ADM Erith (UK)

Air Quality Impact Assessment and Ecology Screening

18 June 2021

Project No.: 0584457

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Document details	
Document title	ADM Erith (UK)
Document subtitle	Air Quality Impact Assessment and Ecology Screening
Project No.	0584457
Date	18 June 2021
Version	Final Version
Author	Sarah Dillon, Yves Verlinden, Les Hatton, Andy Coates and Dr. Chris Hazell-Marshall
Client Name	Archer Daniel Midland Erith Ltd

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft for client review	1	Yves Verlinden, Sarah Dillon	Dr. Chris Hazell-Marshall, Andy Coates. Les Hatton	David Pollok	14/06/21	
Final Version	1	Yves Verlinden	Chris Hazell Marshall	David Pollok	1706/21	

Signature Page

18 June 2021

ADM Erith (UK)

Air Quality Impact Assessment and Ecology Screening

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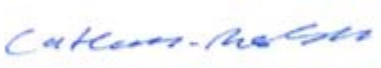

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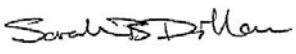

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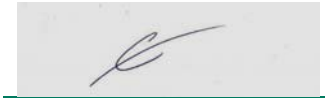

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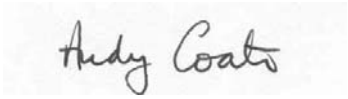

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Acronyms and Abbreviations

Name	Description
AMSL	above mean sea level
AOS	Odour Abatement System
AoS	Areas of Search
APIS	Air Pollution Information System
AQIA-ES	Air Quality Impact Assessment and Ecology Screening
AQS	Air Quality Standard
AQMA	Air Quality Management Area
AQMAU	Air Quality Modelling & Assessment Unit
AURN	Automatic Urban and Rural Network
AW	Ancient Woodland
BREF	Best Available Technology Reference Documents
CIEEM	Chartered Institute of Ecology and Environmental Management
CL	Critical Load/Level
DEFRA	Department for Environment, Food & Rural Affairs
DTDC	Desolventizer/Toaster/Dryer/Cooler
EA	Environment Agency
EP	Environmental Permit
FIDOR	Frequency of detection, Intensity as perceived, Duration of exposure, Offensiveness and Receptor sensitivity
H_2S	Hydrogen Sulphide
HRA	Habitat Risk Assessment
IAQM	Institute of Air Quality Management
LAQN	London Air Quality Network
LEL	Lower Explosive Limit
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MOS	Mineral Oil Extraction System
Mt	Million tonnes
NNR	National Nature Reserve
NE	Natural England
NH_3	Ammonia
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen (NO plus NO_2)
OMP	Odour Management Plan
OU	odour units
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM	Particulate Matter

Name	Description
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SINC	Sites of Importance for Nature Conservation
SSSI	Site of Special Scientific Interest
TO	Thermal Oxidiser
TO&S	Thermal Oxidiser and Scrubber
VOC	Volatile Organic Chemicals
WHO	World Health Organization

APPLICATION CHECKLIST

For ease of reference, the table below sets out all of the information required for the Permit application by the Environment Agency guidance "Environmental permitting: air dispersion modelling reports", and the relevant section in this report.

Requirement	Location in Report
Purpose of the study	**Section 1 Introduction** and **Section 2 Basis and Scope of Assessment**
Describe the site	**Section 3 Site Description**
Modelled scenarios	**Section 4.3 Scenarios Assessed**
Location map	**Figure 3.1: Site**
Surrounding land use map	**Figure 3.1: Site**
Relevant environmental standards	**Sections 5.1** and **6.1.4**
Background level	**Section 5.3** and **Section 6.2**
Explain the model	**Section 4 Impacts on Human Health - Assessment Methodology** and **Appendix A**
Emission parameters	**Section 4.7 Emissions Parameters** and **Appendix A**
Stack location	**Figure 4.2**
Modelled domain and receptors	**Section 4** and **Appendix A**
Weather and surface characteristics	**Section 4.5** Wind Roses in **Appendix A**
Terrain and building treatments	**Section 4**
Special treatments	**Section 4**
Impact Assessment	**Sections 5** and **6.2**
Sensitivity analysis	**Appendix A**
Isopleths/Contour plots	**Appendix C**
Model input files	Sent with application electronically

EXECUTIVE SUMMARY

Archer Daniel Midlands Ltd (ADM) operates the Erith Oil Works (the Site) in Erith under an Environmental Permit (EP). The installation principally processes rapeseed to produce rapeseed oil and rape meal for animal feedstuffs and edible rape oils with a throughput capacity of 1.4Million tonnes. The Site also unloads sunflower oil from ships into storage tanks for transfer (without processing) to the adjacent Edible Oils Limited site.

A variation to the EP is being requested for the following three main reasons:

- To include changes that have occurred at the Site since 2005;
- To include a proposed new thermal oxidiser and scrubber (TO&S); and
- To correct errors and omissions in the 2005 permit.

The variation application has been prepared by Environmental Resources Management Limited (ERM) on behalf of ADM.

The Site currently uses a thermal oxidiser (TO) to abate the waste gases from the Mineral Oil Extraction System (MOS). The current TO is a natural gas-fired burner from which combusted gases are emitted through air emission point A13. A new thermal oxidiser and scrubber (TO&S) is planned to be installed in Q4 2021 replacing the existing TO and will incorporate a natural gas fired burner and integrated wet caustic scrubber. Combusted gases will be emitted through a new air emission point A28. The replacement of the TO will be associated with a change in emissions and emission patterns (new stack, lower exit temperature, different flow rate). Due to the installation of new plant and the design of that plant a decrease in frequency and duration of TO bypass events (short term, abnormal operations when emissions are unabated) is expected in future operations compared to current operations.

This Air Quality Impact Assessment and Ecology Screening report presents an assessment of the potential for significant effects due to emissions to air from operation of the current and future MOS abatement systems. The impact assessment has been carried out using an air dispersion model to assess the potential impact of the Site emissions on human health and ecological receptors, and considers the emissions associated with the normal current and future operations and also bypass events.

The results of the impact assessment are that process contributions are not predicted to be significant and are not predicted to exceed air quality standards for the protection of human health in the future situation during normal operations. This is a considerable expected improvement over the current situation and shows the likely beneficial effect (both for human health impacts and for potential odour nuisance) of the new treatment system for the exhaust of the MOS.

The new TO&S is intended to improve both safety and reliability of the MOS exhaust treatment system, so that the number of bypass events is expected to decrease to a maximum of around five per year with an average duration of one hour. The nature of the bypass emissions (mass flow, flow parameters and emission points), with regards to the main compounds of interest (H_2S, SO_2, hexane and VOCs) will be the same in the current and future situations. The H_2S hourly and daily Process Contributions during a bypass event are predicted to be potentially ‘significant’ as defined in the applicable guidance (>10% of the air quality standards for human health) albeit without breaching the standards.

The overall risk for odour nuisance at sensitive receptors is expected to be low due to a combination of the low predicted potential for odours to reach the receptors, the expected low frequency of bypass operations and, for nearer receptors, the low receptor sensitivity.

The assessment of the potential effects of air emissions on ecological sites designated for their national and local importance for nature conservation is that the emissions associated with the future situation are not predicted to result in likely significant effects on any of the identified national (SSSIs)

or locally designated sites (LNRs, AW and SINCs). This is a considerable improvement over modelling of the current situation and shows the expected beneficial effect of the new treatment system for the MOS exhaust.

No adverse effects in-combination with other projects are predicted as the proposed reduction in emissions from the current situation is expected to have a beneficial effect on local air quality.

As part of the Permit Variation, an updated Odour Management Plan has been drafted outlining further odour mitigation measures at the Site.

1. INTRODUCTION

1.1 Environmental Permit Variation

Archer Daniel Midlands Ltd (ADM) operates the Erith Oil Works (the Site) in Erith, Kent under the Environmental Permit (EP) QP3331PQ, issued on 21st December 2005 ("existing permit").The installation processes rapeseed to produce rapeseed oil and rape meal for feedstuffs and edible rape oils with a throughput capacity of 1.4Million tonnes (Mt). The Site also unloads sunflower oil from ships into storage tanks for transfer (without processing) to the adjacent Edible Oils Limited (EOL) site.

A variation to the EP is being requested for the following three main reasons:

- To include changes that have occurred at the Site since 2005;
- To include a proposed new thermal oxidiser and scrubber (TO&S); and
- To correct errors and omissions in the 2005 permit.

The variation application has been prepared by Environmental Resources Management Limited (ERM) on behalf of ADM.

1.2 Air Quality Impact Assessment (AQIA) and Ecology Screening (ES)

This report presents an assessment of the potential for significant effects due to emissions to air from the Site. The impact assessment has been carried out using an air dispersion model to predict the potential impact of the Site emissions on human health and ecological receptors.

The remainder of this Report is structured as follows:

- Section 2: Presentation of the Basis and Scope of this Assessment
- Section 3: Site Description
- Section 4: AQIA Assessment Methodology
- Section 5: Assessment of Potential Impacts to Human Health and Odour Nuisance
- Section 6: Assessment of Potential Impacts to Designated Ecological Sites
- Section 7: In-Combination Assessment
- Section 8: AQIA and ES Concluding Summary

2. BASIS AND SCOPE OF ASSESSMENT

The Site currently uses a thermal oxidiser (TO) to abate emissions of the waste gases from the mineral oil extraction system (MOS). The current TO is fuelled using a 630kWth natural gas-fired burner (manufactured by Weishaupt) and combusted gases are emitted through air emission point A13 (see **Figure 4.2**).

A new TO (TO&S) is planned to be installed in Q4 2021 replacing the existing TO and will incorporate a natural gas fired burner and integrated wet caustic scrubber. Combusted gases will be emitted through a new air emission point A28.

During the combustion process contaminants within the exhaust gas (in this case H_2S and VOCs) will react with oxygen, oxidising the species present (negligible breakthrough expected). The exhaust gases will then be channelled through a caustic scrubber to remove acid gases. The scrubbing system will consist of an evaporative quencher using re-circulated water to cool down hot gas from the TO.

The replacement of the TO will be associated with a change in emissions and emission patterns (new stack, lower exit temperature, different flow rate) during normal operations.

For safety reasons, due to the flammable nature of hexane, Lower Explosive Limit (LEL) detectors are installed to detect dangerous concentrations of this flammable material between the MOS and the TO (applies to old and new TO). When this equipment detects values above the safe limits, the flow of the MOS exhaust gases bypass the TO to emission point A14 (located in the extraction plant) from where it enters the atmosphere unabated. This bypass also occurs when an operational problem is detected in the TO (e.g. if the natural gas feed is interrupted or if overpressure is detected (again this applies to the old and new TO)).

In the period 2016 to May 2021, with the current TO, the Site has recorded on average 10 bypass events per year, with an average bypass time of 110 minutes, but a maximum of nine hours for one event, and an annual maximum total bypass period of 48 hours in a year (see Table 3.1 of 'ADM Erith Environmental Permit, Substantial Variation Application: Supporting Information Document'). As the future TO+S will comprise new plant, designed to improve both safety and reliability of the MOS exhaust treatment system, the number of bypass events is anticipated to decrease to a maximum of around five events per year with an average duration of around one hour per event.

This Air Quality Impact Assessment and Ecology Screening (AQIA-ES) considers the emissions associated with the current and future MOS abatement systems in normal and bypass operation. Within the framework of the permit variation, three scenarios are assessed (details presented in **Section 4.3)** through dispersion modelling to understand predicted change in impacts associated with the future operation of the TO&S within the context of its surroundings.

Emissions data were taken from Stack Emissions Testing Reports (2020) where available from ADM, supplier data, and/or literature (Best Available Technology Reference Documents (BREF[1])). Following a review and screening of these emissions using the Environment Agency H1 screening tool the emissions of main interest were identified. The emissions may result in potentially significant impacts to:

- Human health (impacts discussed in **Section 5**) through changes of ambient concentrations of:
  - Sulphur dioxide (SO_2);
  - Hydrogen sulphide (H_2S);
  - Oxides of nitrogen (NO_x) and by association nitrogen dioxide (NO_2);

[1] BREF on Emissions from Storage (https://eippcb.jrc.ec.europa.eu/reference/emissions-storage), and BREF on Food, Drink and Milk Industries (https://eippcb.jrc.ec.europa.eu/reference/food-drink-and-milk-industries)

  - Particulate matter[1] (as PM_{10});
  - Volatile Organic Compounds (VOC);
  - Hexane; and
  - Ammonia (NH_3);
- Odour nuisance (impacts discussed in **Section 5.4**) through changes of ambient concentrations primarily of:
  - H_2S;
- Sensitive ecology (impacts discussed in **Section 6.2**) through changes of levels/loads of:
  - Ambient NO_x;
  - Ambient SO_2;
  - Ambient NH_3;
  - Nutrient nitrogen deposition; and
  - Acid deposition.

[1] The largest onsite sources of PM are mechanical sources which are typically associated with the coarser PM_{10} fraction. As such this assessment does not consider $PM_{2.5}$ emissions.

3. SITE DESCRIPTION

3.1 Location

ADM Erith is situated off Church Manorway in Erith adjacent to the western bank of the river Thames (see **Figure 3.1**).

