06	16.28	40	0.55%	41%	Negligible
Houses off French St	0.17	16.06	16.23	40	0.43%	41%	Negligible
Caravans at the Warrington Road site	0.07	16.06	16.13	40	0.18%	40%	Negligible
AQMA 1	0.05	14.67	14.72	30	0.18%	49%	No adverse effect
AQMA 2	0.05	14.67	14.72	30	0.15%	49%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.15	16.06	16.21	30	0.49%	54%	No adverse effect
Randle Reed Bed	0.10	15.37	15.47	30	0.33%	52%	No adverse effect
Mersey Estuary	0.02	14.88	14.90	30	0.06%	50%	No adverse effect
Wigg Island LNR	0.02	13.71	13.73	30	0.07%	46%	No adverse effect
Nearest working population (offsite)	0.12	16.06	16.18	40	0.30%	40%	Negligible
New Housing estate to the west of the site	0.24	16.06	16.30	40	0.60%	41%	Negligible
Houses off French St	0.18	16.06	16.24	40	0.45%	41%	Negligible
Caravans at the Warrington Road site	0.08	16.06	16.14	40	0.20%	40%	Negligible
AQMA 1	0.06	14.67	14.73	30	0.19%	49%	No adverse effect
AQMA 2	0.05	14.67	14.72	30	0.17%	49%	No adverse effect

Table 21 Long Term NO_2 (2019)

	PC from ADMS modelling (µg/m³)	Background (µg/m³)	Total Concentration (PEC) (µg/m³)	EAL (µg/m³)	% PC of EAL	% PEC of EAL	Significance for planning
At average monitored/predicted emissions							
St Helens canal/Widnes Warth	0.08	16.06	16.14	30	0.25%	54%	No adverse effect
Randle Reed Bed	0.09	15.37	15.46	30	0.30%	52%	No adverse effect
Mersey Estuary	0.01	14.88	14.89	30	0.04%	50%	No adverse effect
Wigg Island LNR	0.02	13.71	13.73	30	0.05%	46%	No adverse effect
Nearest working population (offsite)	0.10	16.06	16.16	40	0.25%	40%	Negligible
New Housing estate to the west of the site	0.09	16.06	16.15	40	0.23%	40%	Negligible
Houses off French St	0.16	16.06	16.22	40	0.40%	41%	Negligible
Caravans at the Warrington Road site	0.09	16.06	16.15	40	0.24%	40%	Negligible
AQMA 1	0.05	14.67	14.72	30	0.18%	49%	No adverse effect
AQMA 2	0.05	14.67	14.72	30	0.17%	49%	No adverse effect
At current/proposed ELV							
St Helens canal/Widnes Warth	0.09	16.06	16.15	30	0.30%	54%	No adverse effect
Randle Reed Bed	0.10	15.37	15.47	30	0.33%	52%	No adverse effect
Mersey Estuary	0.01	14.88	14.89	30	0.04%	50%	No adverse effect
Wigg Island LNR	0.02	13.71	13.73	30	0.06%	46%	No adverse effect
Nearest working population (offsite)	0.11	16.06	16.17	40	0.28%	40%	Negligible
New Housing estate to the west of the site	0.10	16.06	16.16	40	0.25%	40%	Negligible
Houses off French St	0.18	16.06	16.24	40	0.44%	41%	Negligible
Caravans at the Warrington Road site	0.10	16.06	16.16	40	0.26%	40%	Negligible
AQMA 1	0.06	14.67	14.73	30	0.20%	49%	No adverse effect
AQMA 2	0.06	14.67	14.73	30	0.19%	49%	No adverse effect

Modelling shows that predicted long term concentrations are likely to be below the EAL, with a maximum of 54% at St Helens canal/Widnes Warth for predicted emissions, and at ELV, using all years of meteorological data. It should be noted that the background concentrations at the majority of locations are the significant contributor to the total concentration, with the site contribution being significantly less than any background level.

Nitrogen Nutrient Deposition

The critical loads given in APIS cover nutrient nitrogen deposition where the gas phase contains NO and NO_2. The low deposition velocity of NO and NO_2, 0.00015 and 0.0015m/s means that 1 $\mu g/m^3$ of NO_2 will only give rise to 0.14 kg/ha/y nutrient nitrogen input.

The Critical Loads for any of the sensitive ecological sites affected by deposition from the site are given on the APIS web site as 20-30 kg N ha^{-1} yr^{-1}. NO_2 concentration meeting the atmospheric concentration standard will not be critical for nutrient nitrogen input.

Critical loads have been taken from the APIS website[3].

Habitat type	Critical load NO_2 kg/ha/y	Potential impact
Mid-upper saltmarshes	20-30	Increase in dominance of graminoids
Pioneer and low-mid saltmarshes	20-30	Increase in late-successional species, increase in productivity
Rich fens [including reed-beds]	15-30	Increase in tall graminoids, decrease in bryophytes

2.4.3 Dioxin Health Risk Assessment

Introduction

The basis for the health risk assessment is predictive modelling using the ADMS Version 5.2 atmospheric dispersion model to estimate concentrations and deposition rates for dioxins as a result of stack emissions from the site as a whole. It does not take account of any existing dioxin contamination at the location of the specific receptors. Meteorological data from 2017 to 2019 was used and results using all three meteorological years are presented.

The health risk assessment takes into account the US EPA methodology outlined in the "Human Health Risk Assessment Protocol (HHRAP) for Hazardous Waste Combustion Facilities, EPA530-R-05-006, September 2005". There is currently no formal guidance in the UK on the assessment of health risks associated with exposure to emissions from facilities that may emit dioxins, and in England and Wales the Environment Agency's Air Quality Management and Assessment Unit (AQMAU) have accepted the use of the US EPA methodology as appropriate. However where the USEPA methodology appears to make

[3] Air Pollution Information System, *Indicative values within nutrient nitrogen critical load ranges for use in air pollution impact assessments*, http://www.apis.ac.uk/indicative-critical-load-values (accessed October 2021).

assumptions that are unlikely to be valid for the UK (Widnes) situation, alternative calculations are submitted.

Background concentration of dioxins is based on the most recently available TOMPs network data (2010) for Manchester and is assessed as 5.00E-05ngTEQ/m^3 for the Widnes area.

Source of dioxins

Lines 2, 3 and 4 are recognised as a potential source of dioxins. 85% of gases potentially containing dioxins are collected and treated in a regenerative thermal oxidiser.

Potential Pathways for Exposure to Dioxins

The following pathways were considered as part of the health risk assessment:

- Inhalation;
- Ingestion of soil;
- Consumption of fruit and vegetables;
- Consumption of dairy produce
- Consumption of poultry and eggs;
- Consumption of lamb, beef and pork
- Consumption of fish
- Breast milk
- Drinking water.

Members of the local population are only likely to be exposed to significant effects associated with emissions of dioxins from the site if:

- They spend periods of time at locations where and when emissions from the site increase the concentration of dioxins significantly above the existing background;
- They consume food grown at locations where emissions increase the concentration of dioxins above the concentration normally present in food from those locations;
- They undertake activities likely to lead to ingestion of soil at locations where emissions have increased the concentration of dioxins in the soil above those normally present; and
- They drink water from sources exposed to increased concentrations of dioxins above the levels normally present.

The extent of exposure that any person may experience will depend directly on the degree to which they engage in any or all of the above activities, and by how much existing background concentrations of dioxins increase as a result of the operation of the site.

Pathways Relevant to emissions from Alkegen Widnes

Inhalation

People living in the vicinity of the site may be exposed to marginally higher levels of dioxins as a result of the operation of Alkegen Widnes for the proportion of the time that they spend there. Accordingly, this pathway is considered relevant to the current assessment.

Ingestion of Soil

People working on the land within close proximity to the site may be exposed to marginally higher levels of dioxins as a result of the operation of the site for the proportion of the time that they work there. The potential for exposure by soil ingestion is likely to affect only a few local residents who may tend plots in their home gardens, and then for only limited periods of the year. Children playing in local gardens may also ingest some soil. Increased dioxin intake due to contribution from the site via the ingestion of soil is included in the assessment.

Food intake

The majority of the general population purchase their food from large commercial outlets, that source their produce from across the UK and outside the country. There are only a small number of convenience stores in Widnes that might market local produce. There are no local producers of food direct to market within 1.5 km of the site. The overwhelming majority of the local population's exposure to dioxins due to consumption of food will not be affected significantly by the operation of Alkegen Widnes.

Consumption of Fruit and Vegetables

People who consume fruit and vegetables grown near the site may be exposed to marginally higher levels of dioxins as a result of the operation of the process, although any increase is likely to be small compared with existing exposures. The likelihood of individuals obtaining almost all of their fruit and vegetable consumption from gardens is likely to be low. No allotments have been identified within 1 km. Nevertheless, dioxin intake via the consumption of fruit and vegetables is included in the assessment.

Consumption of Local Dairy Produce

Alkegen Widnes is located in an urban environment. There is no pasture land within 1.5 km of Alkegen Widnes. Accordingly, there is no potential for grazing animals to forage on pasture land that could be significantly contaminated by deposition of dioxins emitted from Alkegen Widnes.

This scenario could only apply to those people whose milk supply is produced by dairy herds grazing on pasture land that could potentially become contaminated in the vicinity of the site. However no dairy farms have been identified within 10 km of the site.

Milk in the UK is blended in bulk and much is semi-skimmed before distribution so dioxin in milk and milk products consumed by people in the houses near to the site will be at the national average.

Therefore consumption of local dairy produce is not considered for this assessment.

Consumption of Poultry and Eggs

Privately reared poultry may be exposed to dioxins through soil ingested with food picked up from the ground. It is known that the rearing poultry does not occur to a significant scale in the vicinity of the proposed development site. Both caged and commercial free range birds derive their food from controlled feed. There is little scope for land being available for conversion to free range egg production. Nevertheless, dioxin intake via the consumption of poultry and eggs is included in the assessment as there is scope for domestic poultry within 1 km of the site.

Consumption of Lamb, Beef and Pork

The nearest farm land that might be used for grazing or making silage is 1.5 km from the site. Dioxin deposition from at this distance is below 1% of background deposition.

A search on the internet identified no direct farm sales of meat products in the vicinity of the site. From that it is deduced that meat consumed in the Widnes area is from commercial suppliers. Dioxin emissions from the site therefore have no effect on exposure due to consumption of lamb, beef and pork.

Therefore consumption of lamb, beef and pork is not considered further as a potential pathway in this assessment

Consumption of Fish

Oily fish can be a source of dioxins to human consumers.

The majority of fish consumed in the UK is from marine caught fish or from fish farmed remote from Widnes. There is however one small fish farm 5.5 km north of the site. It is devoted to production of Koi Carp rather than fish for human consumption. Fishing in the Spike Island stretch of the St Helens canal is for coarse fish not for consumption

It is considered that emissions from the site will not influence dioxin content of fish for human consumption. Therefore consumption of fish is not considered for this assessment.

Breast Milk

The consumption of breast milk by infants may be a potentially significant pathway for the dietary intake of dioxins due to absorption by the mother’s lactic system.

Drinking Water

The likelihood of contamination of groundwater aquifers occurring due to the deposition of dioxins associated with emissions from the site is considered highly unlikely given their very low solubility and the depth of the aquifer. The likelihood of local residents collecting rain water for drinking purposes is thought to be low and has been discounted. Accordingly, no further consideration has been given to drinking water as a potential pathway.

Receptor Scenarios

Of the sensitive receptors identified in Section 1.4.6, few are susceptible to dioxins. The table below shows the dioxin sensitive receptors including potentially relevant pathways.