To the north of the Site is a Tesco distribution centre, with a pond to the north-west of the Site boundary, which was constructed at the same time as the distribution centre in 2012. To the east is the River Thames. To the south are industrial properties and residential properties. The nearest residential area is approximately 400m to the south/southwest of the Site boundaries.

There are several SSSIs within 10km of the Site (see **Section 6.1.2** for details), the closest of which are the Inner Thames Marshes 1.3km northeast of the Site and Abbey Wood 2.5km southwest of the Site (see **Figure 6.1**). These have been included in this AQIA-ES. No SAC, SPA or Ramsar sites are located within 10km of the Site.

3.2 Site Overview

The Site is approximately 6.5 hectares in area, the majority of which is covered with buildings and industrial infrastructure used for the manufacturing, processing and preparation of (edible oils) and associated animal feedstock products.

The Site Layout is presented in **Figure 3.2**.

Figure 3.1: Site Location

Figure 3.2: Site Layout

4. IMPACTS ON HUMAN HEALTH - ASSESSMENT METHODOLOGY

4.1 Introduction

The scope of the impact assessment for stack emissions from the Site has been determined in the following way:

- Review of the requirements of the relevant Environment Agency (EA) Guidance (see below);
- Consultation with the EA including its Air Quality Modelling & Assessment Unit (AQMAU, see **Appendix E** for extract of AQMAU review of previous ADM dispersion modelling and ADM/ERM's response, note that only AQMAU comments relevant to this AQIA-ES have been extracted. For a full overview and context, please see 'Archer Daniels Midland (ADM) Erith Air Quality Impact Assessment – Final Report, Amended to AQMAU comments, 18 February 2021');
- Desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality;
- Review of emission parameters for the Site and dispersion modelling using the AERMOD dispersion model to predict ground-level concentrations of compounds at sensitive human and habitat receptor locations; and
- Review of air quality data for the area surrounding the Site, including data from the DEFRA Air Quality Information Resource (UK-AIR) and the Air Pollution Information System (APIS) to determine background and evaluate impacts.

4.2 Guidance

The AQIA has been undertaken with reference to applicable guidance documents. These include:

- Environment Agency (accessed May 2021) Air emissions risk assessment for your environmental permit;
- Environment Agency Dispersion modelling best practice: https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports;
- Environment Agency (2014) AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air;
- Environment Agency (undated) Conversion Ratios for NO_X to NO_2;
- Environment Agency (March 2011) Additional guidance for H4 Odour Management, How to comply with your environmental permit (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296737/geho0411btqm-e-e.pdf)
- BREF on Emissions from Storage (https://eippcb.jrc.ec.europa.eu/reference/emissions-storage), and BREF on Food, Drink; and
- BREF on Milk Industries (https://eippcb.jrc.ec.europa.eu/reference/food-drink-and-milk-industries).

4.3 Scenarios Assessed

This AQIA-ES considers the emissions associated with the operation of the current and future MOS abatement systems, for the following scenarios:

- Scenario 1: Current normal operations based on 2020 emission reports where available, and data from literature (BREF notes and/or supplier data) where necessary. This scenario includes operation of the existing TO;

- Scenario 2: Future normal operations based on current operations scenario, but with replacement of the TO by the new TO&S;
- Scenario 3: Bypass of MOS exhaust to A14. The difference between future and current bypass lies with duration and frequency of the events which are expected to decrease considerably (see **Section 2**). The nature of assumed emissions (immediate mass flow, flow parameters and emission points), and consequently the dispersion modelling input, are identical with regards to the main compounds of interest (H_2S, SO_2, hexane and VOCs). Future frequency and duration of events has been estimated by ADM based on knowledge of current MOS operational performance and the design of the new TO&S (see Table 3.1 of 'ADM Erith Environmental Permit, Substantial Variation Application: Supporting Information Document').

4.4 FIDOR – Odour Assessment

Whether or not odour emissions amount to serious pollution depends on a number of factors. There is no single method of reliably measuring or assessing odour pollution, and any conclusion is best based on a number of lines of evidence.

In order to allow the potential significance of any odour impact (source or emission) from a site to be determined, the EA sets out in their H4 guidance a methodology (additional to dispersion modelling) considering the following key aspects of odour, commonly referred to under the FIDOR acronym:

- Frequency of detection: can be assessed from emissions and process control data, wind direction data, complaints and odour diaries;
- Intensity as perceived: For new proposals the expected exposure arising from different options can be estimated through, for example modelling to the standards given in **Section 5.1.3.2**;
- Duration of exposure: can be assessed from emissions and process control data, wind direction data, complaints and odour diaries;
- Offensiveness some odours are generally regarded as more unpleasant than others (see **Section 5.1.3.2**); and
- Receptor sensitivity: Some receptors are more sensitive than others. Domestic residences, or a pub with a beer garden are more likely to be sensitive than an industrial complex or passers-by. Some individuals will be extremely tolerant of odours at high intensities while others will be unable to tolerate an odour as soon as they identify it. Evidence that, for example, only one person finds the odour unacceptable whereas most others, similarly exposed, find it acceptable in that context (e.g. in a rural village) would be relevant to the assessment of the degree of pollution.

4.5 Dispersion Model Parameters

The model parameters are set out in **Table 4.1**.

Table 4.1 Model Parameters

Parameter	Approach	Notes
Dispersion model	USEPA Aermod 19191	
Number of sources	3 - 13	Depending on modelled compound
Model domain	30km x 30km	
Receptor grid resolution	Nested grid centred on the Site: • 18m grid resolution up to 1000m; • 50m grid resolution up to 2000m;	See **Section 5.2**

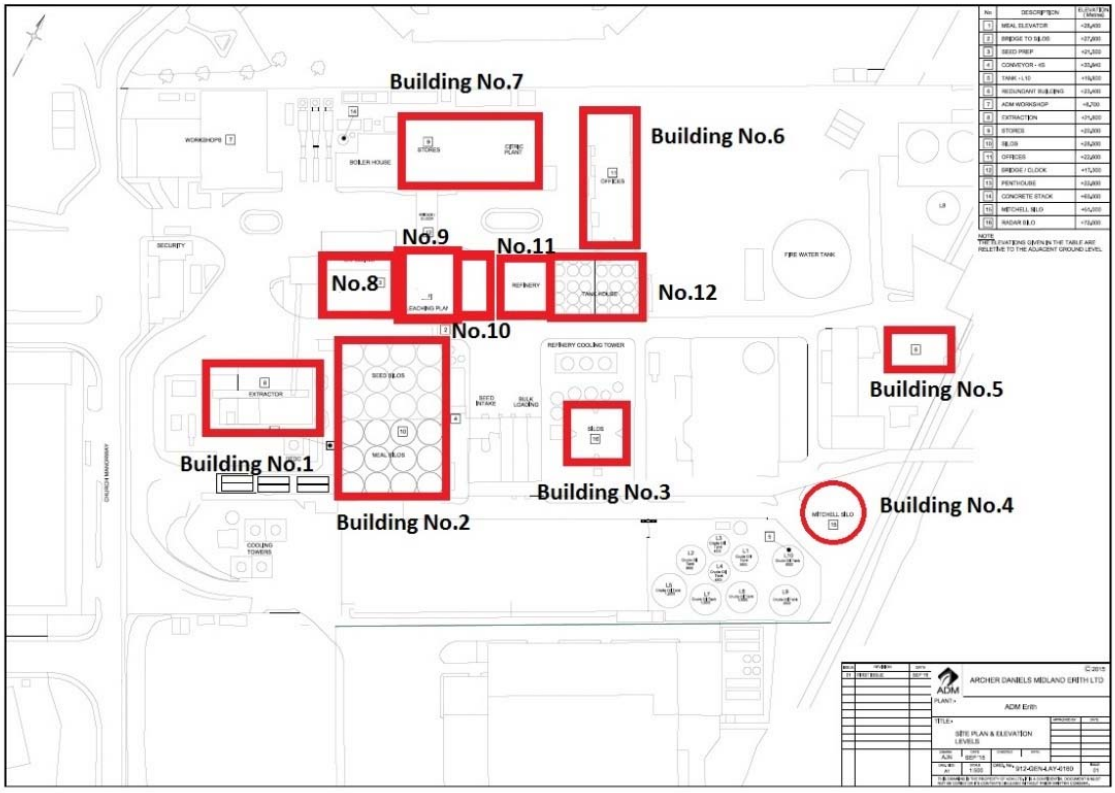
Parameter	Approach	Notes
	• 100m grid resolution up to 5000m; and • 400m grid resolution up to 15000m.	
Buildings	Included	See **Figure 4.1 and Table 4.2**
Terrain	Not included	The terrain elevation is not significant, with no peaks in excess of 100m above mean sea level (AMSL) within 5km of the Site. There are no large scale gradients of 1:10 or greater in the vicinity of the Erith Site and therefore terrain effects are not significant and not included in the model.
Albedo	0.21 – 1.00	Land use parameters varied per month to reflect changing land cover
Bowen Ratio	1.44	
Surface Roughness	1	
Meteorological data	Five years of hourly sequential meteorological data, including wind speed, wind direction, temperature and cloud cover parameters were obtained from London City Airport (6km west of the ADM Erith facility), which is considered to be the closest, most applicable site, for the years 2016 to 2020.	
NO_x to NO_2 conversion ratio	Short-term concentrations: 35% Long-term concentrations: 70%	Environment Agency guidance [a].

[a] *Environment Agency for England (undated) Conversion Ratios for NO_x and NO_2*

4.6 Buildings

Simplified details of the heights, dimensions and orientation of the buildings on Site, provided by ADM, were included to take into account the potential effects of building wakes on the dispersion of emissions (**see Figure 4.1 and Table 4.2**). The twelve buildings at the Erith Site identified from site mapping are defined with heights from 20.5m to 72m.

Figure 4.1 Buildings Modelled



Note: building 5 has been demolished since the 2015 and 2016 modelling reports, but is still included in the current modelling for consistency. This is not expected to make a material difference to the findings of this report.

Table 4.2 Building Model Parameters

Building name	Description	Tier height (m)	X length (m)	Y length (m)	Rotation angle (deg)	Center coordinates	
						X (m)	Y (m)
BLD_1	Extraction Building	21.8	26.17	25.69	26.6	550642	179275
BLD_2	Silos	26.5	32.89	59.25	26.57	550690	179270
BLD_3	IBN Silos	72.0	25.66	25.25	26.6	550753	179319
BLD_4	Mitchell Silo	51.0	Diameter = 18.46m			550848	179346
BLD_5	Roundhouse	23.4	21.86	16.88	26.6	550846	179406
BLD_6	Offices	22.6	14.89	53.72	26.6	550726	179400
BLD_7	Citric plant/stores	20.5	51.78	27.05	26.6	550654	179389
BLD_8	Prep Building	21.5	27.98	23.12	26.6	550650	179328
BLD_9	Penthouse	34.6	21.21	22.93	26.57	550676	179342
BLD_10	Degum Plant	21.5	15.09	22.91	26.6	550695	179351
BLD_11	Refinery	28.1	20.87	23.25	26.6	550709	179358
BLD_12	Tank House	22.6	32.97	25.17	26.6	550728	179369

4.7 Emissions Parameters

The sources of emissions modelled are shown in **Figure 4.2**.

Monitoring on the main emission points has occurred regularly between 2015-2020. Monitoring was also undertaken by ADM of A13 at a sample point before the TO during monitoring campaigns in 2015, 2018, January 2019 and June 2019. The monitoring results show that:

- maximum concentration and maximum mass flow occur at different volume flow rates;
- concentrations of H_2S feeding to A13 are highly variable (1,269 – 35,793mg/Nm^3 between 2015 and 2019), as does the exhaust flow of A13 (2,055 – 6,228 m^3/h between 2015 and 2020). This in turn results in:
  - high variability of SO_2 exhaust mass flows from A13;
  - high variability of H_2S concentrations feeding to emission point A14 in the case of a bypass (scenario 3).

It is important to note that volume flow and concentrations have not always been measured simultaneously.

The combination of maximum flow rates with maximum emission concentrations would be conservative (see responses to AQMAU comments in **Appendix E**).