Table 22 Dioxin sensitive sites specific pathways

Exposure Pathways	Houses off French Street	Caravans at the Warrington Road Site	Farmland Adjacent to Fiddlers Ferry Power Station	New Housing estate to the west of the site
Inhalation	Y	Y	Y	Y
Ingestion of Soil	Y	Y	Y	Y
Consumption of Fruit and Vegetables	Y	N	Y	Y
Consumption of Local Dairy Produce	N	N	N	N
Consumption of Poultry and Eggs	Y	N	Y	Y
Consumption of Beef and Pork	N	N	N	N
Consumption of Fish	N	N	N	N
Breast Milk	Y	Y	N	Y
Drinking Water	N	N	N	N

Table 23 Dioxin dispersion modelling results

	PC from ADMS modelling (ng/m^3)		
	2017	2018	2019
At monitored/predicted emissions			
Houses off French Street	9.96E-07	1.13E-06	1.12E-06
Caravans at the Warrington Road Site	3.51E-07	4.59E-07	6.67E-07
Farmland Adjacent to Fiddlers Ferry Power Station	4.00E-07	4.00E-07	4.00E-07
New Housing estate to the west of the site	3.30E-07	1.14E-06	4.12E-07
At ELV			
Houses off French Street	2.36E-06	2.68E-06	2.65E-06
Caravans at the Warrington Road Site	8.48E-07	1.11E-06	1.61E-06
Farmland Adjacent to Fiddlers Ferry Power Station	1.00E-06	1.00E-06	1.00E-06
New Housing estate to the west of the site	8.58E-07	2.94E-06	1.07E-06

The following figures provide an indication, respectively, of the long-term dioxin distribution using each year of meteorological data at:

- Average monitored/predicted emissions and
- ELV

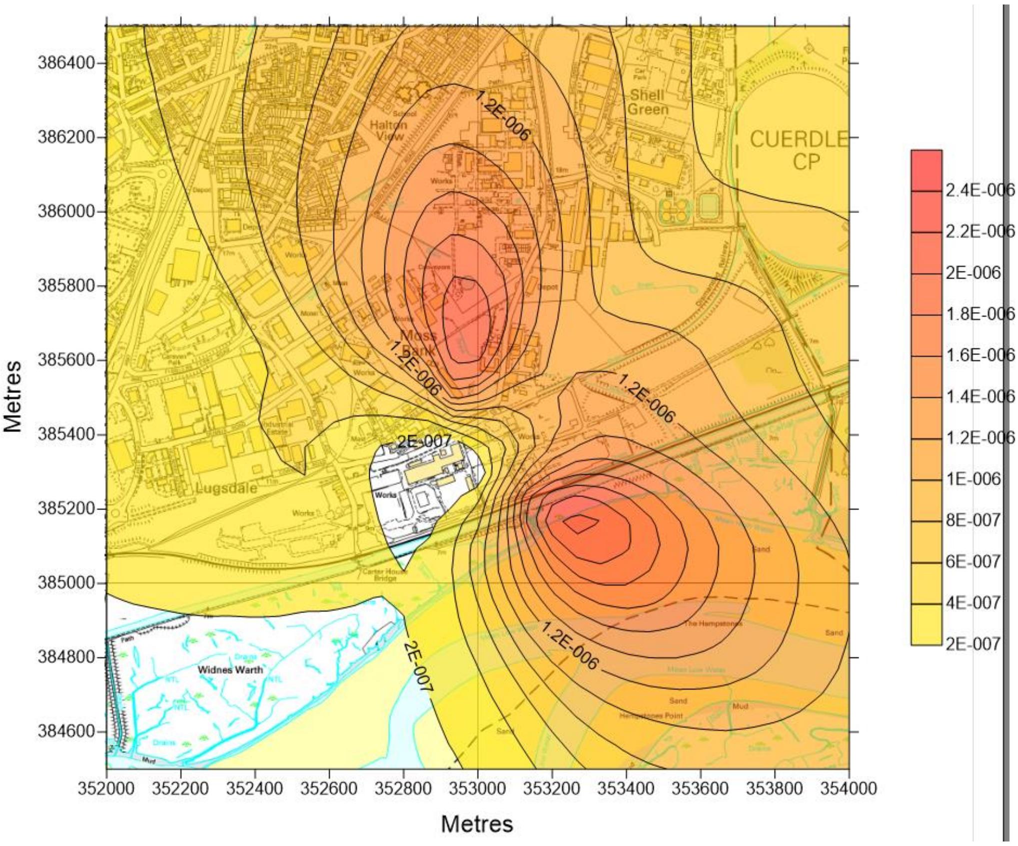


Figure 4 Long term dioxin (ng/m³) at average monitored/predicted emissions (2017)

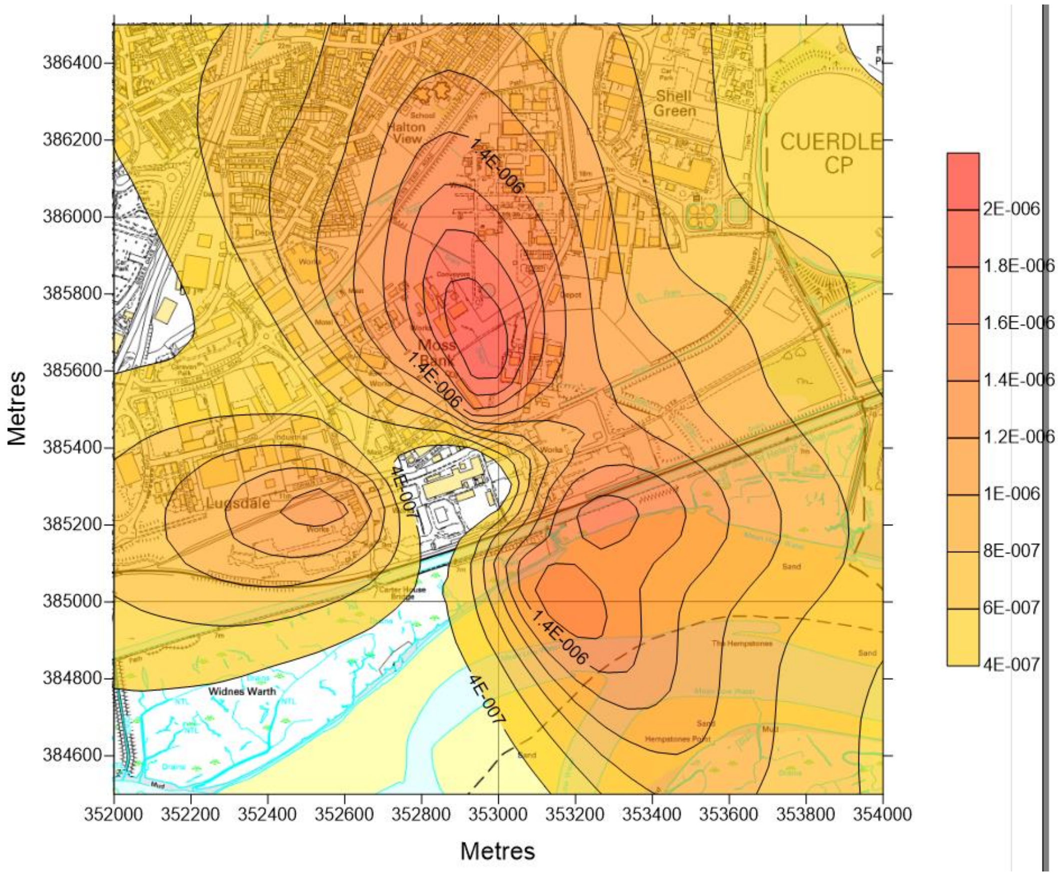


Figure 5 Long term dioxin (ng/m³) at average monitored/predicted emissions (2018)

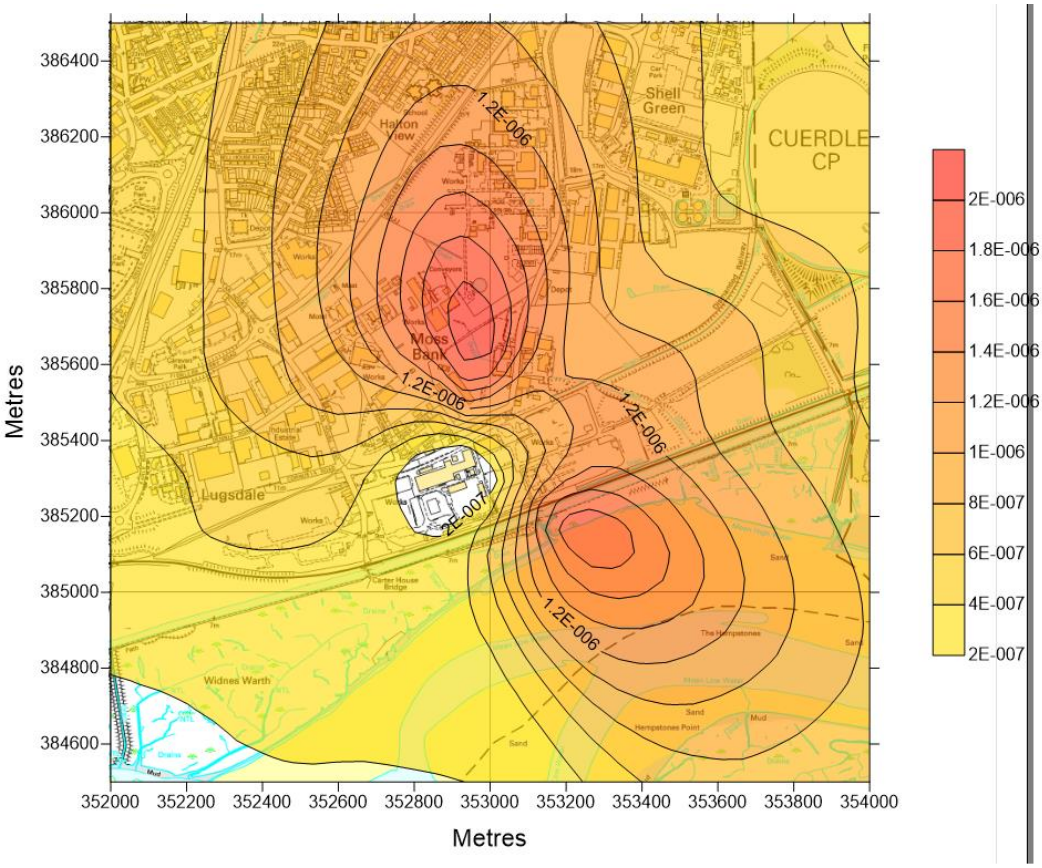


Figure 6 Long term dioxin (ng/m^3) at average monitored/predicted emissions (2019)

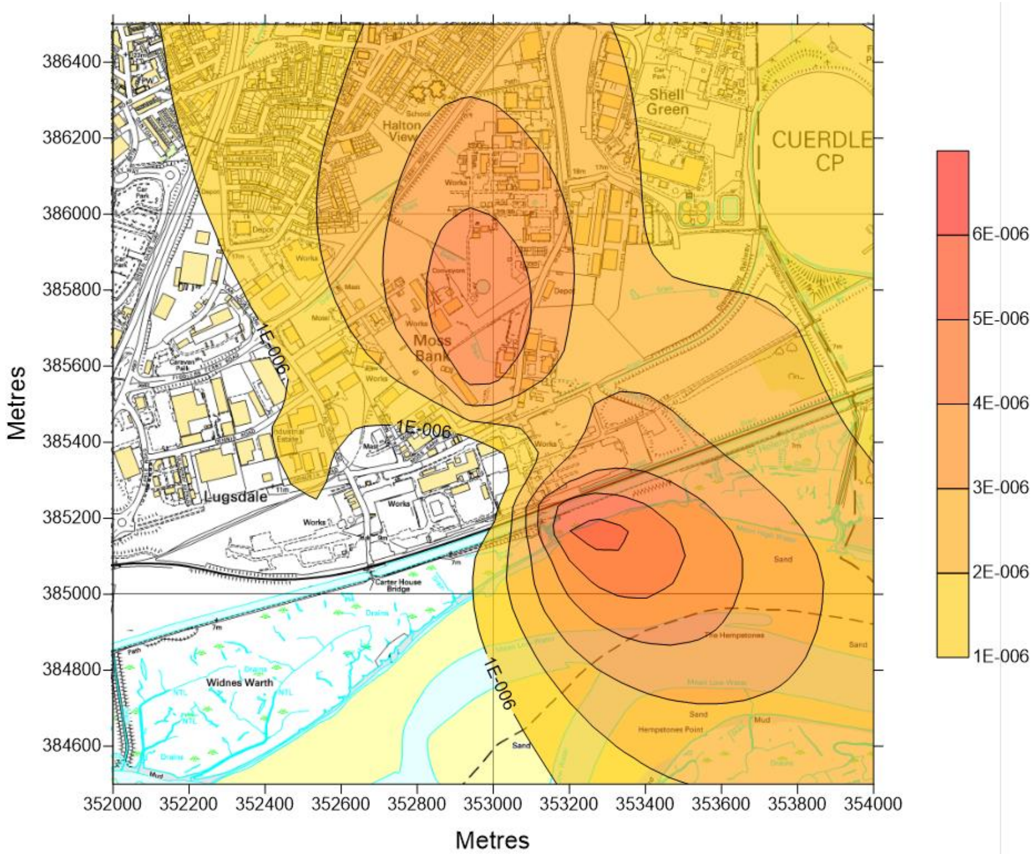


Figure 7 Long Term dioxin (ng/m^3) at current/proposed ELV (2017)