The main objective of this AQIA is to assess the potential change in environmental impact due to the replacement of the TO, on a consistent basis of comparison. ERM opted to:

- use monitored 2020 (2019 if 2020 not available) emissions as a basis for current and future operations as well as for bypass events. For those emission points for which monitored data is not available, data from literature (BREF notes or supplier data) has been used;
- emissions for future operations then only differ due to the replacement of the existing TO with the new TO&S. These emissions have been calculated based on:
  - supplier guaranteed maximum emission concentrations;
  - recorded operational data from MOS exhaust. Flow rates to the TO have been recorded between January 2019 and July 2020. For the purpose of this AQIA-ES ERM has opted to use the P90 flow rate;
- emissions for bypass events were then calculated and modelled as follows:
  - mass emissions prior to the TO (based on monitoring at sample point prior to TO inlet and P90 flow rate from MOS exhaust) were added to the emissions from A14;
  - mass emissions from purging the line between MOS exhaust and TO were calculated based on monitoring at sample point prior to TO inlet;
  - mass emissions from the new TO&S operating at idle on clean air have been calculated and modelled assuming 30% exhaust flow and supplier guaranteed maximum emission concentrations (only applicable for one type of future bypass event);

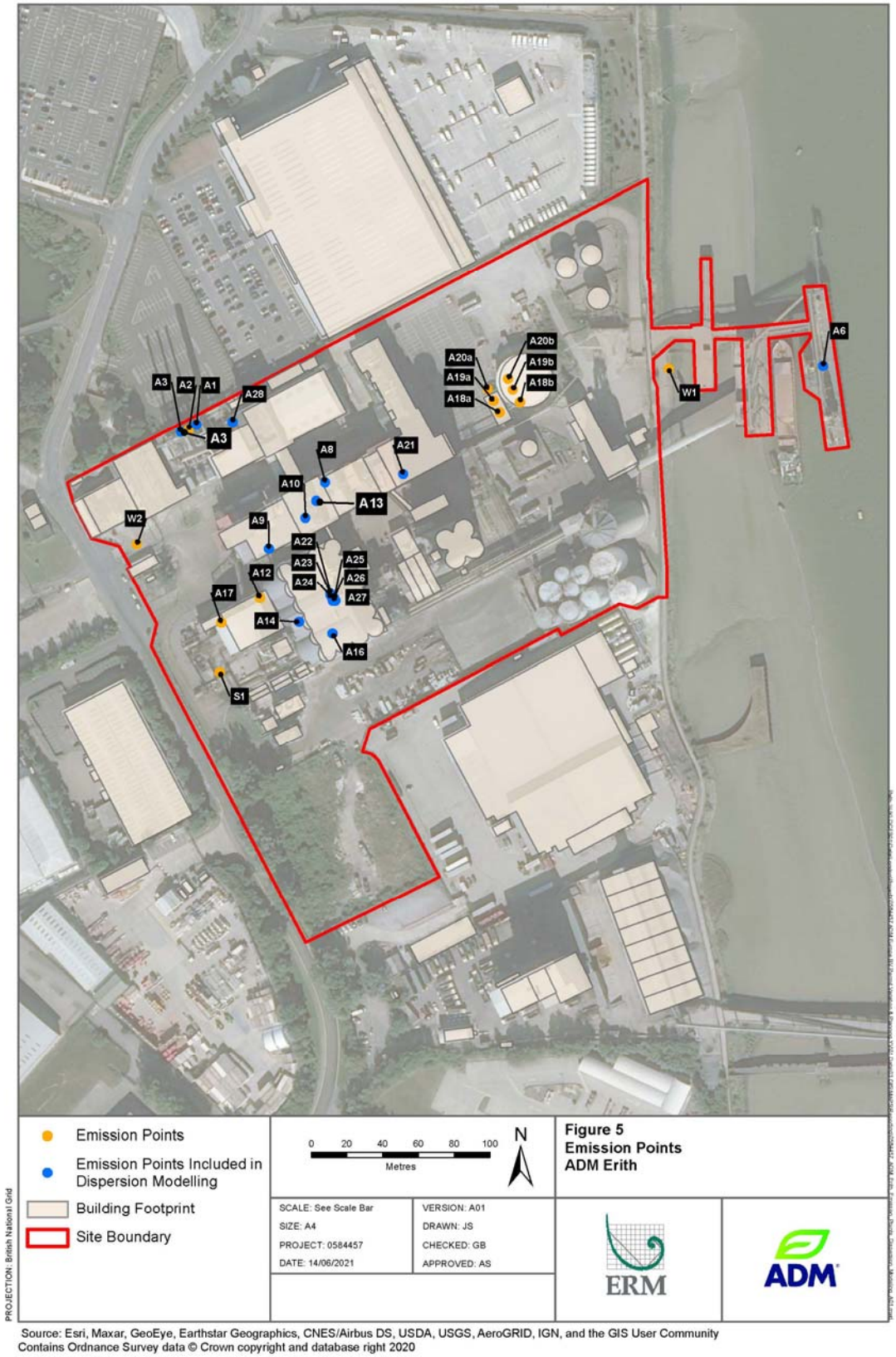
This approach is still considered appropriately conservative for future operations as it assumes:

- mass emissions for the new TO&S corresponding to P90 volume flow rates and maximum guaranteed emission concentrations hence mass emissions are higher than expected on average;
- mass emissions for the bypass to A14 corresponding to P90 volume flow rates and average MOS exhaust concentrations. ERM selected average MOS exhaust concentrations as bypass frequency and duration are limited and are unlikely to coincide with worst case dispersion conditions. As the model is used to calculate emissions at all dispersion conditions observed over 5 years, combining the worst case dispersion conditions with the highest observed concentrations

and highest observed flow rates would be overly conservative and represent a highly unlikely scenario.

The H1 screening tool from the UK Environment Agency was used to identify the compounds of interest from emissions reports supplied by ADM. The emission parameters for the screened-in compounds for the three scenarios are shown in **Table 4.3 to Table 4.5** (all data provided by ADM). The full list of emissions including screened-out compounds are shown in **Appendix A**.

Figure 4.2 Sources Modelled



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Table 4.3 Model Scenario 1 - Source Input Parameters

Parameter	Unit	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
Stack height actual	m	47.0	12.0	32.5	15.5	42.0	40.0	38.5	27.5	32.3	n/a
Internal Diameter	m	1.38	0.250	0.540	0.960	0.700	0.450	1.20	0.376	0.453	n/a
Emission velocity	m/s	A1: 17.5 A2: 14.9 A3: 16.7	20.8	2.20	9.29	4.50	5.60	10.2	5.00	0.338	n/a
Volume flow rate (normalised)	Nm^3/s	A1: 17.6 A2: 14.8 A3:19.7	0.754	0.461	5.71	1.51	0.121	9.75	0.518	0.0284	n/a
Volume flow rate (actual)	m^3/s	A1: 26.2 A2: 22.3 A3: 25.0	1.02	0.509	6.67	1.73	0.895	11.6	0.556	0.0544	n/a
Emission temperature (actual)	K	A1, A2: 428 A3: 438	368	297	319	316	1143	326	5K above ambient	523	n/a
NO_x	g/s	A1: 0.352 A2: 0.295 A3: 0.423	n/a	n/a	n/a	n/a	0.0121* (average 2015)	n/a	n/a	0.00512	n/a
Total Particulate	g/s	n/a	0.000211	0.0154	0.0122	0.0159	0.000917	0.00894	0.00518	n/a	n/a
VOC	g/s	n/a	n/a	n/a	n/a	0.0347	0.00967	1.75	n/a	n/a	n/a
SO_2	g/s	n/a	n/a	n/a	n/a	0.00458	5.81	0.00375	n/a	n/a	n/a

Parameter	Unit	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
H_2S	g/s	n/a	n/a	n/a	n/a	0.0475	0.252	0.00653	n/a	n/a	n/a
Hexane	g/s	n/a	n/a	n/a	n/a	0.00381	0.0131	1.00	n/a	n/a	n/a
NH_3	g/s	n/a	n/a	n/a	n/a	n/a	n/a	0.0206	n/a	n/a	n/a

n/a = not applicable

* most recent emission monitoring data for NO_x on A13 dates back to 2015, used average of February and December 2015
** limited data available:

- emission height assumed 1m above building height;
- actual max flow rate cfr. manufacturer specifications is 2,000m^3/h;
- emission velocity assumed to be 5m/s, internal diameter calculated accordingly;
- emission temperature assumed 5K above ambient;
- particulate concentration assumed 10mg/Nm^3 as per BREF on Emissions from Storage (Section 4.3.7 in https://eippcb.jrc.ec.europa.eu/reference/emissions-storage)

*** limited data available:

- flow rate based on annual average fuel consumption;
- emission temperature estimated at 523K;
- NO_x emission concentration @ emission limit of 180mg/Nm^3

Table 4.4 Model Scenario 2 - Source Input Parameters

	Unit	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
Stack height actual	m	47.0	12.0	32.5	15.5	42.0	n/a	38.5	27.5	32.3	47
Internal Diameter	m	1.38	0.250	0.540	0.960	0.700	n/a	1.20	0.376	0.453	0.600
Emission velocity	m/s	A1: 17.5 A2: 14.9 A3: 16.7	20.8	2.20	9.29	4.50	n/a	10.2	5.00	0.338	6.04
Volume flow rate (normalised)	Nm^3/s	A1: 17.6 A2: 14.8 A3:19.7	0.754	0.461	5.71	1.51	n/a	9.75	0.518	0.0284	1.41
Volume flow rate (actual)	m^3/s	A1: 26.2 A2: 22.3 A3: 25.0	1.02	0.509	6.67	1.73	n/a	11.6	0.556	0.0544	1.71
Emission temperature (actual)	K	A1, A2: 428 A3: 438	368	297	319	316	n/a	326	5K above ambient	523	331
NO_x	g/s	A1: 0.352 A2: 0.295 A3: 0.423	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00512	0.0404
Total Particulate	g/s	n/a	0.000211	0.0154	0.0122	0.0159	n/a	0.00894	0.00518	n/a	0.00809
VOC	g/s	n/a	n/a	n/a	n/a	0.0347	n/a	1.75	n/a	n/a	0.00809
SO_2	g/s	n/a	n/a	n/a	n/a	0.00458	n/a	0.00375	n/a	n/a	0.310

	Unit	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
H_2S	g/s	n/a	n/a	n/a	n/a	0.0475	n/a	0.00653	n/a	n/a	0.00121
Hexane	g/s	n/a	n/a	n/a	n/a	0.00381	n/a	1.00	n/a	n/a	0.0131****
NH_3	g/s	n/a	n/a	n/a	n/a	n/a	n/a	0.0206	n/a	n/a	n/a

n/a = not applicable
** limited data available:

- emission height assumed 1m above building height;
- actual max flow rate cfr. manufacturer specifications is 2,000m^3/h;
- emission velocity assumed to be 5m/s, internal diameter calculated accordingly;
- emission temperature assumed 5K above ambient;
- particulate concentration assumed 10mg/Nm^3 as per BREF on Emissions from Storage (Section 4.3.7 in https://eippcb.jrc.ec.europa.eu/reference/emissions-storage)

*** limited data available:

- flow rate based on annual average fuel consumption;
- emission temperature estimated at 523K;
- NO_x emission concentration @ emission limit of 180mg/Nm^3

**** assumed equal to existing TO

Table 4.5 Model Scenario 3 - Source Input Parameters

Parameter	Unit	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter & MOS Exhaust	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S & purge line****
Stack height actual	m	47.0	12.0	32.5	15.5	42.0	n/a	38.5	27.5	32.3	47
Internal Diameter	m	1.38	0.250	0.540	0.960	0.700	n/a	1.20	0.376	0.453	TO&S: 0.600 Purge: 0.150
Emission velocity	m/s	A1: 17.5 A2: 14.9 A3: 16.7	20.8	2.20	9.29	4.50	n/a	Biofilter: 10.2 MOS: 0.111	5.00	0.338	TO&S: 0.893 Purge: 8.65
Volume flow rate (normalised)	Nm^3/s	A1: 17.6 A2: 14.8 A3:19.7	0.754	0.461	5.71	1.51	n/a	Biofilter: 9.75 MOS: 0.105	0.518	0.0284	TO&S: 0.208 Purge: 0.177
Volume flow rate (actual)	m^3/s	A1: 26.2 A2: 22.3 A3: 25.0	1.02	0.509	6.67	1.73	n/a	Biofilter: 11.6 MOS: 0.125	0.556	0.0544	TO&S: 0.253 Purge: 0.180
Emission temperature (actual)	K	A1, A2: 428 A3: 438	368	297	319	316	n/a	326	5K above ambient	523	TO&S: 331 Purge: ambient
NO_x	g/s	A1: 0.352 A2: 0.295 A3: 0.423	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00512	TO&S: 0.00598 Purge: n/a
Total Particulate	g/s	n/a	0.000211	0.0154	0.0122	0.0159	n/a	Biofilter: 0.00894 MOS: n/a	0.00518	n/a	n/a

Parameter	Unit	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter & MOS Exhaust	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S & purge line****
VOC	g/s	n/a	n/a	n/a	n/a	0.0347	n/a	Biofilter: 1.75 MOS: 0.443	n/a	n/a	TO&S: n/a Purge: 0.00623
SO_2	g/s	n/a	n/a	n/a	n/a	0.00458	n/a	Biofilter: 0.00375 MOS: 0.101	n/a	n/a	TO&S: n/a Purge: 0.00141
H_2S	g/s	n/a	n/a	n/a	n/a	0.0475	n/a	Biofilter: 0.00653 MOS: 1.69	n/a	n/a	TO&S: n/a Purge: 0.0238
Hexane	g/s	n/a	n/a	n/a	n/a	0.00381	n/a	Biofilter: 1.00 MOS: $4.8E^{-5}$	n/a	n/a	TO&S: n/a Purge: $6.7E^{-7}$
NH_3	g/s	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: 0.0206 MOS: n/a	n/a	n/a	n/a

n/a = not applicable
** limited data available:

- emission height assumed 1m above building height;
- actual max flow rate cfr. manufacturer specifications is 2,000m^3/h;
- emission velocity assumed to be 5m/s, internal diameter calculated accordingly;
- emission temperature assumed 5K above ambient;
- particulate concentration assumed 10mg/Nm^3 as per BREF on Emissions from Storage (Section 4.3.7 in https://eippcb.jrc.ec.europa.eu/reference/emissions-storage)

*** limited data available:

- flow rate based on annual average fuel consumption;
- emission temperature estimated at 523K;
- NO_x emission concentration @ emission limit of 180mg/Nm^3

**** the purge is limited to a released volume of 5m^3, over an estimated duration of 30s. The mass flow emission rates in the table are the hourly equivalent of the total released mass

5. POTENTIAL IMPACTS ON HUMAN HEALTH AND ODOUR NUISANCE

5.1 Legal Framework

5.1.1 Introduction

The protection of sensitive human receptors is regulated through the following:

- Air Quality Standards imposed in UK law[1] transposed from EU standards[2]; and
- Environmental Assessment Levels set out by the Environment Agency.

Collectively these are referred to as Air Quality Standards (AQS).

5.1.2 Assessment Criteria for Sensitive Human Receptors

The Air Quality Standards of relevance for this assessment are set out in **Table 5.1**.

Table 5.1: Applicable Air Quality Standards

Applicability	Compound	Averaging period	Assessment Criterion (µg/m^3)	Percentile
Sensitive Human Receptor	SO_2	24 hour, <4 exceedances yearly	125	99th
		1 hour, <25 exceedances yearly	350	99.71th
		15 min, <36 exceedances yearly	266	99.9th
	H_2S	Annual, mean	140	n/a
		24 hour, maximum (WHO)	150	100th
		1 hour, maximum	150	100th
	H_2S, Odour	1 hour, <176 exceedances yearly	1.65*	98th
	PM_{10}	Annual, mean	40	n/a
		24 hour, <36 exceedances yearly	50	90.14th
	NO_2	Annual, mean	40	n/a
		1-hour, <18 exceedances yearly	200	99.79th
	VOC	Annual, mean (benzene as proxy)	5	n/a
		1 hour, maximum (benzene as proxy)	195	100th
	Hexane	Annual, mean	720	n/a
		1 hour, maximum	21 600	100th
	NH_3	Annual, mean	180	n/a
		1-hour, maximum	2 500	100th

n/a = not applicable
* see **Section 5.1.3.2**

[1] The Air Quality Standards Regulations 2010 Statutory Instrument 2008/301, http://www.legislation.gov.uk/uksi/2010/1001/contents/made
[2] European Union Air Quality Standards, http://ec.europa.eu/environment/air/quality/standards.htm

5.1.3 Significance Criteria

5.1.3.1 Effects on Human Health

Based upon Environment Agency Guidance[1], the assessment of atmospheric emissions considers:

- the Process Contribution (PC), i.e. the predicted contribution to the concentration of a specific compound in ambient air from the plant emissions themselves; and
- the Predicted Environmental Concentration (PEC), which is the PC added to the background concentration of the specific compound.

The PCs are not considered significant when:

- Long Term: PC<1% of the AQS or, if background data is available the PEC < 70% of the AQS
- Short Term: PC<10% of the AQS or, if background data is available the PC < 20% of AQS minus twice the background concentration

5.1.3.2 Odour Nuisance

As per H4 Guidance [2], the benchmark level for odour is based on the 98th percentile of hourly average concentrations of odour modelled over a year at the site/installation boundary (i.e. a maximum of 175 exceedance hours allowed per year). The criteria are:

- 1.5 odour units (OU) for most offensive odours;
- 3 odour units for moderately offensive odours;
- 6 odour units for less offensive odours.

In this case, the most stringent criterion was used, which relates to the least pleasant odours. This most stringent value was chosen to represent potential emissions of H_2S which are generally accepted as having an offensive odour. A concentration of one 'odour unit' per cubic metre (OU/m^3) is defined as the odour detection threshold which for H_2S according to WHO[3], falls between 0.2 and 2µg/m^3. For information, the identification threshold falls between 0.6 and 6µg/m^3. For the purposes of this AQIA, one OU/m^3 has been defined as 1.1µg/m^3 for H_2S, i.e. the mean of the WHO range for the odour detection threshold.

5.2 Receptor Grid

In order that the model receptor grid provides a reasonable representation of predicted concentrations across the modelling domain, the resolution of the grid should be less than 1.5 times the stack height in the immediate region of the stack. The lowest emission point (A6) is 12m high. ERM has therefore used a receptor grid with a resolution tiered as follows:

- 1km from Site: 18m;
- 1km – 2km from Site: 50m;
- 2km – 5km from Site: 100m; and
- 5km – 15km from Site: 400m.

Specific potential receptors close to the Site identified by ERM from local mapping are presented in **Table 5.2** and **Figure 5.1**. These receptors have also been selected as they showed the highest predicted results in odour modelling performed December 2016.

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

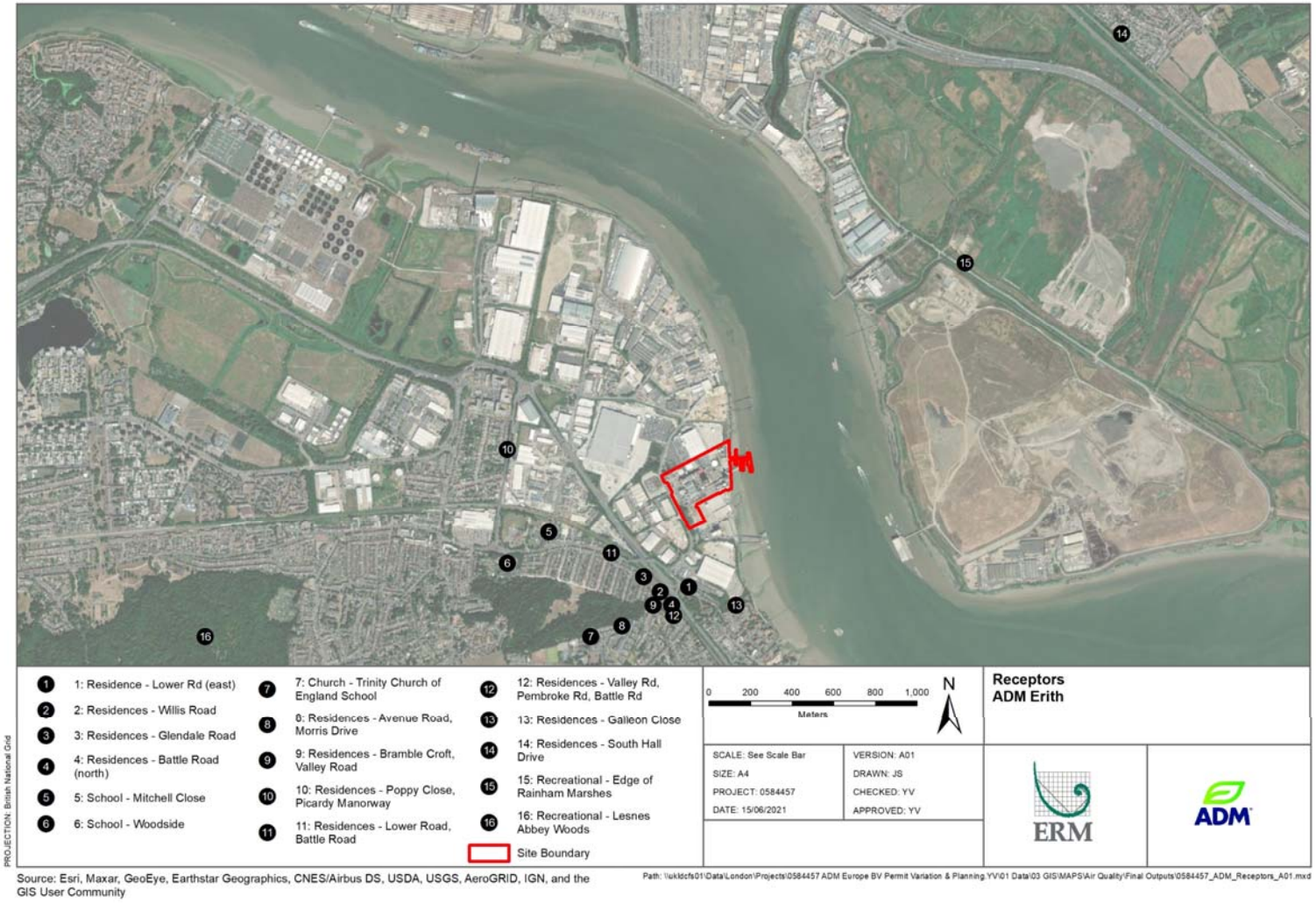
[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296737/geho0411btqm-e-e.pdf

[3] https://www.euro.who.int/__data/assets/pdf_file/0019/123076/AQG2ndEd_6_6Hydrogensulfide.PDF

Table 5.2 Specific Human Receptors

Number	Receptor Name	Easting (m)	Northing (m)	Distance and direction from Site (m)
1	Residences - Lower Rd (east)	550,672	178,837	415, SW
2	Residences - Willis Road	550,535	178,814	420, S
3	Residences - Glendale Road	550,456	178,886	410, S
4	Residences - Battle Road (north)	550,589	178,751	500, SW
5	Mitchell Close - School	550,000	179,100	615, W
6	Woodside School	549,800	178,950	815, SSW
7	Trinity Church of England School	550,200	178,600	810, SSW
8	Residences – Avenue Road, Morris Drive	550,350	178,650	710, SSW
9	Residences – Bramble Croft, Valley Road	550,500	178,750	685, S
10	Residences - Poppy Close, Picardy Manorway	549,800	179,500	800, WNW
11	Residences – Lower Road, Battle Road	550,300	179,000	420, SW
12	Residences – Valley Rd, Pembroke Rd, Battle Rd	550,600	178,700	614, S
13	Residences – Galleon Close	550,900	178,750	400, S
14	Residences – South Hall Drive	552,750	181,500	2,720, NE
15	Recreational – Edge of Rainham Marshes	552,000	180,400	1,430, NE
16	Recreational - Lesnes Abbey Woods	548,350	178,600	2,350, W

Figure 5.1: Specific Receptors



5.3 Air Quality Monitoring and Background Concentrations

5.3.1 Overview

There is limited background data available in the vicinity of the Site reflecting the overall good air quality in the study area. There are is one Automatic Urban and Rural Network (AURN) monitoring site, located at Whitehall Lane, Slade green in Erith, about 3km south of the Site.

Local monitoring has been performed for London Air Quality Network (LAQN) by King's College Environmental Research Group[1] from which data from the 2018 Report is the most recent and which includes data from locations in Belvedere.

For NH_3, there is one monitoring site (London Cromwell Road 2) from National Ammonia Monitoring Network (NAMN) located approximately 25km west of the Site. Another NAMN monitoring site (rural background) is located in Detling, approximately 35km southeast of the Site. Due to their distance to the Site and being located either in a highly urban area with heavy traffic or a more rural area, results from these locations are not deemed relevant to this assessment.

In the UK, a national modelling exercise has been undertaken to identify background concentrations of several compounds[2]. This 'interpolated mapping' data is representative of general background concentrations, away from specific local sources of emissions (i.e. roads and industrial sources). To further support the data from the AURN and local monitoring, these data have been used to derive background concentrations. The background concentrations are substantially below the relevant air quality standards. The most up to date mapping available is for 2019.

No readily available background data (monitored or interpolated) was found for the study area for H_2S or for hexane.

Comparisons of the background air quality for protection of human health have been made to air quality standards, and are shown in **Table 5.3.**

Table 5.3: Background concentrations (µg/m^3)

	2018	2019	2020	Average	AQS
NO_2					
AURN - Bexley - Slade Green	22.9	22.7	18.9	**21.5**	40 (annual)
LAQN - Bexley Belvedere	28.0	n/a	n/a	**28.0**	
LAQN - Bexley Belvedere West	21.0	n/a	n/a	**21.0**	
Background Mapping	20.7	20.71	n/a	**20.7**	
SO_2					
Background mapping	1.73	1.90	n/a	**1.82**	125 (24h)
PM_{10}					
LAQN - Bexley Belvedere	19.0	n/a	n/a	**19.0**	40 (annual)
LAQN - Bexley Belvedere FDMS	19.0	n/a	n/a	**19.0**	
LAQN - Bexley Belvedere West	19.0	n/a	n/a	**19.0**	
LAQN - Bexley Belvedere West FDMS	15.0	n/a	n/a	**15.0**	
LAQN - Bexley - Slade Green	18.0	n/a	n/a	**18.0**	
Background mapping	17.6	17.6	n/a	**17.6**	
Benzene (as proxy for VOC)					
Background mapping	0.600	0.590	n/a	**0.600**	5 (annual)

[1] https://www.londonair.org.uk/london/asp/reportdetail.asp?ReportID=2018laqnr&ReportType=LAQN_Annual_Report
[2] https://uk-air.defra.gov.uk/data/gis-mapping/

5.3.2 Summary of Background Data Used in the Assessment

Table 5.4 sets out the background data used as the basis for the impact assessment along with the sources of these data. The most relevant Air Quality Standards are also presented for comparison, where these are applicable.