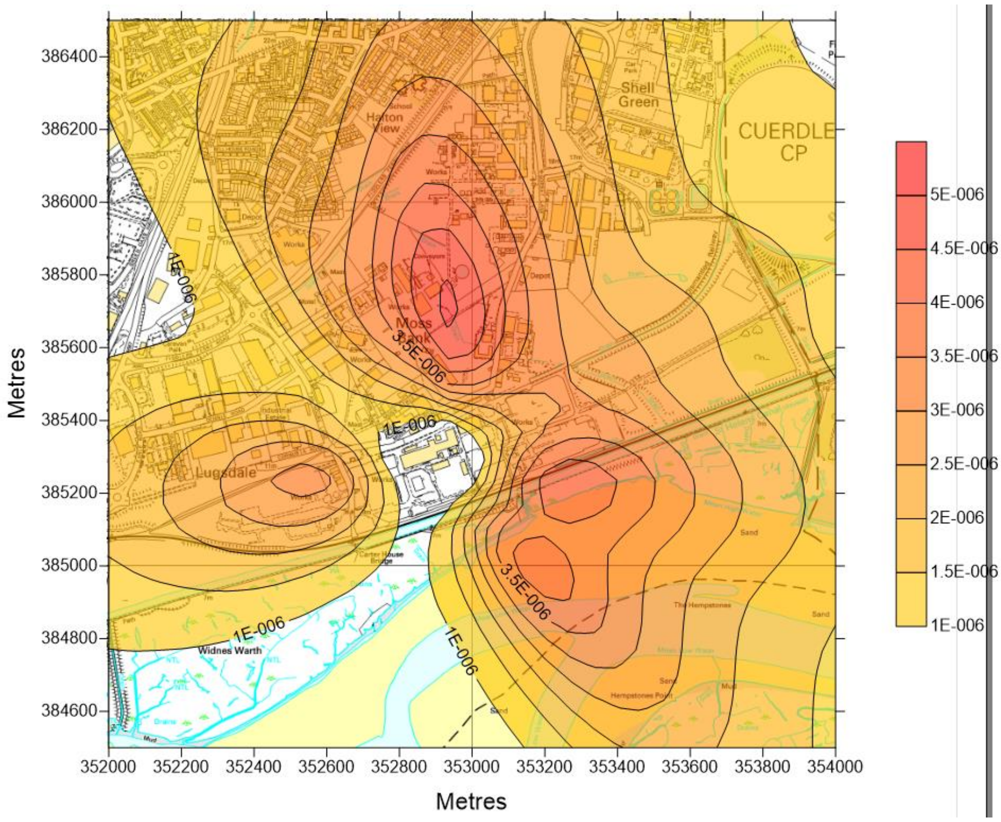


Figure 8 Long Term dioxin (ng/m³) at current/proposed ELV (2018)

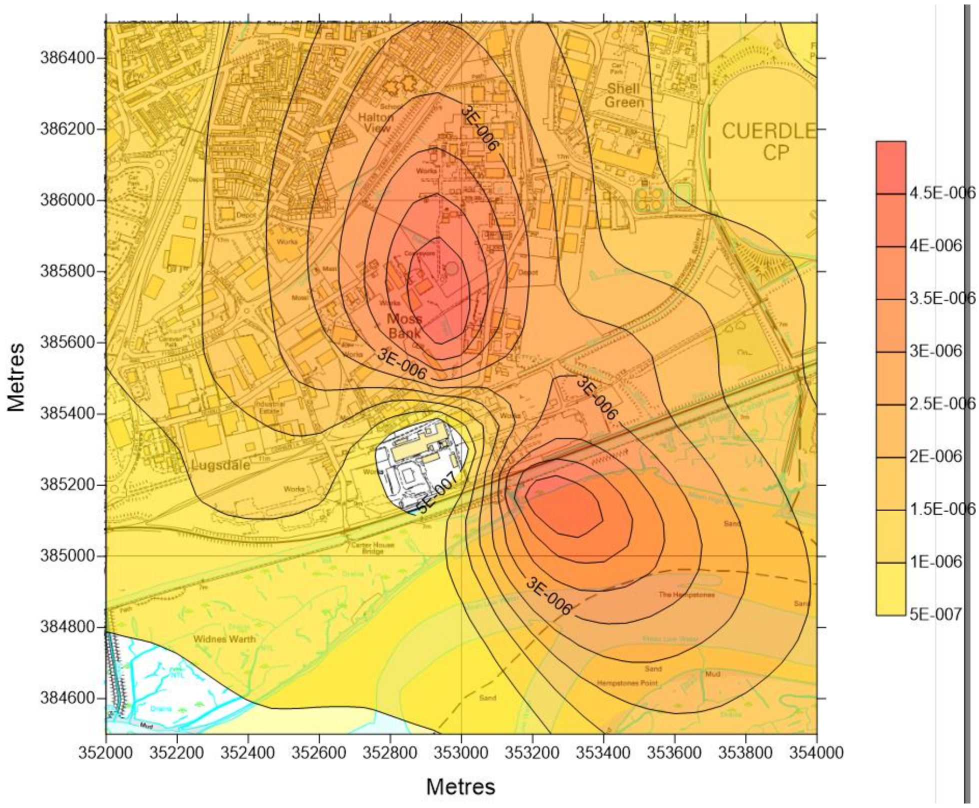


Figure 9 Long Term dioxin (ng/m³) at current/proposed ELV (2019)

The following receptor scenarios have been considered as relevant to the exposure sites selected:

Inhalation Dose

The area in the immediate vicinity of the site is predominantly urban. Alkegen Widnes is bordered to the north by commercial premises. The nearest permanent housing will be the new housing to the west of the site. This is built on what was brownfield land. There is also a caravan site 700 m at 300 degrees east of north from the site. People living and working in the vicinity of the site may be exposed to dioxins via the inhalation route. The additional concentration of dioxins likely to occur at the nearest housing due to Alkegen Widnes has been modelled using ADMS 5.2. The emissions modelled are for normal operation and for operation at the ELV using weather data from Rostherne for 2017, 2018 and 2019.

Table 24 Dioxin Inhalation Dose (2017)

Location	PC (ng/m³)	70 kg adult breath (m³/day)	15 kg child breath (m³/ day)	Adult Intake (ng/day)	Adult Intake (pg/day)	Child intake (ng/day)	Child Intake (pg/day)	Adult (70kg) TDI (pg/day)*	Child (15kg) TDI (pg/day)*	Atmospheric inhalation % of adult TDI*	Atmospheric inhalation % of child TDI*	Site % contribution of total adult or child inhalation**
Background	5.00E-05	20	7.8	1.00E-03	1.00	3.90E-04	0.39	140	30	0.71%	1.30%	N/A (background)
At Monitored/Predicted												
Houses off French Street	9.96E-07	20	7.8	1.99E-05	0.02	7.77E-06	0.01	140	30	0.01%	0.03%	2.0%
Caravans at the Warrington Road Site	3.51E-07	20	7.8	7.02E-06	0.01	2.74E-06	0.003	140	30	0.01%	0.01%	0.7%
Farmland Adjacent to Fiddlers Ferry Power Station	4.00E-07	20	7.8	8.00E-06	0.01	3.12E-06	0.003	140	30	0.01%	0.01%	0.8%
New Housing estate to the west of the site	3.30E-07	20	7.8	6.60E-06	0.01	2.57E-06	0.003	140	30	0.005%	0.01%	0.7%
At ELV												
Houses off French Street	2.36E-06	20	7.8	4.73E-05	0.05	1.84E-05	0.02	140	30	0.03%	0.06%	4.5%
Caravans at the Warrington Road Site	8.48E-07	20	7.8	1.70E-05	0.02	6.61E-06	0.01	140	30	0.01%	0.02%	1.7%
Farmland Adjacent to Fiddlers Ferry Power Station	1.00E-06	20	7.8	2.00E-05	0.02	7.80E-06	0.01	140	30	0.01%	0.03%	2.0%
New Housing estate to the west of the site	8.58E-07	20	7.8	1.72E-05	0.02	6.69E-06	0.01	140	30	0.01%	0.02%	1.7%

* Tolerable Daily Intake. For dioxins, this is 2pg I-TEQ/kg bodyweight per day, e.g. for a 70 kg adult, the TDI is 70 kg x 2 pg/kg/day = 140 pg/day. The Tolerable inhalation Daily Intake (TiDI) is defined as 20% of the TDI.

**Total inhalation is background concentration added to concentration at sensitive receptor from Alkegen Widnes as calculated from ADMS.

Table 25 Dioxin Inhalation Dose (2018)

Location	PC (ng/m^3)	70 kg adult breath (m^3/day)	15 kg child breath (m^3/ day)	Adult Intake (ng/day)	Adult Intake (pg/day)	Child intake (ng/day)	Child Intake (pg/day)	Adult (70kg) TDI (pg/day)*	Child (15kg) TDI (pg/day)*	Atmospheric inhalation % of adult TDI*	Atmospheric inhalation % of child TDI*	Site % contribution of total adult or child inhalation**
Background	5.00E-05	20	7.8	1.00E-03	1.00	3.90E-04	0.39	140	30	0.71%	1.30%	N/A (background)
At Monitored/Predicted												
Houses off French Street	1.13E-06	20	7.8	2.25E-05	0.02	8.78E-06	0.01	140	30	0.02%	0.03%	2.2%
Caravans at the Warrington Road Site	4.59E-07	20	7.8	9.19E-06	0.01	3.58E-06	0.004	140	30	0.01%	0.01%	0.9%
Farmland Adjacent to Fiddlers Ferry Power Station	4.00E-07	20	7.8	8.00E-06	0.01	3.12E-06	0.003	140	30	0.01%	0.01%	0.8%
New Housing estate to the west of the site	1.14E-06	20	7.8	2.28E-05	0.02	8.91E-06	0.009	140	30	0.02%	0.03%	2.2%
At ELV												
Houses off French Street	2.68E-06	20	7.8	5.36E-05	0.05	2.09E-05	0.02	140	30	0.04%	0.07%	5.1%
Caravans at the Warrington Road Site	1.11E-06	20	7.8	2.22E-05	0.02	8.66E-06	0.01	140	30	0.02%	0.03%	2.2%
Farmland Adjacent to Fiddlers Ferry Power Station	1.00E-06	20	7.8	2.00E-05	0.02	7.80E-06	0.01	140	30	0.01%	0.03%	2.0%
New Housing estate to the west of the site	2.94E-06	20	7.8	5.87E-05	0.06	2.29E-05	0.02	140	30	0.04%	0.08%	5.5%

* Tolerable Daily Intake. For dioxins, this is 2pg I-TEQ/kg bodyweight per day, e.g. for a 70 kg adult, the TDI is 70 kg x 2 pg/kg/day = 140 pg/day. The Tolerable inhalation Daily Intake (TiDI) is defined as 20% of the TDI.

**Total inhalation is background concentration added to concentration at sensitive receptor from Alkegen Widnes as calculated from ADMS.