Table 5.4: Background Pollution Data

Species	AQS (µg/m^3)	Background concentration (µg/m^3)	Source
NO_2	40 (annual) 200 (1h)	22.1 44.2	Average of data presented **Table 5.3**
SO_2	125 (24h) 350 (1h) 266 (15 min)	3.64 3.64 3.64	Average from background mapping 2018-2019, multiplied by a factor 2 as Environment Agency guidance
PM_{10}	40 (annual) 50 (24h)	17.9 35.8	Average of data presented **Table 5.3**
Benzene as proxy for VOC	5 (annual) 195 (1h)	0.600 1.20	Average from background mapping 2018-2019

In order to assess short term impacts, the short term background concentrations have been derived by multiplying the long term derived background by a factor of 2 [1].

5.4 Impact Assessment Results – Human Health and Odour Nuisance

5.4.1 Overview

This section sets out a summary of the predicted results for the assessment of impacts on human health and for odour for scenarios 1, 2 and 3 as detailed in **Section 4.3**, using the emissions parameters as specified in **Table 4.3 to Table 4.5**.

The significance of predicted impacts for the assessed scenarios is summarised in **Table 5.5**.

More detailed results are presented in the next Sections.

Table 5.5 Summary of Predicted Impacts

Compound	Scenario 1 (current normal)	Scenario 2 (future normal)	Scenario 3 (bypass)
NO_2	Not significant	Not significant	Not significant
PM_{10}	Not significant	Not significant	Not significant
SO_2	Significant (exceedance of AQS)	Not significant	Not significant
H_2S	Potentially Significant	Not significant	Potentially Significant
H_2S Odour	Risk for odour nuisance is high	Risk for odour nuisance is low	Risk for odour nuisance is low
VOC*	Not significant	Not significant	Not significant
Hexane	Not significant	Not significant	Not significant
NH_3	Not significant	Not significant	Not significant

* see **Appendix B**

[1] Defra (2009) Local Air Quality Management Technical Guidance Note TG(09)

5.4.2 Human Health Impact

Maximum off-site results predicted by dispersion modelling are presented in **Table 5.6 to Table 5.8**. Interpolated plots of model outputs are set out in **Appendix C** for those compounds of most interest. Predicted results at specific residential receptors, as defined in **Table 5.2**, are presented in **Appendix D**.

Table 5.6: Scenario 1 (Current Normal), Predicted Human Health Impacts

Compound	Averaging Time	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
		µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
NO_2	Annual, mean	40	22.1	0.559	1.4%	22.7	57%	no
	1 hour, <19 exceedances yearly	200	44.2	1.86	0.93%	46.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.788	2.0%	18.7	47%	no
	24 hour, <36 exceedances yearly	50	35.8	2.67	5.3%	38.5	77%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	162	130%	166	133%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	406	116%	409	117%	**yes**
	15 min, <36 exceedances yearly	266	3.64	773	291%	777	292%	**yes**
H_2S	Annual, mean	140	n/a	1.91	1.4%	n/a	n/a	**yes**
	24 hour, maximum (WHO)	150	n/a	10.4	6.9%	n/a	n/a	no
	1 hour, maximum	150	n/a	65.1*	43%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	3.20	0.44%	n/a	n/a	no
	1 hour, maximum	21600	n/a	59.3	0.27%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.0656	0.036%	n/a	n/a	no
	1 hour, maximum	2500	n/a	1.22	0.049%	n/a	n/a	no

* this value indicates an exceedance of the odour criterion (1.65µg/m^3) cannot be ruled out. See **Sections 5.4.3** and **5.5** for further discussion.
n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table 5.7: Scenario 2 (Future Normal), Predicted Human Health Impacts

Compound	Averaging Time	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
		µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
NO_2	Annual, mean	40	22.1	0.584	1.5%	22.7	57%	no
	1 hour, <19 exceedances yearly	200	44.2	1.83	0.92%	46.0	23%	no
PM_{10}	Annual, mean	40	17.9	0.790	2.0%	18.7	47%	no
	24 hour, <36 exceedances yearly	50	35.8	2.68	5.4%	38.5	77%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	3.09	2.5%	6.73	5.4%	no
	1 hour, <25 exceedances yearly	350	3.64	7.36	2.1%	11.0	3.1%	no
	15 min, <36 exceedances yearly	266	3.64	14.4	5.4%	18.1	6.8%	no
H_2S	Annual, mean	140	n/a	0.261	0.19%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	1.60	1.1%	n/a	n/a	no
	1 hour, maximum	150	n/a	12.4*	8.3%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	3.19	0.44%	n/a	n/a	no
	1 hour, maximum	21600	n/a	59.4	0.27%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.0656	0.036%	n/a	n/a	no
	1 hour, maximum	2500	n/a	1.22	0.049%	n/a	n/a	no

* this value indicates an exceedance of the odour criterion (1.65µg/m^3) cannot be ruled out. See **Sections 5.4.3** and **5.5** for further discussion.
n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table 5.8: Scenario 3 (Bypass), Predicted Human Health Impacts

Compound	Averaging Time	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
		µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	1.20	1.0%	4.84	3.9%	no
	1 hour, <25 exceedances yearly	350	3.64	3.05	0.87%	6.69	1.9%	no
	15 min, <36 exceedances yearly	266	3.64	6.09	2.3%	9.73	3.7%	no
H_2S	24 hour, maximum (WHO)	150	n/a	26.6	18%	n/a	n/a	**yes**
	1 hour, maximum	150	n/a	120*	80%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	59.2	0.27%	n/a	n/a	no

* this value indicates an exceedance of the odour criterion (1.65µg/m^3) cannot be ruled out. See **Sections 5.4.3** and **5.5** for further discussion.
n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

5.4.3 Odour Nuisance due to H_2S Emissions

Table 5.9 shows the results of the dispersion modelling for predicted odour due to the Site's H_2S emissions. Results are presented as hours per year during which the odour criterion (1.5 OU/m^3 or 1.65 $\mu g/m^3$, see **Section 5.1.3.2**) is predicted to be exceeded for current and future normal operations and for bypass operations. As mentioned in **Section 4.3**, the difference between future and current bypass lies with duration and frequency of the events, whilst the nature of assumed emissions are identical with regards to H_2S.

Interpolated plots of model outputs are set out in **Appendix C**.

Predicted results at specific residential receptors, as defined in **Table 5.2**, are presented in **Appendix D**.

Table 5.9: Predicted H_2S Odour Impact

Parameter	Unit	AQS	Current – Normal Operations	Future – Normal Operations	Current – Bypass Events	Future – Bypass Events
Maximum Operational hours	h/yr	-	8760	8760	Maximum observed: 48	Maximum expected: 5
Maximum Anywhere offsite						
Odour criterion exceedance	h/yr (%)	175 (2%)	2495 (28%)	263 (3.0%)	Maximum observed: 22.7 (0.26%)	Maximum expected: 2.37 (0.027%)
Maximum affected residential receptor						
Odour criterion exceedance	h/yr (%)	175 (2%)	251 (2.9%)	38 (0.43%)	Maximum observed: 8.10 (0.092%)	Maximum expected: 0.84 (0.0096%)

As the predicted future H_2S process contributions (1 hour maximum of 120µg/m^3, see **Table 5.8**) during a bypass event exceed the odour criterion (1.65µg/m^3), a FIDOR assessment has been performed specifically for this situation.

Table 5.10 outlines the FIDOR risk assessment (see **Section 4.4**) following the process set out in H4[1]. Frequency of detection; Intensity as perceived; Duration of exposure; Offensiveness; Receptor sensitivity.

On the basis of the Site context, the sensitive receptors with the greatest risk of odour nuisance are residential properties to the south/southwest of the Site. These are receptors which are upwind for the greatest proportion of the year, but are close to the Site, being 400m from the Site boundary at the closest point.

Table 5.10: Scenario 3 (Future Bypass), H_2S Odour FIDOR Assessment

Sensitive Receptor	Frequency of detection	Intensity	Duration	Offensiveness	Receptor sensitivity	Risk
Residential areas (#1 - 4)	Very infrequent due to separation distance, low occurrence of events, prevailing wind direction away from receptors	Medium	Short, on average events assumed to last for around one hour.	Medium	High	Low (due to low frequency and duration)
Other non-residential public receptors (# 5 - 7)	Infrequent due to large separation distance, low occurrence of events, prevailing wind direction away from receptors	Medium	Short, on average events assumed to last for around one hour.	Medium	Medium	Low (due to low frequency and duration)
Commercial and industrial, non-public receptors (#8 - 11)	Infrequent due to low occurrence of events	High (closer to source)	Short, on average events assumed to last for around one hour.	High (closer to source)	Low	Low(due to low frequency and duration)

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296737/geho0411btqm-e-e.pdf

5.5 Discussion - Human Health Impacts and Odour Nuisance

Dispersion modelling was performed for the following scenarios to help understand the potential effects of ADM's emissions on ambient air quality:

- Scenario 1: Current normal operations based on 2020 emission reports where available, and data from literature (BREF notes and/or supplier data) where necessary. This scenario includes operation of the existing TO;
- Scenario 2: Future normal operations based on current operations scenario, but with replacement of the TO by the new TO&S;
- Scenario 3: Bypass of MOS exhaust to A14.

The modelling performed, as summarised in the tabulated results and the contour plots, indicates:

- SO_2:
  - PCs and PECs are predicted to exceed the AQS in the current situation (scenario 1), but are predicted to improve considerably and not be significant in the future situation (scenario 2) with maximum predicted impacts less than 6% of the AQS;
  - bypassing MOS exhaust to A14 (scenario 3) is predicted to effectively eliminate the potential for significant SO_2 impacts to occur, as H_2S is not oxidised to SO_2 in this scenario;
- H_2S (human health):
  - annual and hourly PC are predicted to be potentially significant in the current normal situation (scenario 1) without exceeding the AQS (max. 1.4% and 42% of AQS respectively). Daily PC is predicted to be not significant in the current situation. The annual PC leaves approximately 96µg/m^3 of 'headroom' till the PEC significance threshold (70% of AQS) is reached in scenario 1. Given the identification threshold for H_2S is 0.6-6µg/m^3, and it is likely that on an annual basis the background levels do not exceed this level, annual PEC is likely to be less than 70% of the AQS. The hourly PC exceeds both the 10% and the 20% threshold in its own right and is therefore significant irrespective of background level;
  - all PCs are predicted to improve considerably in the future normal situation (scenario 2) with maximum predicted impacts less than 9% of the AQS. The H_2S impacts are therefore predicted to not be significant in the future situation;
  - bypassing MOS exhaust to A14 (scenario 3) will have a detrimental effect on H_2S emissions with predicted maximum PCs reaching 18% and 80% of the daily and hourly PC respectively, i.e. potentially significant. The area of potentially significant impact in this case is predicted to reach up to approximately 0.5km and 6km from the Site for the daily and hourly PC respectively. The maximum predicted impact at specifically modelled human receptors stays below 9% (i.e. not significant) and 41% (potentially significant) of the daily and the hourly AQS respectively.
  - in the future, the number of bypass events is anticipated to decrease from an average of 10 events per year (18.5 hours per year, maximum recorded total of 48 hours over one year) to a maximum of around five events per year, with an average duration of one hour per event. With this in mind, the chance of a bypass event occurring during worst case dispersion conditions and therefore resulting in the predicted impacts becomes extremely small, i.e. the predicted results should be considered highly conservative.
- H_2S (odour) – <u>current normal operations (scenario 1)</u>:
  - the odour criterion is predicted to be exceeded >175 hours (>2%) per year (maximum allowed as per H4 Guidance, see **Section 5.1.3.2**) in the current situation with a maximum of 2,495 (28%) predicted exceedances per year at the point of maximum impact. The area where >175 yearly exceedances are predicted includes the largely industrial immediate area,

and the adjacent Thames River to the east, but also extends to residential receptors to the west (Lower Road, Culing Road, Beltwood Road, Bullbanks Road, Mayfield Road). The maximum predicted number of exceedances at the specifically modelled human receptors for this situation is 251 (2.9%) per year. Based on this the current risk of odour nuisance is considered high;

- H_2S (odour) – future normal situation (scenario 2):
  - the number of exceedance hours is predicted to decrease to a maximum of 263 exceedances (3.0%) per year at the point of maximum impact, which is situated over a small area over the northeast corner off the Site and the River Thames, where the number of sensitive receptors should in practice be few. The maximum predicted number of exceedances at the specifically modelled residential receptors is reduced significantly to 38 (0.43%) per year. Based on this the future risk for odour nuisance during normal operations is considered to be low;
- H_2S (odour) – bypass event (scenario 3):
  - the number of bypass events is expected to decrease to a maximum of five events annually with an average duration of one hour as compared to a maximum recorded annual total of 48 hours and 1.85 hour average per event for the current situation. As 48 hours is below the 175 hours benchmark level allowable in guidance, the odour benchmark level cannot be exceeded. Taking into account the maximum recorded and expected future bypass hours, the model predicts that the maximum percentage of time during a year in which the odour criterion (1.65µg/m^3) will potentially be exceeded is only 0.26% in the current situation and will further decrease to 0.027% in the future situation. Nevertheless, there is a small risk of causing occasional odour nuisance at nearby residential receptors during a bypass event. This risk has been further assessed using the FIDOR method on which basis it is concluded that there is a low risk for odour nuisance taking into account frequency of detection, intensity as perceived, duration of exposure, offensiveness and receptor sensitivity.
- NO_2, $PM_{10,}$ hexane and NH_3: none of the investigated emission scenarios is predicted to have the potential to be associated with significant impacts;
- VOC: Impacts from VOCs (other than hexane) are assessed in more detail in **Appendix B**. This detailed assessment shows that impacts from VOCs are predicted to be not significant for all scenarios.

As part of the Permit Variation, an updated Odour Management Plan has been drafted (Appendix D in ‘ADM Erith Environmental Permit, Substantial Variation Application: Supporting Information Document’) outlining further odour mitigation measures at the Site.

6. POTENTIAL IMPACTS ON DESIGNATED SITES

6.1 Approach to the Assessment of Designated Sites

6.1.1 Introduction

The approach to the assessment of potential impacts of air emissions on sites designated for their national and local ecological importance follows the guidance set out in the Planning Inspectorate's Advice Note 10[1] and guidance produced by Defra / Environment Agency (EA) on screening risks from emissions to air on protected areas for nature conservation[2].

This process follows the Habitat Risk Assessment (HRA) process by initially Screening to identify the likely effects of a project on a nationally or locally designated site for nature conservation and considering whether there are likely to be adverse effects.

6.1.2 Ecological Receptors - Designated Sites

Designated sites that were included in the assessment are detailed below, along with their Areas of Search (AoS):

- Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites and Sites of Special Scientific Interest (SSSI) within 10km of the Site; and
- National Nature Reserves (NNR), Local Nature Reserves (LNR), Sites of Importance for Nature Conservation (SINC) and ancient woodland (AW) within 2km of the Site.

No European designated sites (i.e. SACs, SPAs and Ramsar sites) were identified within 10km of the Site. There were seven SSSIs designated for biological interest within 10km of the Site, as listed in **Table 6.1** and shown on **Figure 6.1.** The closest SSSI is Inner Thames Marshes SSSI which lies 1.3km to the north east of the Site.

A further eight SSSIs designated for geological interest were identified within the 10km AoS. As geological sites are not sensitive to air emissions, these SSSIs were scoped out of further assessment and were not included in the table of sites.

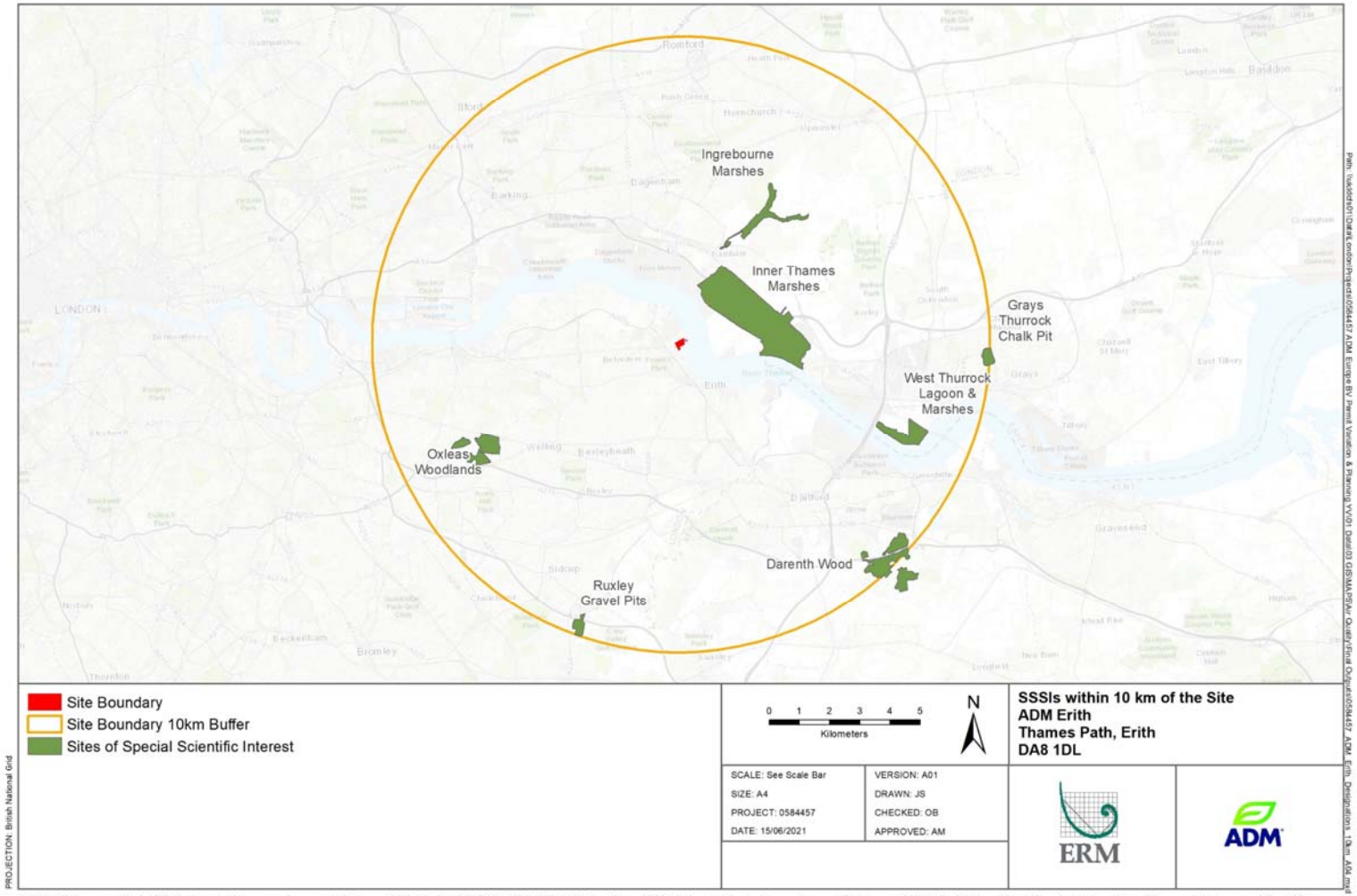
A number of locally designated sites for nature conservation were also identified within 2km of the Site. This included three LNRs, one AW and 12 SINCs. The LNRs and AW are listed in **Table 6.2** and shown on **Figure 6.2**. The SINCs are listed in **Table 6.3** but not shown on the maps as digital site boundaries were not available[3]. The closest locally designated site to the Site was the River Thames and tidal tributaries SINC (M031) which is adjacent to the Site.

[1] Advice Note 10: *Habitats Regulations Assessment relevant to nationally significant infrastructure projects.* The Planning Inspectorate. Republished November 2017, Version 8.

[2] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screening-for-protected-conservation-areas

[3] The local records centre, Greenspace Information for Greater London (GIGL), holds the local SINC information but does not supply shape files of SINC locations or allow their reports or maps to be published for an external audience.

Figure 6.1: SSSIs designated for biological interest within 10km of the Site



SOURCE:Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Figure 6.2: Locally designated sites for nature conservation within 2km of the Site

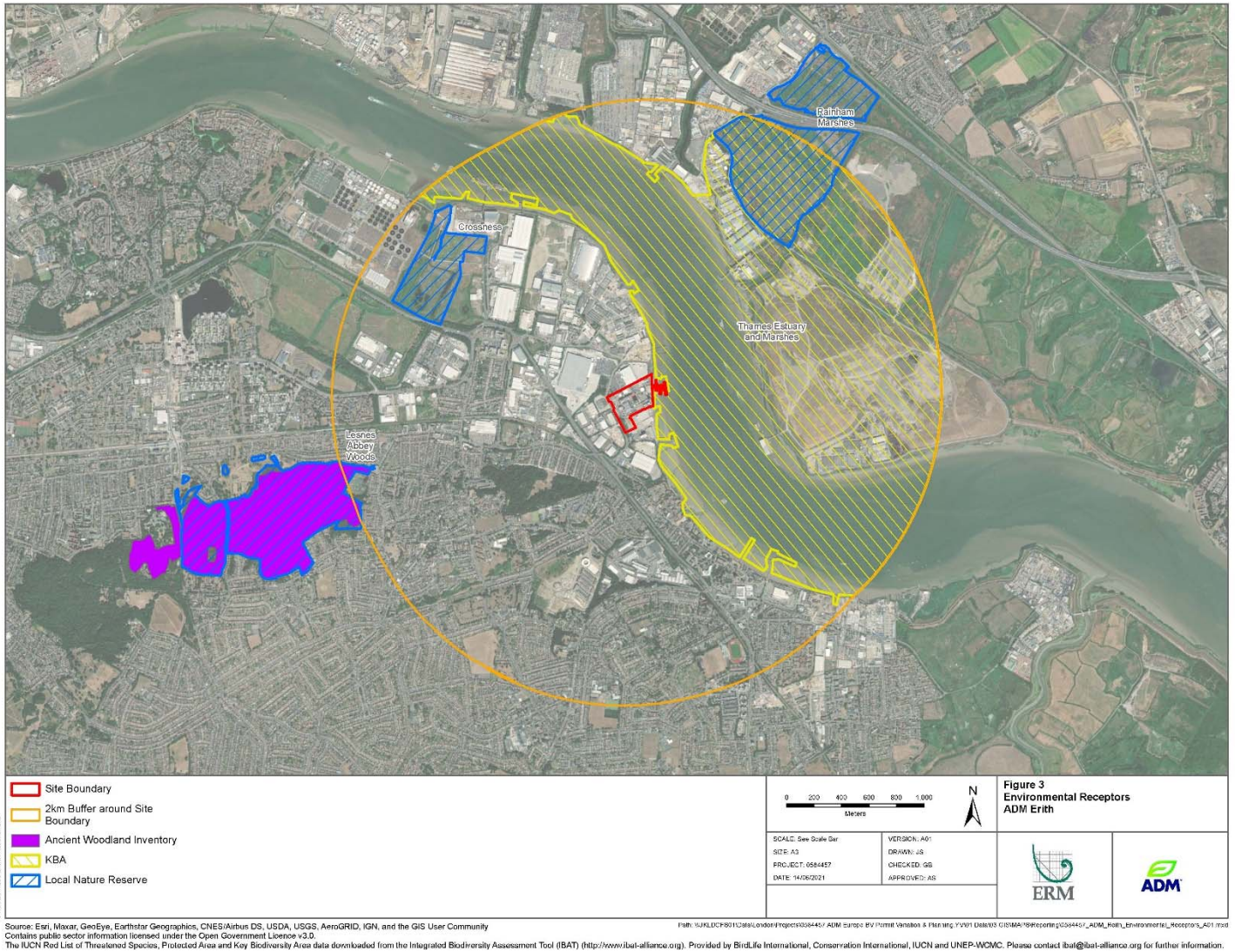


Table 6.1: SSSIs within 10km of the Site

SSSI	Distance from Site (km)	Citation Features
Inner Thames Marshes	1.3km north east	The largest remaining expanse of wetland bordering the upper reaches of the Thames Estuary. The site is noted for its diverse ornithological interest and also supports a wide range of wetland plants and insects. The majority of the site is also an RSPB reserve.
Ingrebourne Marshes	3.2km north east	The largest and one of the most diverse areas of freshwater marshland in Greater London, which supports a rich assemblage of associated invertebrates and breeding birds.
Oxleas Woodlands	6.7km south west	Part of an extensive area of long established broadleaved woodland on the London Clay, supporting a rich flora, invertebrate and bird community.
West Thurrock Lagoon & Marshes	6.7km south east	One of the most important sites for wintering waders and wildfowl on the Inner Thames Estuary. Extensive intertidal mudflats, lagoon and saltmarsh habitats.
Darenth Wood	8.9km south east	The site comprises some of the most valuable areas of ancient semi-natural woodland in north-west Kent and includes several rare woodland types and diverse invertebrate communities supporting some rare species.
Ruxley Gravel Pits	9.2km south west	Four small gravel pits with patches of fen vegetation forming one of the few areas of relatively undisturbed open water in Greater London south of the Thames. The sites supports a variety of important habitats, plant species, invertebrates and breeding wetland birds.
Grays Thurrock Chalk Pit	9.6km east	A disused quarry that now comprises a range of woodland, scrub and calcareous grassland habitats that support an important assemblage of invertebrate fauna.

Table 6.2: LNR and AW within 2km of the Site

Locally Designated Site	Distance from Site (km)	Citation Features
Rainham Marshes LNR	1.3km north east	An important area of ancient low-lying grazing marsh in the Thames Estuary. It forms a complex of wet grassland, ditches, grassland and scrub that support breeding and wintering birds, water vole and scarce wetland plants and insects.
Crossness LNR	1.5km north west	One of the few remaining areas of grazing marsh in London, with large reedbeds, ponds, ditches and rough grassland. It is a major site for water vole and also supports birds, some rare invertebrates and scarce plant species.
Lesnes Abbey Woods LNR & AW	1.8km west	Extensive broadleaved ancient woodland and surrounding parkland and grassland.