Table 26 Dioxin Inhalation Dose (2019)

Location	PC (ng/m³)	70 kg adult breath (m³/day)	15 kg child breath (m³/ day)	Adult Intake (ng/day)	Adult Intake (pg/day)	Child intake (ng/day)	Child Intake (pg/day)	Adult (70kg) TDI (pg/day)*	Child (15kg) TDI (pg/day)*	Atmospheric inhalation % of adult TDI*	Atmospheric inhalation % of child TDI*	Site % contribution of total adult or child inhalation**
Background	5.00E-05	20	7.8	1.00E-03	1.00	3.90E-04	0.39	140	30	0.71%	1.30%	N/A (background)
At Monitored/Predicted												
Houses off French Street	1.12E-06	20	7.8	2.24E-05	0.02	8.72E-06	0.01	140	30	0.02%	0.03%	2.2%
Caravans at the Warrington Road Site	6.67E-07	20	7.8	1.33E-05	0.01	5.21E-06	0.01	140	30	0.01%	0.02%	1.3%
Farmland Adjacent to Fiddlers Ferry Power Station	4.00E-07	20	7.8	8.00E-06	0.01	3.12E-06	0.003	140	30	0.01%	0.01%	0.8%
New Housing estate to the west of the site	4.12E-07	20	7.8	8.24E-06	0.01	3.21E-06	0.003	140	30	0.01%	0.01%	0.8%
At ELV												
Houses off French Street	2.65E-06	20	7.8	5.31E-05	0.05	2.07E-05	0.02	140	30	0.04%	0.07%	5.0%
Caravans at the Warrington Road Site	1.61E-06	20	7.8	3.21E-05	0.03	1.25E-05	0.01	140	30	0.02%	0.04%	3.1%
Farmland Adjacent to Fiddlers Ferry Power Station	1.00E-06	20	7.8	2.00E-05	0.02	7.80E-06	0.01	140	30	0.01%	0.03%	2.0%
New Housing estate to the west of the site	1.07E-06	20	7.8	2.13E-05	0.02	8.31E-06	0.01	140	30	0.02%	0.03%	2.1%

* Tolerable Daily Intake. For dioxins, this is 2pg I-TEQ/kg bodyweight per day, e.g. for a 70 kg adult, the TDI is 70 kg x 2 pg/kg/day = 140 pg/day. The Tolerable inhalation Daily Intake (TiDI) is defined as 20% of the TDI.

**Total inhalation is background concentration added to concentration at sensitive receptor from Alkegen Widnes as calculated from ADMS.

The table above shows that the background atmospheric concentration of dioxins is substantially larger than the concentration attributable to Alkegen Widnes emissions. From these results it is concluded that the additional contribution from site emissions will only marginally increase the exposure of people at the nearest housing through the inhalation route.

Ingestion of Soil

The additional exposure to dioxins by ingestion of soil in the nearest garden has been assessed. The dry deposition velocity of dioxins is assumed to be 0.002 m/s based on Koestler et al[4]. This figure is increased to 0.006 m/s to account for additional wet deposition.

The results for atmospheric dioxin concentration (see Table 23) have been compared both for the houses off French Street and for the new housing estate to the west of the site, considering all three years' meteorological data. Although the new houses to the west are closer in proximity to the site than the houses off French Street, the ADMS modelling predicts a lower concentration here in 2017 and 2019, most likely due to prevailing conditions such as wind direction. The overall worst-case concentration result is of 1.14E-06 ng TEQ/m^3 at the new housing estate to the west of the site for 2018 meteorological data, therefore this value is carried through into the assessment below.

Deposition over 25 years would give a total of 5.40 ng/m^2, which if mixed with soil, dry density 1.5 kg/l, to a depth of 0.1 m would give an additional soil concentration of 0.04 ng/kg DW. This is compared with the urban guideline value of 8,000 ng/kg.

Using the exposure factor from SC050021/dioxins SGV of 0.0104 pg/kg body weight/day/ng/kgDW, this gives a soil average daily exposure of 0.00037 pg WHO-TEQ/kg body weight/day. This is an order of magnitude less than the inhalation dose.

The tables below present the constants and calculations (respectively) which inform these conclusions.

Table 27 Dioxin Soil Ingestion Calculation Constants

Constant	Value
Dry deposition velocity (m/s)[(4)]	0.002
Wet and dry deposition velocity in nearest garden (m/s)	0.006
Dry soil density kg/L	1.5
Exposure factor (pg/kg body weight/day/ng/kgDW) from SC050021/dioxinsSGV	0.0104
TEF (Toxicity Equivalence Factor)	1
TDSI pg WHO-TEQ/kgBW/day	1

[4] (1) Koester, C.J. and R.A. Hites. 1992. Wet and dry deposition of chlorinated dioxins and furans.

Table 28 Dioxin Soil Ingestion (2017)

	PC (ng/m^3)	Deposition (ng/m^2/s)	Deposition (ng/m^2/yr)	Dioxin conc after 25 years operation (ng/kg)*	Soil average daily exposure (pg WHO-TEQ/kg BW/day)	Adult (70 kg)	Child (15 kg)	Hazard index	% increase due to site contribution
Background	5.00E-05	3.00E-07	9.46	1.5768	0.01640	2.29582	0.49196	0.0164	N/A (background)
At monitored/predicted emissions									
Houses off French Street	1.01E-06	6.06E-09	0.19	0.0319	0.00033	0.04638	0.00994	0.0003	2.0%
Caravan site	3.58E-07	2.15E-09	0.07	0.0113	0.00012	0.01644	0.00352	0.0001	0.7%
Farmland	4.00E-07	2.40E-09	0.08	0.0126	0.00013	0.01837	0.00394	0.0001	0.8%
New Housing estate to the west of the site	3.32E-07	1.99E-09	0.06	0.0105	0.00011	0.01524	0.00327	0.0001	0.7%
At ELV									
Houses off French Street	2.41E-06	1.45E-08	0.46	0.0760	0.00079	0.11066	0.02371	0.0008	4.8%
Caravan site	8.72E-07	5.23E-09	0.16	0.0275	0.00029	0.04004	0.00858	0.0003	1.7%
Farmland	1.00E-06	6.00E-09	0.19	0.0315	0.00033	0.04592	0.00984	0.0003	2.0%
New Housing estate to the west of the site	8.63E-07	5.18E-09	0.16	0.0272	0.00028	0.03963	0.00849	0.0003	1.8%

*Assuming no degradation or re-evaporation, mixing depth 0.1m.

Table 29 Dioxin Soil Ingestion (2018)

	PC (ng/m^3)	Deposition ($ng/m^2/s$)	Deposition ($ng/m^2/yr$)	Dioxin conc after 25 years operation (ng/kg)*	Soil average daily exposure (pg WHO-TEQ/kg BW/day)	Adult (70 kg)	Child (15 kg)	Hazard index	% increase due to site contribution
Background	5.00E-05	3.00E-07	9.46	1.5768	0.01640	2.29582	0.49196	0.0164	N/A (background)
At monitored/predicted emissions									
Houses off French Street	1.13E-06	6.78E-09	0.21	0.0356	0.00037	0.05189	0.01112	0.0004	2.3%
Caravan site	4.70E-07	2.82E-09	0.09	0.0148	0.00015	0.02158	0.00462	0.0002	0.9%
Farmland	4.00E-07	2.40E-09	0.08	0.0126	0.00013	0.01837	0.00394	0.0001	0.8%
New Housing estate to the west of the site	1.15E-06	6.90E-09	0.22	0.0363	0.00038	0.05280	0.01132	0.0004	2.3%
At ELV									
Houses off French Street	2.71E-06	1.63E-08	0.51	0.0855	0.00089	0.12443	0.02666	0.0009	5.4%
Caravan site	1.15E-06	6.90E-09	0.22	0.0363	0.00038	0.05280	0.01132	0.0004	2.3%
Farmland	1.00E-06	6.00E-09	0.19	0.0315	0.00033	0.04592	0.00984	0.0003	2.0%
New Housing estate to the west of the site	2.95E-06	1.77E-08	0.56	0.0930	0.00097	0.13545	0.02903	0.0010	5.9%

*Assuming no degradation or re-evaporation, mixing depth 0.1m.

Table 30 Dioxin Soil Ingestion (2019)

	PC (ng/m³)	Deposition (ng/m²/s)	Deposition (ng/m²/yr)	Dioxin conc after 25 years operation (ng/kg)*	Soil average daily exposure (pg WHO-TEQ/kg BW/day)	Adult (70 kg)	Child (15 kg)	Hazard index	% increase due to site contribution
Background	5.00E-05	3.00E-07	9.46	1.5768	0.01640	2.29582	0.49196	0.0164	N/A (background)
At monitored/predicted emissions									
Houses off French Street	1.12E-06	6.71E-09	0.21	0.0352	0.00037	0.05132	0.01100	0.0004	2.2%
Caravan site	6.67E-07	4.00E-09	0.13	0.0210	0.00022	0.03064	0.00657	0.0002	1.3%
Farmland	4.00E-07	2.40E-09	0.08	0.0126	0.00013	0.01837	0.00394	0.0001	0.8%
New Housing estate to the west of the site	4.12E-07	2.47E-09	0.08	0.0130	0.00014	0.01891	0.00405	0.0001	0.8%
At ELV									
Houses off French Street	2.65E-06	1.59E-08	0.50	0.0837	0.00087	0.12189	0.02612	0.0009	5.3%
Caravan site	1.61E-06	9.64E-09	0.30	0.0507	0.00053	0.07377	0.01581	0.0005	3.2%
Farmland	1.00E-06	6.00E-09	0.19	0.0315	0.00033	0.04592	0.00984	0.0003	2.0%
New Housing estate to the west of the site	1.07E-06	6.39E-09	0.20	0.0336	0.00035	0.04893	0.01048	0.0003	2.1%

*Assuming no degradation or re-evaporation, mixing depth 0.1m.

Data in the tables above show that ingestion of soil contaminated with dioxins from the site will not be a significant route compared with inhalation of dioxins from the site, which has been demonstrated as less than background inhalation.

There are no appropriate air standards available for dioxin emissions, therefore a human health risk assessment approach is used to determine the long term impact of dioxin. This has been used in previous assessment of dioxin emissions from Alkegen Widnes and is an approach that has been accepted by the EA.

Dispersion modelling results are added to background levels (0.05 pg/m^3) to determine the concentration on and off site. The highest concentrations have been used as a worst case.

The recommended WHO Tolerable Daily Intake (TDI) for dioxins is 2 pg I-TEQ/kg bodyweight per day. A weight of 70 kg has been used for average adult weight and 15 kg for a child. The Tolerable inhalation Daily Intake (TiDI) is defined as 20% of the TDI.

It is assumed that the average adult inhalation rate is 20 m^3 of air per day and for children 7.8 m^3 of air per day. These figures have been used to multiply the predicted concentrations in order to give a daily intake.

The calculated amounts for both adults and children are shown in the tables below.

Table 31 Adult Dioxin Health Risk Assessment (TiDI) (2017)

	PC from ADMS Modelling (pg/m^3)	Background Conc (pg/m^3)	PEC (pg/m^3)	Maximum levels of exposure (pg)	TDI (pg) per kg BW	TiDI (pg) per kg BW	TiDI x BW (pg)	% of Recommended TiDI
At monitored levels								
Onsite	2.00E-04	0.05	5.02E-02	1.0	2	0.4	28	3.6%
Offsite	2.40E-03	0.05	5.24E-02	1.0	2	0.4	28	3.7%
At current and proposed limits								
Onsite	5.00E-04	0.05	5.05E-02	1.0	2	0.4	28	3.6%
Offsite	6.00E-03	0.05	5.60E-02	1.1	2	0.4	28	4.0%

Table 32 Child Dioxin Health Risk Assessment (TiDI) (2017)

	PC from ADMS Modelling (pg/m^3)	Background Conc (pg/m^3)	PEC (pg/m^3)	Maximum levels of exposure (pg)	TDI (pg) per kg BW	TiDI (pg) per kg BW	TiDI x BW (pg)	% of Recommended TiDI
At monitored levels								
Onsite	2.00E-04	0.05	5.02E-02	1.0	2	0.4	6	16.7%
Offsite	2.40E-03	0.05	5.24E-02	1.0	2	0.4	6	17.5%
At current and proposed limits								
Onsite	5.00E-04	0.05	5.05E-02	1.0	2	0.4	6	16.8%
Offsite	6.00E-03	0.05	5.60E-02	1.1	2	0.4	6	18.7%

Table 33 Adult Dioxin Health Risk Assessment (TiDI) (2018)

	PC from ADMS Modelling (pg/m^3)	Background Conc (pg/m^3)	PEC (pg/m^3)	Maximum levels of exposure (pg)	TDI (pg) per kg BW	TiDI (pg) per kg BW	TiDI x BW (pg)	% of Recommended TiDI
At monitored levels								
Onsite	2.00E-04	0.05	5.02E-02	1.0	2	0.4	28	3.6%
Offsite	2.00E-03	0.05	5.20E-02	1.0	2	0.4	28	3.7%
At current and proposed limits								
Onsite	5.00E-04	0.05	5.05E-02	1.0	2	0.4	28	3.6%
Offsite	5.00E-03	0.05	5.50E-02	1.1	2	0.4	28	3.9%