Table 6.3: SINCs within 2km of the Site

SINC	Central Grid Reference	Citation Features
Metropolitan:		
Lesnes Abbey Woods and Bostall Woods (M015)	TQ 475 782	A large complex of ancient and secondary woodland, with adjacent areas of heathland and acid grassland.
River Thames and tidal tributaries (M031)	TQ 302 806	The River Thames and the tidal sections of creeks and rivers that flow in to it. Habitats include mudflats, shingle beach, intertidal vegetation, islands and the river channel itself which support many species from freshwater, estuarine and marine communities. The site is of particular importance for wildfowl and wading birds.
Wennington, Aveley and Rainham Marshes (M039)	TQ 528 804	A large expanse of wetland and grassland alongside the Thames, supporting uncommon plant species and important populations of breeding, passage and wintering birds.
Erith Marshes (M041)	TQ 485 803	One of the few remaining examples of Thames-side grazing marshes which is important for supporting birds, rare plant species and insects.
Borough Grade I		
Belvedere Dykes (BxBI02)	TQ 500 798	A number of drainage ditches that support some rare plant species, birds and water vole.
Franks Park, Belvedere (BxBI03)	TQ 500 787	A mature broadleaved woodland with areas of acid grassland containing regionally important plant species.
Erith Quarry and Fraser Road (BxBI04)	TQ 503 780	A mosaic of broadleaved woodland, scrub and grassland supporting a range of important birds, invertebrates and plant species.
Hollyhill Open Space (BxBI05)	TQ 498 781	A former heathland, now mainly a mix of acid grassland, amenity grassland and scrubby parkland. Supports scarce plant species.
Borough Grade II		
Southmere Park & Yarnton Way/Viridion Way (BxBII02)	TQ 479 799	A large lake (mainly used for recreation) and surrounding parkland, a poplar woodland and neutral grassland.
St John the Baptist Churchyard, Erith (BxBII20)	TQ 507 787	A small churchyard with moderately species-rich grassland supporting a large colony of the nationally scarce *Orobanche hederae* (ivy broomrape).
Streamway, Chapman's Land and Erith Cemetery (BxBII21)	TQ 495 779	A small stream with patchy woodland and a cemetery with species-rich grassland habitats.
Local:		
Our Lady of Angels Cemetery (BxL18)	TQ 503 775	A small cemetery of acid grassland supporting important plant assemblages including a population of the locally rare *Succisa pratensis* (devil's-bit scabious).

The approach to assessing the effects on the habitats and species of these designated sites from air emissions is detailed below.

6.1.3 Guidance

The approach to the assessment has taken account of the following guidance:

- DEFRA / EA guidance on Air Emissions Risk Assessment for Your Environmental Permit (as updated on 7 October 2020 - https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit - accessed on 20 May 2021).
- DEFRA/ EA guidance on Environmental Permitting: Air Dispersion Modelling Reports (as updated on 19 January 2021 - https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports - accessed on 20 May 2021).
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.0, June 2019). Institute of Air Quality Management (IAQM).
- CIEEM (2021) Advice on Ecological Assessment of Air Quality Impacts. Chartered Institute of Ecology and Environmental Management. Winchester, UK.

Information about the relative sensitivity of qualifying interest habitats and plant species, and habitats supporting qualifying interest fauna species, was obtained (where available) from the Air Pollution Information System (APIS)[1].

6.1.4 Critical Loads and Levels

The critical loads[2] and critical levels[3] for each habitat type were also obtained from APIS and used as tools to assess the potential for effects of air compounds on habitats. The critical load refers to the quantity of compound deposited from air to the ground, while the critical level is the gaseous concentration of a compound in the air.

Effects resulting from nitrogen and acid deposition have been assessed on a habitat and species specific approach against critical loads listed in APIS. These specific loads are provided in the relevant tables in **Appendix F**.

Critical levels (for the effects of NO_x, SO_2 and NH_3) have been assessed against environmental standards that apply either across all habitat types (for NO_x), or across lichens/bryophytes and vascular plants (for SO_2 and NH_3) as set out in **Table 6.4**.

Table 6.4: Relevant Environmental Standards

Substance	Emission period	Target (mean)
Nitrogen oxides (NO_x)	Annual	30 micrograms per cubic metre (µg m^{-3})
	Daily (24hr mean)	75µg m^{-3}
Sulphur dioxide (SO_2)	Annual	10µg m^{-3} – where lichens / bryophytes are present
	Annual	20µg m^{-3} – for all other vegetation
Ammonia (NH_3)	Annual	1µg m^{-3} – where lichens / bryophytes are present
	Annual	3µg m^{-3} – for all other vegetation

[1] http://www.apis.ac.uk

[2] Critical Loads are defined as: *"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"* (http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis - accessed 30 August 2021)

3 Critical levels are defined as *"concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge"*. (http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis - accessed 30 August 2021)

6.1.5 Screening Methodology

The Process Contribution (PC) is the predicted contribution to the concentration of a specific compound in ambient air from the plant emissions themselves.

Air dispersion modelling was undertaken to predict the short and long-term PC against the respective environmental standards. The screening approach to determine whether the PCs for the Site were insignificant, or required further assessment, was undertaken by comparing the PCs (and where necessary Predicted Environmental Contributions (PECs)[1]), against the percentages of the critical levels / loads for each habitat as set out in the Defra / EA guidance (see **Table 6.5**). The percentages shown have been used as a guide, with a precautionary approach taken.

The approach will also consider the contribution of the Site along with other projects and plans as part of an in-combination assessment (see **Section 7**).

Table 6.5: Assessment Criteria for Habitats and Species for National Sites

Criterion	Assessment
Long Term / Short Term	
PC < 1% of CL (long) and / or PC <10% of CL (short) or PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL	Insignificant contribution and no further assessment required. Considered in the assessment to have no likely significant effect.
PC > 1% of CL (long) and / or >10% of CL (short) and PEC > 70% of CL	Cannot be considered as an insignificant contribution. Further assessment is required to determine the effects on habitats and species and whether, or not, they are likely to have an adverse effect on the integrity of a designated site.

For local sites, impacts are deemed insignificant if PC<100% of CL (short and long term).

The levels and loads of air emissions at habitats in the SSSIs within a 10km radius of the Site and local sites within 2km of the Site were predicted by the air dispersion modelling. Details about the model and its input data can be found in **Section 4**.

To assess the likely effects on designated sites, the methods listed below were undertaken.

- Habitats that were not sensitive to the specific air emissions assessed were scoped out;
- In terms of nitrogen and acid deposition, the critical load for the most sensitive habitat at a designated site in the UK (as identified on APIS) was used for all sites as a first step to screen for potential effects. If the effects on this habitat type were found to be insignificant, it was assumed that effects on other qualifying features (with less stringent critical loads) would be insignificant also. Where this critical load was exceeded, the next step was to select the most sensitive habitat type amongst the qualifying interest features for that individual site to provide more tailored modelling. If the effects on this habitat type were found to be insignificant, it was assumed that effects on other less sensitive qualifying features would be similarly insignificant;
- Where there were no identified critical loads on APIS (eg. for neutral grassland habitat at the Inner Thames Marshes SSSI), appropriate critical loads were derived using the following approach, which was agreed with Natural England (NE)[2]:

[1] The PEC is the PC added to the baseline concentration of the substance.
[2] Consultation email from Louise Crothall (NE), 24.03.21

- Where not specified, the relevant habitat type was identified based on information in the SSSI citations and site condition table information;
- The 'Search by Location' facility for that habitat type on APIS was used to derive location-specific proxy critical loads;
- Where faunal species were listed with no critical loads, the effects on the habitat type that supported them was assessed. If that habitat was not affected, then it was assumed that the faunal species would not be affected either.

6.2 Screening for Potential Significant Effects on Nationally and Locally Designated Sites

6.2.1 Overview

This Section summarises the predicted effects of the emissions from the Site alone on the nationally and locally designated sites for two modelling scenarios:

- Scenario 1 – current normal operations with the existing Thermal Oxidiser (TO); and
- Scenario 2 – future normal operation with the new TO.

Further details on these two scenarios are given in **Section 4.3**. The third scenario (bypass event) is not deemed relevant with regards to impacts to ecological receptors for the following reasons:

- Limited hours of operation (current maximum of 48 and expected maximum of five, one hour events per year once the new TO&S is operational);
- When compared to normal operations, a bypass event is associated with a reduction of the most relevant emissions with regards to ecological impact (SO_2 and NO_x).

A summary of the PCs, and where necessary Predicted Environmental Concentration (PECs), as a percentage of the critical levels / loads for each designated site is presented below. For nutrient nitrogen and acid deposition, the percentage PC for the most detailed modelling undertaken is shown (i.e. percentages are either based on the critical load for the most sensitive habitat in the UK or for the most sensitive habitat for the designated site where required). A more detailed summary of the air dispersion modelling results for air compounds associated with both the current and future operation of the Site is set out in **Appendix F**.

6.2.2 Assessment of Predicted Effects on National Sites (SSSIs)

This Section summarises the predicted effects of the compounds from the current (Scenario 1) and future (Scenario 2) operations on all Sites of Special Scientific Interest (SSSIs) within 10km of the Site.

6.2.2.1 Effects of NO_x on National Sites

The predicted PCs as a percentage of the critical level for long-term (annual mean) and short-term (24 hour) NO_x at the SSSIs are listed in **Table 6.6**. Scenarios 1 and 2 are very similar in terms of NO_x emissions. The predicted PC was <1% of the critical level (for annual mean) and <10% of the critical level (for 24 hours) at all of the SSSIs for both scenarios. In terms of the proposed future Site operations, the predicted PCs of NO_x are considered to be insignificant at all of these sites and no likely significant effects on the SSSIs are predicted as a result of NO_x emissions.

Table 6.6: Predicted PCs as Percentages of Critical Levels for NO_x

SSSI	Scenario 1 (current normal)	Scenario 2 (future normal)
	PC as % of Critical Level	PC as % of Critical Level
NO_x Annual Mean		
Inner Thames Marshes SSSI	0.6%	0.7%
Ingrebourne Marshes SSSI	0.1%	0.1%
Oxleas Woodlands SSSI	0.05%	0.05%
West Thurrock Lagoon & Marshes SSSI	0.03%	0.03%
Darenth Wood SSSI	0.01%	0.02%
Ruxley Gravel Pits SSSI	0.01%	0.01%
Grays Thurrock Chalk Pit SSSI	0.01%	0.01%
NO_x 24hr		
Inner Thames Marshes SSSI	1.1%	1.2%
Ingrebourne Marshes SSSI	0.3%	0.3%
Oxleas Woodlands SSSI	0.2%	0.2%
West Thurrock Lagoon & Marshes SSSI	0.1%	0.2%
Darenth Wood SSSI	0.1%	0.1%
Ruxley Gravel Pits SSSI	0.1%	0.1%
Grays Thurrock Chalk Pit SSSI	0.1%	0.1%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

6.2.2.2 Effects of Ammonia on National Sites

The predicted PCs as a percentage of the critical level for ammonia (NH_3) are listed in **Table 6.7**. At Inner Thames Marshes SSSI, Ingrebourne Marshes SSSI and West Thurrock Lagoon & Marshes SSSI, no lichens or bryophytes were expected to be present so the critical level for other vegetation was used. At the remaining SSSIs, the more stringent critical level for lichens / bryophytes was used as a precautionary measure.

There was no change predicted in the low levels of ammonia emitted between Scenario 1 and 2. The predicted PC did not exceed 1% at any of the SSSIs and therefore emissions of NH_3 are predicted to be insignificant for both scenarios. No likely significant effects on the SSSIs below are predicted as a result of the proposed future Site emissions.

Table 6.7: Predicted PCs as Percentages of Critical Levels for NH_3

SSSI	Scenario 1 (current normal)	Scenario 2 (future normal)
	PC as % of Critical Level	PC as % of Critical Level
Inner Thames Marshes SSSI	0.2%	0.2%
Ingrebourne Marshes SSSI	0.03%	0.03%
Oxleas Woodlands SSSI	0.04%	0.04%
West Thurrock Lagoon & Marshes SSSI	0.01%	0.01%
Darenth Wood SSSI	0.01%	0.01%

SSSI	Scenario 1 (current normal)	Scenario 2 (future normal)
	PC as % of Critical Level	PC as % of Critical Level
Ruxley Gravel Pits SSSI	0.02%	0.02%
Grays Thurrock Chalk Pit SSSI	0.01%	0.01%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

6.2.2.3 Effects of SO_2 on National Sites

The predicted PCs as a percentage of the critical level for SO_2 (annual) at the SSSIs are listed in **Table 6.8**. As for NH_3, the more stringent critical level for lichens / bryophytes was used as a precautionary measure at sites where their presence could not be ruled out.

SO_2 emissions are predicted to be reduced greatly between Scenario 1 and Scenario 2. The predicted PC was greater than 1% of the critical level at Oxleas Woodland SSSI, Inner Thames Marshes SSSI and Ingrebourne Marshes SSSI for Scenario 1, but the PEC was <70% in all cases so the emissions were considered insignificant. In Scenario 2, the emissions were greatly reduced and the predicted PC was <1% at all of the SSSIs. No likely significant effects on any of the SSSIs are predicted as a result of the proposed future Site emissions.