Table 34 Child Dioxin Health Risk Assessment (TiDI) (2018)

	PC from ADMS Modelling (pg/m^3)	Background Conc (pg/m^3)	PEC (pg/m^3)	Maximum levels of exposure (pg)	TDI (pg) per kg BW	TiDI (pg) per kg BW	TiDI x BW (pg)	% of Recommended TiDI
At monitored levels								
Onsite	2.00E-04	0.05	5.02E-02	1.0	2	0.4	6	16.7%
Offsite	2.00E-03	0.05	5.20E-02	1.0	2	0.4	6	17.3%
At current and proposed limits								
Onsite	5.00E-04	0.05	5.05E-02	1.0	2	0.4	6	16.8%
Offsite	5.00E-03	0.05	5.50E-02	1.1	2	0.4	6	18.3%

Table 35 Adult Dioxin Health Risk Assessment (TiDI) (2019)

	PC from ADMS Modelling (pg/m³)	Background Conc (pg/m³)	PEC (pg/m³)	Maximum levels of exposure (pg)	TDI (pg) per kg BW	TiDI (pg) per kg BW	TiDI x BW (pg)	% of Recommended TiDI
At monitored levels								
Onsite	2.00E-04	0.05	5.02E-02	1.0	2	0.4	28	3.6%
Offsite	2.00E-03	0.05	5.20E-02	1.0	2	0.4	28	3.7%
At current and proposed limits								
Onsite	5.00E-04	0.05	5.05E-02	1.0	2	0.4	28	3.6%
Offsite	4.50E-03	0.05	5.45E-02	1.1	2	0.4	28	3.9%

Table 36 Child Dioxin Health Risk Assessment (TiDI) (2019)

	PC from ADMS Modelling (pg/m³)	Background Conc (pg/m³)	PEC (pg/m³)	Maximum levels of exposure (pg)	TDI (pg) per kg BW	TiDI (pg) per kg BW	TiDI x BW (pg)	% of Recommended TiDI
At monitored levels								
Onsite	2.00E-04	0.05	5.02E-02	1.0	2	0.4	6	16.7%
Offsite	2.00E-03	0.05	5.20E-02	1.0	2	0.4	6	17.3%
At current and proposed limits								
Onsite	5.00E-04	0.05	5.05E-02	1.0	2	0.4	6	16.8%
Offsite	4.50E-03	0.05	5.45E-02	1.1	2	0.4	6	18.2%

Modelling typical emissions based on monitored levels shows that predicted levels both onsite and offsite are likely to be significantly below the TiDI for adults and children.

The results also show that when current and proposed limits are modelled that predicted levels both onsite and offsite are still likely to be significantly below the TiDI for adults and children.

Food intake

Exposure via the Consumption of Fruit and Vegetables

This scenario is only likely to apply to a small proportion of the local population who grow fruit and vegetables for their own consumption in their gardens in the vicinity of the site. The nearest allotment to the site is 1.2 km from the site and is represented by gardens at French Street.

Dioxin in soil is not generally biologically transferred to fruit or vegetables via the roots and stems. Dioxin contamination of fruit and vegetables from soil is largely by direct surface contamination.

Atmospheric deposition can contaminate both fruit and vegetables. How much of the surface contamination remains in prepared food is variable, e.g. outer surfaces are peeled or otherwise rejected before consumption.

Data is not available to make a realistic prediction; however, worst case could be where open leaves are consumed on a regular basis for example vegetable foliage. Vegetable leaves are unlikely to be available except during the summer.

Taking a surface area of exposed leaves of 1 m^2 and an age of usable leaves of 1 month, this gives a burden of 16 pg for a large sample of vegetable foliage at French Street if all three lines are operating as predicted, for both 2019 and 2018 meteorological data, with 15 pg for 2017 meteorological data. Assuming that a person is unlikely to consume as much as 1 m^2 of vegetable foliage per day, a dietary input could be estimated.

This estimates a summer dietary input of 1.6 pg per day for an adult and 0.8 pg for a child from garden vegetables for 2019 and 2018 meteorological data, with 1.6 pg per day for an adult and 0.8 pg per day for a child for 2017 meteorological data. This could amount to less than 1% of the TDI during part of the year.

Exposure by the Consumption of Poultry and Eggs

This scenario could apply to those individuals who derive their total consumption of eggs and poultry meat produced within the potential zone of exposure of the emissions from the site.

No registered flocks of chickens kept near Widnes have been identified. Nevertheless, the consumption of domestically managed chickens and eggs could be a potential exposure pathway. This is a foreseeable scenario since there is no requirement for a householder to seek permission to keep chickens provided the flock is less than 50 birds nor is it necessary to notify the owners of a nearby industrial process if they did. This could be a pathway for dioxin exposure and as such it is appropriate that it should be investigated.

Accordingly, an assessment for exposure to dioxins has been undertaken for the intake of dioxins via the consumption of eggs and chicken in order to represent a possible future scenario where the rearing of free-range eggs and poultry became significant.

The US EPA Human Health Risk Assessment Protocol (HHRAP) methodology was taken into account to assess the potential exposure to dioxins arising from emissions from the site.

The following approach was used to estimate the potential dioxin concentration in eggs due to ingestion of soil and grain by free-range chickens reared at the nearest housing.

Concentration of dioxin in eggs was estimated by summing dioxin in diet from grain and dioxin ingested from soil and assuming a biotransfer factor of 1 from hens to eggs. Taking into account:

- Quantity of grain ingested by chickens – assumed to be 0.2 kg/d (US EPA HHRAP)
- Concentration of dioxin in grain is based on data published by the EC Scientific Committee on Animal Nutrition.

This Committee conclude that:

"All other feed materials of plant (roughages, cereals, legume seeds) and animal (milk by-products, meat and bone meal) origin contain mean concentrations of dioxins around or below 0.2 ng WHO-TEQ/kg DM."

The fraction of grain grown on soil contaminated by dioxin from the site and ingested by chickens is assumed to be very low as feed grain for hens in local gardens would have been bought in from national suppliers that would only very marginally be affected by emissions from the site. The same is also typical at the nearest free range hen farms in the Widnes area, which is over 4 km from the site.

- Quantity of soil ingested by chicken – assumed to be 0.022 kg day-1 (US EPA HHRAP)
- Maximum annual average incremental increase in dioxin concentration in soil – estimated by modelling to be of the order of 0.0014 ng/kg based on a dioxin deposition velocity of 0.006 m/s and an annual mean concentration of 1.13E-06 ng/m^3;
- Soil bioavailability factor – assumed to be 1.0 (US EPA HHRAP)
- Biotransfer factor for chicken eggs – assumed to be 1.09984 (US EPA HHRAP Database)

As the chickens eat about 0.2 kg of grain with somewhat below 0.2 ng WHO-TEQ/kg DM and ingest 0.022 kg of soil where the incremental increase in dioxin is of the order of 0.0014 ng WHO-TEWQ/kg DW, the influence of dioxin from the site on dioxin in eggs from hens at nearby housing is minimal. The same argument would apply to chicken meat.

Breast Milk

The dioxin content of breast milk will depend on the total intake of the mother from all sources. At the nearest housing, the calculations above suggest that Alkegen Widnes emissions will increase the total intake of dioxins from all routes by less than 1% of the TDI.

Dioxin Conclusion

The methods for estimating inhalation dose and dose from soil are relatively well established. The combined inhalation and soil ingestion dose has been shown to be very much less than the tolerable daily intake (TDI).

The UK Soil Guideline value for residential areas of 8,000 ng/kg dry weight is compared with the additional dioxin input from the site (lines 2, 3 and 4) over 25 years of 0.036 ng/kg. This is the highest predicted concentration based on the ADMS modelling for the new housing estate to the west of the site (using 2018 meteorological data).

The methodology for estimating human intake from home grown vegetables and home raise poultry and eggs due to atmospheric deposition is much less well established for an urban area such as Widnes.

The UK guideline value for garden soil takes into account soil contamination of home grown produce that is taken to include vegetables and eggs.

Detailed modelling of dioxin emissions combined with an assessment of potential routes by which dioxins could reach human receptors shows that emissions from the site have the potential to marginally increase the dioxin burden to the nearest human receptors, but is minimal and not of concern.

3 Mitigation

The following section provides details of the abatement techniques and technologies in place onsite and accounted for within the modelling to ensure the emissions from the site are minimised. These abatement techniques have been shown to ensure there are no adverse effects from site emissions. An assessment of the best available techniques selected (BAT) has been carried out separately from this assessment and is not within the scope of this report.

3.1 Main process stacks (A3, A5 and A11)

The pollutants are reduced via very similar air abatement systems before being discharged via stack to atmosphere.

The process includes the following equipment:

- VOC and dioxin emissions arising in the LT furnace and Decomposition oven are extracted and pre-filtered (to remove particulate matter) ahead of being rapidly quenched (to prevent the possibility of dioxin reformation) before passing to the thermal oxidiser and then to the two stage scrubbing system.
- A second stage scrubber circulating the make-up water into the emissions control plant. The two-stage scrubber provides an effective means of reducing the HCl concentration in the gas. The dilute acid solution from the second stage is fed to the first stage scrubber where the vent gas is quenched and contacted with a dilute HCl solution.

Both scrubbers are complete with duty/standby circulation pumps, and a similar degree of control and instrumentation to the first stage scrubber.

The vent gas ducting enables the secondary air from the spinning section to be passed through the scrubbers. This reduces the overall HCl emission at the stack.

3.2 Dust extraction (A2, A4, A6, A12a/b)

For all lines, the dust extraction system comprises a large bag filter system exhausting at height via a stack. The systems in place are effective for limiting concentrations emitted to below levels accepted within the environmental permit.

3.3 Boiler emissions (A7, A9, A13, A14)

Emissions from the boilers are minimised as follows:

- NOx emissions are minimised by using natural gas as a main fuel burnt in low NOx burners
- SOx emissions are minimised by choice of low sulphur fuels
- CO_2 emissions are minimised by energy efficiency measures such as installation of flue gas economisers (3-4% improvement), modulating burners with inverter driven combustion air fans, automated blowdown systems and blowdown heat recovery.

4 Conclusion

Detailed dispersion modelling has been carried out using ADMS 5.2.2 to assess the impacts of the site on both nearby environmental receptors and human receptors.

The results from the H1 assessment and subsequent detailed dispersion modelling assessment have shown overall that the site will not have any significant impacts on the nearby environmental and human receptors and the concentrations are below all the relevant air quality and environmental standards, both with predicted emission concentrations and also if the site were operating at the top end of the permitted range (at the emission limit values).

It is believed that based on the results of the dispersion modelling that sufficient mitigation measures are in place to prevent adverse impacts on nearby receptors and no further mitigation is necessary.

5 Appendices

The following appendices are provided in this document:

- Appendix 1 – H1 assessment
- Appendix 2 – Building/stack location map
- Appendix 3 – Receptor map

5.1 Appendix 1 – H1 assessment

RISK & HAZARD MANAGEMENT

H1 Risk Assessment

Unifrax, Widnes

Safety Risk   Business Risk   Environment Risk

Document History

Version	Issue	Date	Notes	Authors	Reviewer
1	Draft	28/03/21	Internal draft	J. Carroll	C. Nicholls
2	1	14/04/22	Draft issued to client	J. Carroll	C. Nicholls
3	2	11/05/22	Updated draft issued pending potential further changes.	J. Carroll	C. Nicholls
4	3	21/06/22	Updated based on an additional stack and revised coordinates.	R. Ritchie	C. Nicholls
5	4	30/06/22	Minor updates to coordinates of emissions points A2, A5, A6, A11, A12a and A12b.	R. Ritchie	C. Nicholls

Contents

1 Introduction

Unifrax is proposing to install a fourth production line for Saffil alumina fibre, known as Line 4 at their site in Widnes. As part of the permit variation application, the H1 Risk Assessment has been updated in light of this proposed expansion.

The Saffil fibre process generates a number of pollutants which are treated in an abatement plant before being released to atmosphere under permit emission limits. The principal pollutants are volatile organic compounds (VOCs), dioxins, hydrochloric acid (HCl) and particulates.

This document contains the results from the H1 Risk Assessment update. As part of this update, information related to the emission points A1 and S1 for Line 1 has been removed from the H1 tool as that production line is no longer in use, however the dust collector and water emissions points from Line 1 are still in use in some capacity therefore remain within the assessment.

Information related to Line 4 has been added using the data for Line 3 as a worst-case estimate as the information for Line 4 is not yet available; the emissions are however expected to be less significant than for Line 3. The difference between Lines 3 and 4 are that point A11 will have an additional spinner therefore the flow has been increased to account for this and also, there will be two emission points for particulates. A new boiler emission point has also been added, using the details from boiler emission point A9 as requested by the site, as emission limits proposed for the new boiler will match that of A9 currently (100 mg/m^3). The boiler emission point A8 has also been removed as this boiler is not in operation. Finally, there will also be an additional stack, A14 (indirect gas firing – heat treatment).

Emission concentrations for Line 2 and Line 3 have been updated, using an average of the emissions figures from 2016-2021 for average concentrations, and the worst-case concentration over this period for maximum concentrations. 2020 data has been excluded due to the impacts of the COVID-19 pandemic.

Details regarding which emission sources have been screened out due to not having significant contributions and not breaching the emission limits within the H1 tool are provided, in addition to those which have not been screened out and therefore require further assessment.

Where further assessment is needed, detailed modelling is performed and the results provided within a separate report.

2 Impact to Air

2.1 Emissions to Air

The table below indicates the point source emissions to air from the site:

Table 1 Point Sources to Air

Emission point	Grid reference	Source	Effective Height (m)	Efflux velocity (m/s)	Total flow (m^3/hr)	Emissions
A2	352922 385322	Line 1 dust collection	14.5	13.1	35,604	Particulates
A3	352868 385336	Line 2 ovens	40	6.9	43,708	Dioxin
A4	352917 385346	Line 2 dust collection	8.15	12.2	29,886	Particulates
A5	352923 385285	Line 3 ovens	40	7.8	49,431	Dioxin
A6	352978 385299	Line 3 dust collection	20	19.4	47,338	Particulates
A7	352942 385328	Boiler	30	4.8	4,924	NOx
A9	352942 385328	Boiler	30	14.1	14,302	NOx
A11	352951 385254	Line 4 ovens	40	8.7	55,610	Dioxin
A12a	353043 385288	Line 4 dust collection part a (general process dust extraction)	20	19.4	47,338	Particulates
A12b	353021 385278	Line 4 dust collection part b (fibre picking, shredding and milling)	20	19.4	47,338	Particulates
A13	352942 385328	Boiler	30	14.1	14,302	NOx
A14	352933 385247	Indirect gas firing – heat treatment	30	15	6,405	NOx

The emissions from the sources above are grouped into the following categories:

- Class A VOCs
- Class B VOCs
- Other VOCs
- Hydrogen chloride
- Particulates
- Nitrogen dioxide (NO_2, representative of nitrogen oxides (NOx))
- Sulphur dioxide (SO_2, representative of sulphur oxides (SOx))
- Dioxins

The tables in the sections below present the results of the H1 Screening Assessment for each of these substances in turn.

2.1.1 Class A VOCs

A summary of the Class A VOC emission measurements is shown in the table below. Note: acetaldehyde has been taken as the representative substance of Class A VOC emissions, as it is by far the dominating individual substance within the Class A category from 2016 to 2018 and was taken as representative in previous assessments submitted to the EA also. The method for monitoring VOCs has altered in the last couple of years, altering from individual components to just a total of Class A from 2019 onwards in line with the permit monitoring requirements and thus taking averages of each individual VOC is not possible for the full data set and not representative of how emissions are monitored in line with the permit.

Table 2 Individual Class A VOCs emissions data

Substance	Measurement basis	Line 2 (A3) Emission	Line 3 (A5) Emission	Line 4 (A11) Emission
Acetaldehyde	Long term av. conc. (mg/m^3)	6.53	9.59	9.59
	Peak conc. (mg/m^3)	32.8	52.9	52.9

The screening results from the H1 Risk Assessment tool are provided in the table below.

Table 3 Class A VOC Screening Results

Substance	Long Term EAL ($\mu g/m^3$)	Short Term EAL ($\mu g/m^3$)	Long Term				Short Term			
			PC ($\mu g/m^3$)	% PC of EAL	> 1% EAL	Significant?	PC ($\mu g/m^3$)	% PC of EAL	> 10% EAL	Significant?
Acetaldehyde	370	9200	0.399	0.108	No	No	105	1.14	No	No

The above emissions have been screened out as insignificant because process contributions are significantly below 1% and 10% of the EAL respectively for long and short term impact.

2.1.2 Class B VOCs

A summary of the individual Class B VOC emission measurements is shown in the table below. Note: toluene has been taken as the representative substance of Class B VOC emissions based on the analysis methods applied by the monitoring companies and in line with permit monitoring requirements.

Table 4 Individual Class B VOCs emissions data

Substance	Measurement basis	Line 2 (A3) Emission	Line 3 (A5) Emission	Line 4 (A11) Emission
Toluene	Long term av. conc. (mg/m^3)	3.1	9.43	9.43
	Peak conc. (mg/m^3)	17.7	73.10	73.10

The screening results from the H1 Risk Assessment tool are provided in the table below.

Table 5 VOC Screening Results

Substance	Long Term EAL (µg/m³)	Short Term EAL (µg /m³)	Long Term				Short Term			
			PC (µg /m³)	% PC of EAL	> 1% EAL	Significant?	PC (µg /m³)	% PC of EAL	> 10% EAL	Significant?
Toluene	1,910	8,000	0.348	0.0182	No	No	127	1.59	No	No

All of the above emissions have been screened out as insignificant because process contributions are significantly below 1% and 10% of the EAL respectively for long and short term impact.

2.1.3 Other VOCs

A summary of the individual other VOC emission measurements is shown in the table below.

Table 6 Individual Other VOCs emissions data

Substance	Measurement basis	Line 2 (A3) Emission	Line 3 (A5) Emission	Line 4 (A11) Emission
Ethylene oxide	Long term av. conc. (mg/m³)	0.77	0.51	0.51
	Peak conc. (mg/m³)	4.6	1.7	1.7
Vinyl chloride	Long term av. conc. (mg/m³)	0.8	0.87	0.87
	Peak conc. (mg/m³)	8.2	5.5	5.5

The screening results from the H1 Risk Assessment tool are provided in the table below:

Table 7 VOC Screening Results

Substance	Long Term EAL (µg/m³)	Short Term EAL (µg /m³)	Long Term				Short Term			
			PC (µg /m³)	% PC of EAL	> 1% EAL	Significant?	PC (µg /m³)	% PC of EAL	> 10% EAL	Significant?
Ethylene Oxide	18.5	552	0.0268	0.146	No	No	5.7	1.04	No	No
Vinyl Chloride	159	1,851	0.0390	0.0246	No	No	14	0.759	No	No

All of the above emissions have been screened out as insignificant because process contributions are significantly below 1% and 10% of the EAL respectively for long and short term impact.

2.1.4 Hydrogen Chloride

A summary of the hydrogen chloride emission measurements is shown in the table below.

Table 8 Hydrogen chloride emissions data

Measurement basis	Line 2 (A3) Emission	Line 3 (A5) Emission	Line 4 (A11) Emission
Long term av. conc. (mg/m^3)	0.71	2.23	2.23
Peak conc. (mg/m^3)	2.4	8.5	8.5

The screening results from the H1 Risk Assessment tool are provided in the table below:

Table 9 HCl Screening Results

Long Term EAL (µg/m^3)	Short Term EAL (µg/m^3)	Long Term				Short Term			
		PC (µg/m^3)	% PC of EAL	> 1% EAL	Significant?	PC (µg/m^3)	% PC of EAL	> 10% EAL	Significant?
-	750	0.082	-	-	-	15	2.0	No	No

The above emissions have been screened out as insignificant because process contributions are significantly below 1% and 10% of the EAL respectively for long and short term impact.

2.1.5 Particulates

A summary of the particulates emission measurements is shown in the table below.

Table 10 Particulates emissions data

Substance	Measurement basis	Line 1 (A2) Emission	Line 2 (A4) Emission	Line 3 (A6) Emission	Line 4 (A12a) Emission	Line 4 (A12b) Emission
PM10	Long term av. conc. (mg/m^3)	1.05	0.91	1.07	1.07	1.07
PM10	Peak conc. (mg/m^3)	2.90	3.20	2.80	2.80	2.80
PM2.5	Long term av. conc. (mg/m^3)	0.16	0.14	0.16	0.16	0.16
PM2.5	Peak conc. (mg/m^3)	0.44	0.48	0.42	0.42	0.42

The screening results from the H1 Risk Assessment tool are provided in the table below:

Table 11 Screening Results

Substance	Long Term EAL (µg/m³)	Short Term EAL (µg /m³)	Long Term				Short Term			
			PC (µg/m³)	% PC of EAL	> 1% EAL	Significant?	PC (µg/m³)	% PC of EAL	> 10% EAL	Significant?
PM10	40	50	0.794	1.99	Yes	Yes	60.8	121	Yes	Yes
PM2.5	25	-	0.119	0.475	No	No	-	-	-	-

Calculation of the process contribution and comparison with the EAL for particulate emissions using the H1 methodology indicated that the maximum percentage EAL for all lines for both long and short term is above the value that may be judged as insignificant and so requires second stage screening.

For the second stage screening, the predicted environmental concentration (PEC) is calculated by adding the Process Contribution to the background concentration.

Background concentration data for particulates were obtained using the UK Air Quality Archive website predicted 2019 levels for the Unifrax area[1]. The short term background concentration has been taken to be twice the average long term concentration.

Table 12 Short Term Screening Results

Short Term PC From H1 (µg/m³)	Background Conc (µg/m³)	Short Term EAL (µg/ m³)	%PC /Headroom	Short Term Significance Test 1 PC>20% Of Headroom
60.8	24.08	50	234	DETAILED MODELLING REQUIRED

The short term criteria to determine if detailed dispersion modelling is required is if the Process Contribution (PC) is greater than 20% of the headroom between the background concentration and the Environmental Assessment Level (EAL). The results show further detailed modelling is required for the short term impact case.

Table 13 Long Term Screening Results

Long Term PC From H1 (µg/m³)	Background Conc (µg/m³)	PEC (µg/m³)	Long Term EAL (µg/m³)	% PEC/EAL	Headroom (EAL Minus Background)	%PC /Headroom	PEC>70% of EAL Long Term Significance Test 1	PC>20% of Headroom Long Term Significance Test 2
0.794	12.04	12.834	40	32.09	27.96	2.84	*NO FURTHER EVALUATION*	*NO FURTHER EVALUATION*

There are two long term criteria used to identify whether the emissions require any detailed modelling in order to determine the impact. The first criterion is long term Predicted Environmental Concentration (PEC) greater than 70% of the EAL. The second criterion is Process Contribution (PC) greater than 20% of the headroom between the

[1] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

background concentration and the Environmental Assessment Level (EAL). The results show further detailed modelling is not required for the long term impact case.

2.1.6 Nitrogen Dioxide

A summary of the nitrogen dioxide emission measurements is shown in the table below.

Table 14 Nitrogen dioxide emissions data

Measurement basis	A7 Emission	A9 Emission	A13 Emission	A14 Emission
Long term av. conc. (mg/m^3)	119	93	93	50
Peak conc. (mg/m^3)	152	117	117	117

Note: there is expected to be a small amount of NOx released from emission point A11 due to gas burning in the high temperature kiln used in this operation, but this is expected to be insignificant versus the overall emissions from the boilers.

The screening results from the H1 Risk Assessment tool are provided in the table below:

Table 15 NO_2 Screening Results

Long Term EAL ($\mu g/m^3$)	Short Term EAL ($\mu g/m^3$)	Long Term				Short Term			
		PC ($\mu g/m^3$)	% PC of EAL	> 1% EAL	Significant?	PC ($\mu g/m^3$)	% PC of EAL	> 10% EAL	Significant?
40	200	1.68	4.20	Yes	Yes	104	51.9	Yes	Yes

Calculation of the Process contribution and comparison with the EAL for nitrogen dioxide using the H1 methodology indicated that the maximum percentage EAL for all lines for both long and short term is above the value that may be judged as insignificant and so requires second stage screening.

For the second stage screening, the predicted environmental concentration (PEC) is calculated by adding the Process Contribution to the background concentration.

Background concentration data for Nitrogen Dioxide were obtained using the UK Air Quality Archive website predicted 2019 levels for the Unifrax area[1]. The short term background concentration has been taken to be twice the average long term concentration.

Table 16 Short Term Screening Results

Short Term PC From H1 ($\mu g/m^3$)	Background Conc ($\mu g/m^3$)	Short Term EAL ($\mu g/m^3$)	%PC /Headroom	Short Term Significance Test 1 PC>20% Of Headroom
104	28.6	200	60.5	*DETAILED MODELLING REQUIRED*

The short term criterion to determine if detailed dispersion modelling is required is if the Process Contribution (PC) is greater than 20% of the headroom between the background concentration and the Environmental Assessment Level (EAL). The short term results show that further detailed modelling is required.

Table 17 Long Term Screening Results

Long Term PC From H1 (µg/m³)	Background Conc (µg/m³)	PEC (µg/m³)	Long Term EAL (µg/m³)	% PEC/ EAL	%PC /headroom	PEC>70% of EAL Long Term Significance Test 1	PC>20% of Headroom Long Term Significance Test 2
1.68	14.3	16.0	40	40.0	6.53	*NO FURTHER EVALUATION*	*NO FURTHER EVALUATION*

There are two long term criteria used to identify whether the emissions require any detailed modelling in order to determine the impact. The first criterion is long term Predicted Environmental Concentration (PEC) greater than 70% of the EAL. The second criterion is Process Contribution (PC) greater than 20% of the headroom between the background concentration and the Environmental Assessment Level (EAL). Neither of these two criteria are exceeded. Nevertheless, modelling has still been undertaken to assess the impact on specific environmental receptors.

2.1.7 Sulphur Dioxide

A summary of the sulphur dioxide emission measurements is shown in the table below. These were not available from the emissions monitoring reports provided, thus the maximum allowable concentrations used within the previous assessment were used.

Table 18 Sulphur dioxide emissions data

Measurement basis	A7 Emission	A9 Emission	A13 Emission	A14 Emission
Long term av. conc. (mg/m³)	0.29	0.15	0.15	0.15
Peak conc. (mg/m³)	0.29	0.15	0.15	0.15

The screening results from the H1 Risk Assessment tool are provided in the table below:

Table 19 SOx Screening Results

Long Term EAL (µg/m³)	Short Term EAL (µg/m³)	Long Term				Short Term			
		PC (µg/m³)	% PC of EAL	> 1% EAL	Result	PC (µg/m³)	% PC of EAL	> 10% EAL	Result
350	125	0.00331	0.0009	No	*NO FURTHER EVALUATION*	0.150	0.12	No	*NO FURTHER EVALUATION*

The above emission has been screened out as insignificant because process contribution is significantly below 1% and 10% of the EAL respectively for long and short term impacts.

2.1.8 Dioxins

There are no EALs for dioxins, thus screening within the H1 tool is not possible and detailed modelling will be undertaken instead, as per the assessment completed as part of the permit variation in 2011.

3 Impact to Water and Sewer

3.1 Emissions to Water

The table below indicates the point source emissions to water from the site:

Table 20 Point Sources to Water

Emission point	Discharge Point	Mean effluent flow rate (m^3/s)
W1	River Mersey Middle Estuary	0.00042
W2	River Mersey Middle Estuary	0.00014
W3	River Mersey Middle Estuary	0.00042

A summary of the individual emission measurements is shown in the table below.

Table 21 Emissions to water

		W1 Emissions	W2 Emissions	W3 Emissions
pH	Long term av value	7.3	8.4	8.3
	Peak value	9.1	8.7	10.2
Chemical oxygen demand (COD)	Long term av. conc. (µg/L)	60,647	26,584	56,986
	Peak conc. (µg/L)	682,000	56,000	197,000
Suspended Solids	Long term av. conc. (µg/L)	152,222	4,021	96,424
	Peak conc. (µg/L)	1,440,000	12,000	1,070,000
Mercury	Long term av. conc. (µg/L)	0.39	-	1.67
	Peak conc. (µg/L)	4.45	-	38.36
Cadmium	Long term av. conc. (µg/L)	0.32	-	0.48
	Peak conc. (µg/L)	1.7	-	3.25
Aluminium	Long term av. conc. (µg/L)	64,352	-	6,781
	Peak conc. (µg/L)	1,280,000	-	59,300
Dry Weather flow	m^3/hr	1.5	0.51	1.5
Temperature	°C	23	30	17

3.2 Emissions to Sewer

The table below indicates the point source emissions to sewer from the site. There is an emission point (S4) from the boilers, but this is mainly for hot water and only pH monitoring is required as per the permit so it is not included here.

Table 22 Point Sources to Sewer

Emission point	Discharge Point	Mean effluent flow rate (m^3/s)
S2	River Mersey Pickerings	0.00035
S3	River Mersey Pickerings	0.0014
S5**	River Mersey Pickerings	0.0014

**As per emission point S3 (line 3)

A summary of the individual emission measurements is shown in the table below.

Table 23 Emissions to sewer

		S2 Emissions	S3 Emissions	S5 Emissions
pH	Long term av value	8.23	7.6	7.6
COD	Long term av. conc. (µg/L)	411,188	404,815	404,815
	Peak conc. (µg/L)	735,000	876,000	876,000
Suspended Solids	Long term av. conc. (µg/L)	225,583	206,722	206,722
	Peak conc. (µg/L)	732,000	376,000	376,000
Mercury	Long term av. conc. (µg/L)	0.06	0.04	0.04
	Peak conc. (µg/L)	0.22	0.07	0.07
Cadmium	Long term av. conc. (µg/L)	1.18	1.05	1.05
	Peak conc. (µg/L)	2.83	2.83	2.83
Dichloroethane	Long term av. conc. (µg/L)	6.21	15.04	15.04
	Peak conc. (µg/L)	7.0	50.3	50.3
Lead	Long term av. conc. (µg/L)	21.74	20.8	20.8
	Peak conc. (µg/L)	59.74	59.7	59.7
Copper	Long term av. conc. (µg/L)	43.04	36.07	36.07
	Peak conc. (µg/L)	160	166	166
Zinc	Long term av. conc. (µg/L)	136	41.29	41.29
	Peak conc. (µg/L)	1,840	199	199
Chromium	Long term av. conc. (µg/L)	348	302	302
	Peak conc. (µg/L)	3,010	680	680

		S2 Emissions	S3 Emissions	S5 Emissions
Nickel	Long term av. conc. (µg/L)	694	636	636
	Peak conc. (µg/L)	2,280	1,420	1,420
Dichloromethane	Long term av. conc. (µg/L)	7.04	6.97	6.97
	Peak conc. (µg/L)	8.15	7.39	7.39
Trichloromethane	Long term av. conc. (µg/L)	28.2	70.23	70.23
	Peak conc. (µg/L)	55.3	385	385
Trichloroethane	Long term av. conc. (µg/L)	0.63	0.64	0.64
	Peak conc. (µg/L)	0.69	0.69	0.69
Tetrachloroethane	Long term av. conc. (µg/L)	0.62	0.63	0.63
	Peak conc. (µg/L)	0.72	0.72	0.72
Carbon tetrachloride	Long term av. conc. (µg/L)	0.72	0.71	0.71
	Peak conc. (µg/L)	0.74	0.74	0.74
Trichlorobenzene	Long term av. conc. (µg/L)	2.99	3.03	3.03
	Peak conc. (µg/L)	3.6	3.6	3.6
Toluene	Long term av. conc. (µg/L)	4.89	4.92	4.92
	Peak conc. (µg/L)	5.44	5.44	5.44
Xylene	Long term av. conc. (µg/L)	8.96	8.96	8.96
	Peak conc. (µg/L)	9.69	9.69	9.69

3.3 Overall Impact

3.3.1 Test 1

The screening results from test 1 within the H1 Risk Assessment tool for releases to water and sewer against the Environmental Quality Standards (EQS) are provided in the table below.

Table 24 Test 1 Screening Results

	Annual average EQS			MAC EQS		
Substance	**Release (µg/L)**	**EQS µg/L)**	**<10% EQS Result**	**Release (µg/L)**	**EQS µg/L**	**<10% EQS Result**
Point W1						
COD	60,647	N/A	N/A	682,000	N/A	N/A
Aluminium	64,352	N/A	N/A	1,280,000	N/A	N/A
Cadmium	0.32	0.07	Fail	1.70	0.44	Fail
Mercury	0.39	N/A	N/A	4.45	0.07	Fail
Suspended Solids	152,222	N/A	N/A	1,440,000	N/A	N/A
Point W2						
COD	26,584	N/A	N/A	56,000	N/A	N/A
Suspended Solids	4,021	N/A	N/A	12,000	N/A	N/A
Point W3						
COD	56,986	N/A	N/A	197,000	N/A	N/A
Aluminium	6,781	N/A	N/A	59,300	N/A	N/A
Cadmium	0.48	0.07	Fail	3.25	0.44	Fail
Mercury	1.67	N/A	N/A	38.36	0.07	Fail
Suspended Solids	96,424	N/A	N/A	1,070,000	N/A	N/A
Point S2						
Dichloroethane	6.21	10	Fail	7.0	N/A	N/A
Dichloromethane	7.04	20	Fail	8.15	N/A	N/A
Cadmium	1.18	0.07	Fail	2.83	0.44	Fail
COD	411,188	N/A	N/A	735,000	N/A	N/A
Mercury	0.06	N/A	N/A	0.22	0.07	Fail
Nickel	694	4.0	Fail	2,280	34	Fail

	Annual average EQS			MAC EQS		
Substance	Release (µg/L)	EQS µg/L)	<10% EQS Result	Release (µg/L)	EQS µg/L	<10% EQS Result
Suspended Solids	225,583	N/A	N/A	732,000	N/A	N/A
Chromium	348	3.4	Fail	3,010	N/A	N/A
Copper	43.04	1	Fail	160	N/A	N/A
Lead	21.74	1.2	Fail	59.74	14	Fail
Carbon tetrachloride	0.72	12	Pass	0.74	N/A	N/A
Trichloroethane	0.63	400	Pass	0.69	N/A	N/A
Tetrachloroethane	0.62	140	Pass	0.72	1,848	Pass
Toluene	4.89	74	Pass	5.44	380	Pass
Trichlorobenzenes	2.99	0.40	Fail	3.6	N/A	N/A
Trichloromethane	28.2	2.5	Fail	55.3	N/A	N/A
Xylene	8.96	N/A	N/A	9.69	N/A	N/A
Zinc	136	10.9	Fail	1,840	N/A	N/A
Point S3						
Dichloroethane	15.04	10	Fail	50.3	N/A	N/A
Dichloromethane	6.97	20	Fail	7.39	N/A	N/A
Cadmium	1.05	0.07	Fail	2.83	0.44	Fail
COD	404,815	N/A	N/A	876,000	N/A	N/A
Mercury	0.04	N/A	N/A	0.07	0.07	Fail
Nickel	636	4	Fail	1,420	34	Fail
Suspended Solids	206,722	N/A	N/A	376,000	N/A	N/A
Chromium	302	3.4	Fail	680	N/A	N/A
Copper	36.07	1	Fail	166	N/A	N/A
Lead	20.78	1.2	Fail	59.7	14	Fail
Carbon tetrachloride	0.71	12	Pass	0.74	N/A	N/A
Trichloroethane	0.64	400	Pass	0.69	N/A	N/A
Tetrachloroethane	0.63	140	Pass	0.72	1,848	Pass
Toluene	4.92	74	Pass	5.44	380	Pass
Trichlorobenzenes	3.03	0.4	Fail	3.6	N/A	N/A
Trichloromethane	70.23	2.5	Fail	385	N/A	N/A
Xylene	8.96	N/A	N/A	9.69	N/A	N/A

Substance	Annual average EQS			MAC EQS		
	Release (µg/L)	EQS µg/L)	<10% EQS Result	Release (µg/L)	EQS µg/L	<10% EQS Result
Zinc	41.29	10.9	Fail	199	N/A	N/A
Point S5						
Dichloroethane	15.04	10	Fail	50.3	N/A	N/A
Dichloromethane	6.97	20	Fail	7.39	N/A	N/A
Cadmium	1.05	0.07	Fail	2.83	0.44	Fail
COD	404,815	N/A	N/A	876,000	N/A	N/A
Mercury	0.04	N/A	N/A	0.07	0.07	Fail
Nickel	636	4	Fail	1,420	34	Fail
Suspended Solids	206,722	N/A	N/A	376,000	N/A	N/A
Chromium	302	3.4	Fail	680	N/A	N/A
Copper	36.07	1	Fail	166	N/A	N/A
Lead	20.78	1.2	Fail	59.7	14	Fail
Carbon tetrachloride	0.71	12	Pass	0.74	N/A	N/A
Trichloroethane	0.64	400	Pass	0.69	N/A	N/A
Tetrachloroethane	0.63	140	Pass	0.72	1,848	Pass
Toluene	4.92	74	Pass	5.44	380	Pass
Trichlorobenzenes	3.03	0.4	Fail	3.6	N/A	N/A
Trichloromethane	70.23	2.5	Fail	385	N/A	N/A
Xylene	8.96	N/A	N/A	9.69	N/A	N/A
Zinc	41.29	10.9	Fail	199	N/A	N/A

Where a fail result is returned in the table above, these substances are carried through into test 2.

3.3.2 Test 2

The screening results from Test 2 within the H1 Risk Assessment tool for releases to water and sewer are provided in the table below:

Table 25 Test 2 Screening Results

Substance	Annual average EQS				MAC EQS			
	Annual Avg EQS (µg/L)	PC (µg/L)	%PC of EQS	PC < 4% of EQS?	MAC EQS (µg/L)	PC	%PC of MAC	PC <4% of MAC?
River Mersey Pickerings (Sewer)								
Dichloroethane (Pickerings)	10	0.0003	0.00	Pass	-	0.0012	-	Pass
Cadmium (Pickerings)	0.07	0.0000	0.02	Pass	0.44	0.0000	0.00784	Pass
Chromium (Pickerings)	3.4	0.0052	0.15	Pass	-	0.0116	-	Pass
Copper (Pickerings)	1	0.0002	0.02	Pass	-	0.0011	-	Pass
Dichloromethane (Pickerings)	20	0.0000	0.00	Pass	-	0.0000	-	Pass
Lead (Pickerings)	1.2	0.0001	0.01	Pass	14	0.0003	0.00239	Pass
Mercury (Pickerings)	-	0.0000	-	Pass	0.07	0.0000	0.00221	Pass
Nickel (Pickerings)	4	0.0159	0.40	Pass	34	0.0355	0.105	Pass
Trichlorobenzenes (Pickerings)	0.4	0.0000	0.00	Pass	-	0.0000	-	Pass
Trichloromethane (Pickerings)	2.5	0.0000	0.00	Pass	-	0.0001	-	Pass
Zinc (Pickerings)	10.9	0.0004	0.00	Pass	-	0.0022	-	Pass

After test 2 screening, all results were deemed to pass and not exceed the emission limits, therefore the screening ends here and tests 3 and 4 were not needed within the H1.

3.3.3 Significant Loads

The next step of the H1 is to carry out the significant loads test. The results are provided in the table below.

Table 26 Water Impact - Significant Loads

Discharge location	Substance	Annual load (kg)	Significant load for substance (kg)	Part B Significance Load Test
River Mersey Middle Estuary	Cadmium	0.0106	5	Pass
	Mercury	0.027	1	Pass
River Mersey Pickerings	Cadmium	0.013	5	Pass
	Mercury	0.0010	1	Pass

The results from the table above show that the significant loads for both Cadmium and Mercury are not breached.

4 Conclusions

The H1 screening assessment has been carried out for the Unifrax Widnes site, based on the proposed expansion plans.

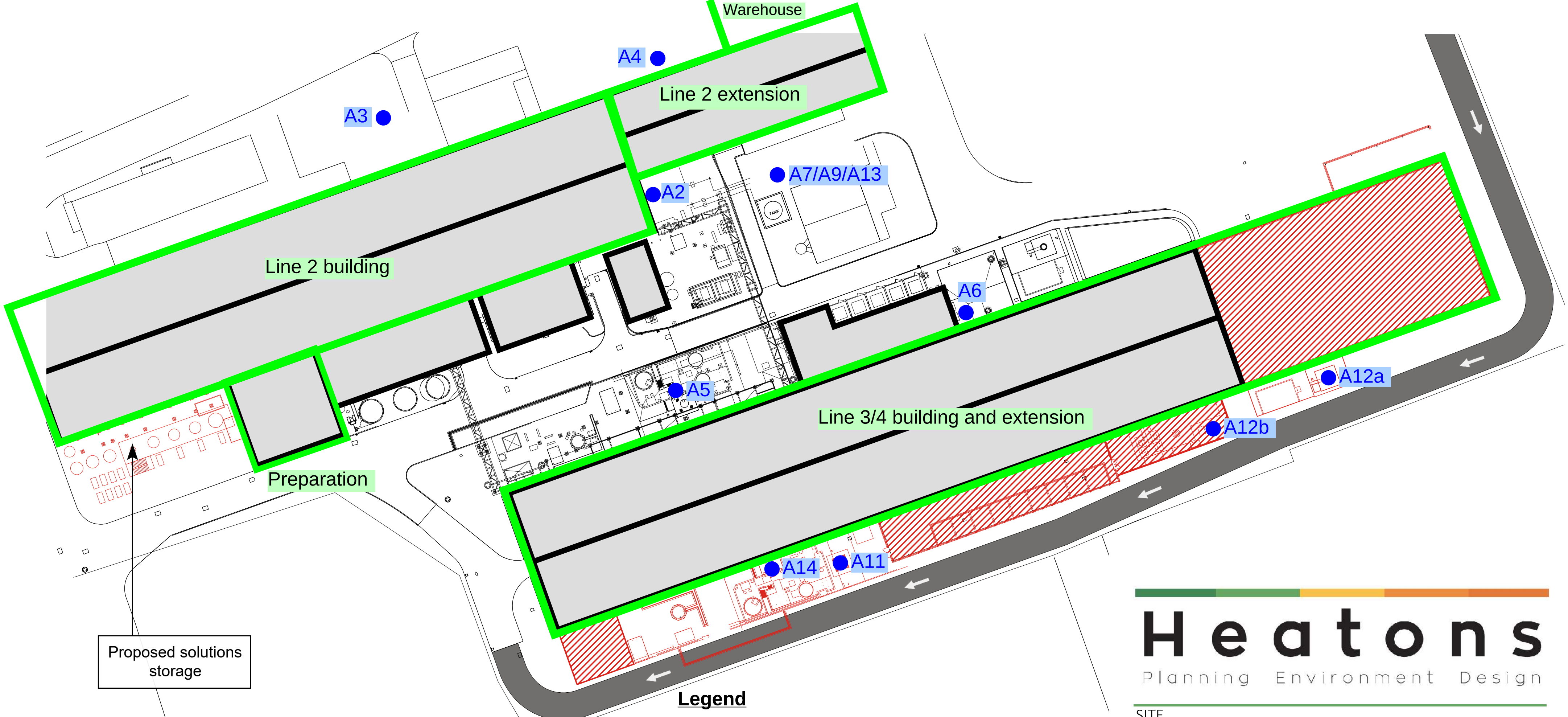
The results for the emissions to air screening are that all substances except for particulates (PM10) and nitrogen dioxide have been screened out, and do not need to be carried forward to detailed modelling. Particulates and nitrogen dioxide do however need to be carried forward to detailed modelling, and a full assessment of both the long-term and short-term concentrations of particulates (PM10) and nitrogen dioxide will be carried out and compared to the EALs.

Additionally, since dioxins cannot be screened out using the H1 tool because there is no EAL for dioxins, detailed modelling will be carried out for dioxins, as has been done in the past to satisfy Environment Agency requirements.

With regards to emissions to water and sewer, a number of substances were not screened out within Test 1, as their process contributions were less than 10% of the EQS. However, within Test 2, all of the substances passed this stage of the screening as they were less than 4% of the EQS.

With regards to significant loads, the test for this aspect was also passed, and the concentrations of cadmium and mercury have been calculated within the H1 to be below their significant loads.

5.2 Appendix 2 – Building/stack location map



220616_RAS-001-C.dwg

Legend

- Stack locations
- Buildings modelled
- Existing Building
- Proposed Plant Equipment
- Proposed Building Extension
- Proposed Trailer Loading Cover
- Proposed One-way HGV Route

Heatons

Planning Environment Design

SITE
Pilkington Sullivan

PROJECT
Production Line 4

DRAWING TITLE
Proposed Building Alterations

DATE	REFERENCE
June 2022	RAS-001-C-006

SCALE
1:1,000 @ A4

STATUS
FINAL

The Arc, 6 Mallard Way, Pride Park, Derby. DE24 8GX
www.heatonplanning.co.uk

5.3 Appendix 3 – Receptor map

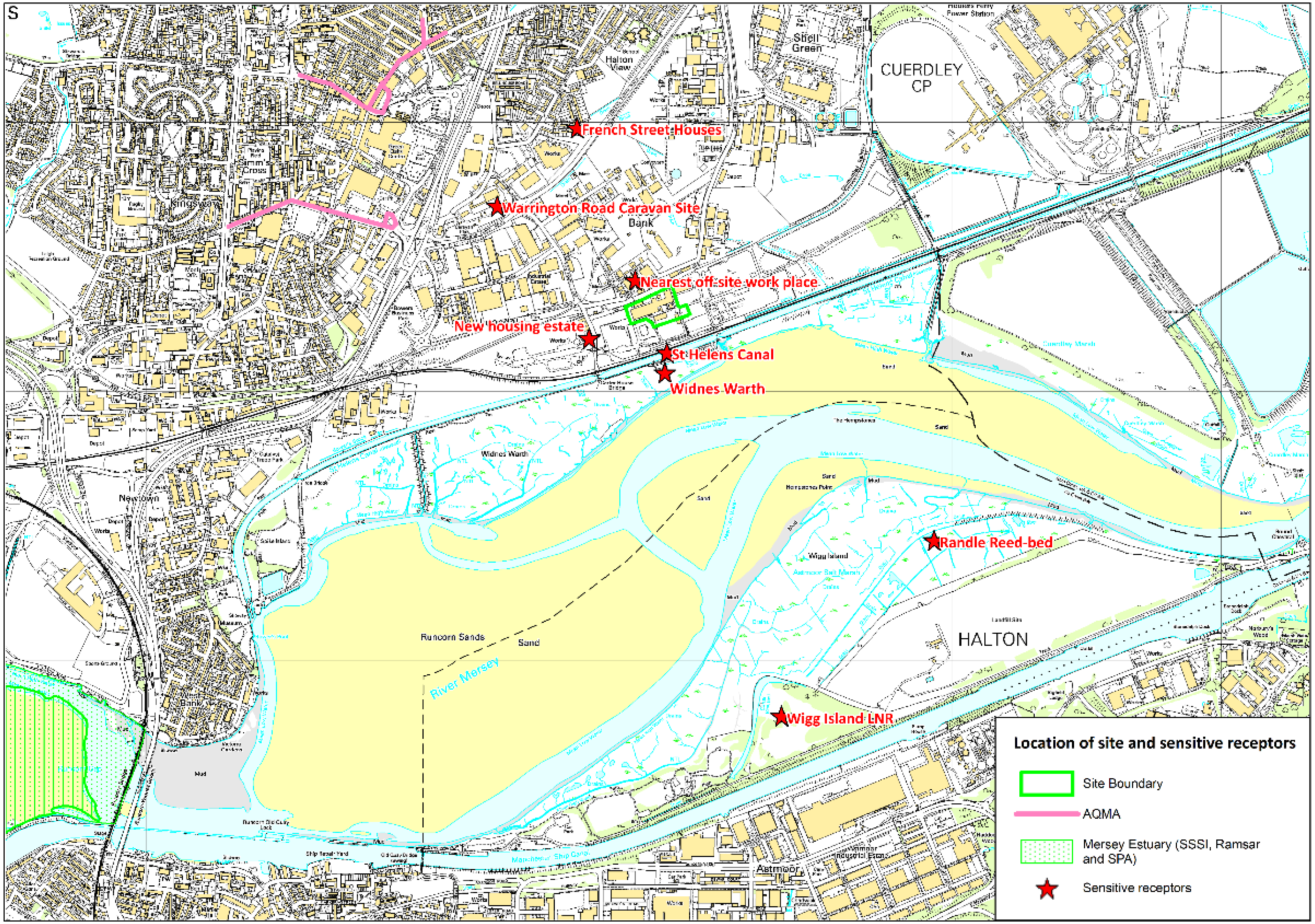


Figure 10 Receptor map