Table 6.8: Predicted PCs as Percentages of Critical Levels for SO_2

SSSI	Scenario 1 (current normal)		Scenario 2 (future normal)	
	PC as % of Critical Level	PEC as % of Critical Level	PC as % of Critical Level	PEC as % of Critical Level
Inner Thames Marshes SSSI	8.8%	20%	0.4%	12%
Ingrebourne Marshes SSSI	1.4%	13%	0.1%	12%
Oxleas Woodlands SSSI	1.3%	18%	0.1%	17%
West Thurrock Lagoon & Marshes SSSI	0.4%	-	0.02%	-
Darenth Wood SSSI	0.5%	-	0.03%	-
Ruxley Gravel Pits SSSI	0.7%	-	0.04%	-
Grays Thurrock Chalk Pit SSSI	0.4%	-	0.02%	-

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

6.2.2.4 Effects of Nutrient Nitrogen Deposition on National Sites

The predicted PCs as a percentage of the Critical Load (CL) for nitrogen deposition are listed in **Table 6.9**. Qualifying interest features were listed as woodland where the CL for the most sensitive habitat type at a designated site in the UK was used for the modelling and more specific habitat types were listed where the CL for the most sensitive habitat type on the SSSI was used for either scenario.

There was no change predicted in the levels of nitrogen deposition between Scenarios 1 and 2. The predicted PC did not exceed 1% of the critical load at any of the SSSIs in either scenario. The predicted contribution of deposited nitrogen as a result of the proposed future Site operations is considered insignificant and no likely significant effects on the SSSIs are predicted.

Table 6.9: SSSIs – Predicted PCs as % of Critical Loads for Nutrient Nitrogen Deposition

SSSI	Qualifying Interest Feature	Scenario 1 (current normal)	Scenario 2 (future normal)
		PC as % of CL (min)	PC as % of CL (min)
Inner Thames Marshes SSSI	Littoral sediment (saltmarshes) supporting teal (*Anas crecca*)	0.2%	0.2%
Ingrebourne Marshes SSSI	Woodland	0.5%	0.5%
Oxleas Woodlands SSSI	Woodland	0.2%	0.2%
West Thurrock Lagoon & Marshes SSSI	Woodland	0.1%	0.1%
Darenth Wood SSSI	Woodland	0.1%	0.1%
Ruxley Gravel Pits SSSI	Woodland	0.1%	0.1%
Grays Thurrock Chalk Pit SSSI	Woodland	0.1%	0.1%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

6.2.2.5 Effects of Acid Deposition on National Sites

The predicted PCs as a percentage of the CL for acid deposition are listed in **Table 6.10**.

As for nitrogen deposition, qualifying interest features were listed as woodland where the CL for the most sensitive habitat type in the UK was used for the modelling and more specific habitat types are listed where the CL for the most sensitive habitat type on the SSSI was used for either scenario.

The addition of the new TO&S in Scenario 2 is predicted to greatly decrease the levels of acid deposition from the Site. In Scenario 1, predicted acid deposition at Oxleas Woodland SSSI exceeds the critical load for both PC and PEC. However, the future proposed Site emissions (Scenario 2) are predicted to not exceed 1% of the CL for any of the SSSIs and therefore acid deposition levels were considered insignificant and no likely significant effects on any of the SSSIs are predicted.

Table 6.10: SSSIs – Predicted PCs as % of Critical Load for Acid Deposition

SSSI	Qualifying Interest Feature	Scenario 1 (current normal)		Scenario 2 (future normal)	
		PC as % of CL (min)	PEC as % of CL (min)	PC as % of CL (min)	PEC as % of CL (min)
Inner Thames Marshes SSSI	Neutral grassland - lowland	5.2%	10%	0.3%	6%
Ingrebourne Marshes SSSI	Neutral grassland - lowland	0.7%	-	0.05%	-
Oxleas Woodlands SSSI	Broadleaved, mixed and yew woodland	1.2%	94%	0.1%	93%
West Thurrock Lagoon & Marshes SSSI	Acid grassland	0.2%	-	0.01%	-
Darenth Wood SSSI	Unmanaged broadleaved/ / coniferous woodland	0.9%	-	0.06%	-
Ruxley Gravel Pits SSSI	Broadleaved, mixed and yew woodland	0.9%	-	0.06%	-

SSSI	Qualifying Interest Feature	Scenario 1 (current normal)		Scenario 2 (future normal)	
		PC as % of CL (min)	PEC as % of CL (min)	PC as % of CL (min)	PEC as % of CL (min)
Grays Thurrock Chalk Pit SSSI	Unmanaged broadleaved/ / coniferous woodland	0.5%	-	0.03%	-

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

6.2.2.6 Summary of Effects on National Sites

Emissions and consequently the predicted impacts, of NO_x, ammonia and nitrogen remain very similar between the current Scenario 1 and future Scenario 2. The proposed new TO&S (Scenario 2) will greatly reduce the emissions of SO_2 which is reflected in the predicted reduction of acid deposition by the Site. No likely significant effect on any of the SSSIs is predicted as a result of emissions arising from the proposed future Site operations.

6.2.3 Assessment of Predicted Effects on Local Sites

This Section summarises the predicted effects of the air emissions on locally designated sites for nature conservation: Sites of Importance for Nature Conservation (SINCs), Local Nature Reserves (LNRs) and Ancient Woodland (AW). Where there are local sites, emissions are considered to be insignificant if the short / long term PC is less than 100% of the short / long term environmental standard[1].

6.2.3.1 Effects of NO_x on Local Designated Sites

The predicted PCs as a percentage of the critical level for long-term (annual mean) and short-term (24 hour) NO_x at the locally designated sites are listed in **Table 6.11**. The emissions from Scenarios 1 and 2 are very similar and the predicted PC did not exceed 100% of the critical level at any of the locally designated sites in either scenario. Predicted NO_x PCs as a result of the proposed future Site operations are considered to be insignificant at all of the local sites and no likely significant effects on the local sites are expected.

Table 6.11: Local Designations – Predicted PCs as % of Critical Levels for NO_x

Local Designations	Scenario 1 (current normal)	Scenario 2 (future normal)
	PC as % of CL	PC as % of CL
NO_x Annual Mean		
Lesnes Abbey Woods and Bostall Woods SINC	0.2%	0.2%
River Thames and tidal tributaries SINC	2%	2%
Wennington, Aveley and Rainham Marshes SINC	0.6%	0.7%
Erith Marshes SINC	0.2%	0.2%
Belvedere Dykes SINC	0.3%	0.3%
Franks Park, Belvedere SINC	0.3%	0.4%
Erith Quarry and Fraser Road SINC	0.2%	0.2%
Hollyhill Open Space SINC	0.2%	0.2%
Southmere Park & Yarnton Way/Viridion Way SINC	0.3%	0.3%

[1] As set out in DEFRA / EA guidance on Air Emissions Risk Assessment for Your Environmental Permit - https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Local Designations	Scenario 1 (current normal)	Scenario 2 (future normal)
	PC as % of CL	PC as % of CL
St John the Baptist Churchyard, Erith SINC	0.4%	0.4%
Streamway, Chapman's Land and Erith Cemetery SINC	0.1%	0.2%
Our Lady of Angels Cemetery SINC	0.1%	0.1%
Rainham Marshes LNR	0.6%	0.6%
Crossness LNR	0.2%	0.2%
Lesnes Abbey Woods LNR	0.2%	0.2%
Lesnes Abbey Woods AW	0.2%	0.2%
NO_x 24hr		
Lesnes Abbey Woods and Bostall Woods SINC	0.6%	0.6%
River Thames and tidal tributaries SINC	4%	4%
Wennington, Aveley and Rainham Marshes SINC	1%	1%
Erith Marshes SINC	1%	1%
Belvedere Dykes SINC	1%	1%
Franks Park, Belvedere SINC	2%	2%
Erith Quarry and Fraser Road SINC	1%	1%
Hollyhill Open Space SINC	2%	2%
Southmere Park & Yarnton Way/Viridion Way SINC	1%	1%
St John the Baptist Churchyard, Erith SINC	3%	3%
Streamway, Chapman's Land and Erith Cemetery SINC	1%	1%
Our Lady of Angels Cemetery SINC	0.8%	0.8%
Rainham Marshes LNR	1%	1%
Crossness LNR	1%	1%
Lesnes Abbey Woods LNR	0.7%	0.7%
Lesnes Abbey Woods AW	0.7%	0.7%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

6.2.3.2 Effects of Ammonia on Local Designated Sites

The predicted PCs as a percentage of the critical level for ammonia (NH_3) are listed in **Table 6.12**. All sites were assessed against the more stringent critical level for lichens and bryophytes as a precautionary measure. There is no change predicted in the low levels of ammonia emitted between Scenario 1 and 2. The predicted PC did not exceed 1% at any of the locally designated sites and therefore emissions of NH_3 were considered insignificant for both scenarios. No likely significant effects on the local sites below are predicted as a result of the proposed future Site operations.

Table 6.12: Local Designations – Predicted PCs as % of Critical Levels for NH_3

Local Designations	Scenario 1 (current normal)	Scenario 2 (future normal)
	PC as % of CL	PC as % of CL
Lesnes Abbey Woods and Bostall Woods SINC	0.2%	0.2%
River Thames and tidal tributaries SINC	4%	4%
Wennington, Aveley and Rainham Marshes SINC	0.6%	0.6%
Erith Marshes SINC	0.2%	0.2%
Belvedere Dykes SINC	1%	1%

Local Designations	Scenario 1 (current normal)	Scenario 2 (future normal)
	PC as % of CL	PC as % of CL
Franks Park, Belvedere SINC	0.5%	0.5%
Erith Quarry and Fraser Road SINC	0.3%	0.3%
Hollyhill Open Space SINC	0.2%	0.2%
Southmere Park & Yarnton Way/Viridion Way SINC	0.2%	0.2%
St John the Baptist Churchyard, Erith SINC	0.8%	0.8%
Streamway, Chapman's Land and Erith Cemetery SINC	0.2%	0.2%
Our Lady of Angels Cemetery SINC	0.1%	0.1%
Rainham Marshes LNR	0.5%	0.5%
Crossness LNR	0.2%	0.2%
Lesnes Abbey Woods LNR	0.2%	0.2%
Lesnes Abbey Woods AW	0.2%	0.2%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

6.2.3.3 Effects of SO_2 on Local Designated Sites

The predicted PCs as a percentage of the critical level for SO_2 (annual) at the locally designated sites are listed in **Table 6.13**. As for NH_3, the more stringent critical level for lichens / bryophytes was used as a precautionary measure at all the local sites.

SO_2 emissions are predicted to reduce considerably between Scenario 1 and Scenario 2. In Scenario 1, the only site where exceedance of the critical level was predicted is the River Thames and tidal tributaries SINC (both predicted PC and PEC >100% of CL). In Scenario 2 however, the predicted effects of SO_2 on all local sites were greatly reduced and the predicted PC did not exceed the critical level. Therefore for the proposed future Site operations the emissions are considered insignificant and no likely significant effects on any of the locally designated sites are predicted.

Table 6.13: Local Designations – Predicted PCs as % of Critical Levels for SO_2

Local Designations	Scenario 1 (current normal)		Scenario 2 (future normal)	
	PC as % of Critical Level	PEC as % of Critical Level	PC as % of Critical Level	PEC as % of Critical Level
Lesnes Abbey Woods and Bostall Woods SINC	7%	-	0.3%	-
River Thames and tidal tributaries SINC	327%	347%	8.0%	28%
Wennington, Aveley and Rainham Marshes SINC	18%	-	0.8%	-
Erith Marshes SINC	9%	-	0.4%	-
Belvedere Dykes SINC	75%	-	0.9%	-
Franks Park, Belvedere SINC	26%	-	0.7%	-
Erith Quarry and Fraser Road SINC	12%	-	0.4%	-
Hollyhill Open Space SINC	10%	-	0.3%	-
Southmere Park & Yarnton Way/Viridion Way SINC	10%	-	0.4%	-
St John the Baptist Churchyard, Erith SINC	38%	-	1.3%	-
Streamway, Chapman's Land and Erith Cemetery SINC	8%	-	0.3%	-
Our Lady of Angels Cemetery SINC	6%	-	0.2%	-
Rainham Marshes LNR	18%	-	0.8%	-
Crossness LNR	8%	-	0.4%	-

Local Designations	Scenario 1 (current normal)		Scenario 2 (future normal)	
	PC as % of Critical Level	PEC as % of Critical Level	PC as % of Critical Level	PEC as % of Critical Level
Lesnes Abbey Woods LNR	7%	-	0.4%	-
Lesnes Abbey Woods AW	7%	-	0.3%	-

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

6.2.3.4 Effects of Nutrient Nitrogen Deposition on Local Designated Sites

The predicted PCs as a percentage of the Critical Load (CL) for nitrogen deposition are listed in **Table 6.14**. The modelling used the critical loads for the most sensitive habitat at any designated site in the UK.

There were minimal changes in the predicted levels of nitrogen deposition between Scenarios 1 and 2. The predicted PC does not exceed 100% of the critical load at any of the local sites. The predicted contribution of deposited nitrogen as a result of the proposed future Site operations is considered insignificant and no likely significant effects on the local sites are expected.

Table 6.14: Local Designations – Predicted PCs as % of Critical Loads for Nutrient Nitrogen Deposition

Local Designations	Qualifying Interest Feature	Scenario 1 (current normal)	Scenario 2 (future normal)
		PC as % of CL (min)	PC as % of CL (min)
Lesnes Abbey Woods and Bostall Woods SINC	Woodland	1%	1%
River Thames and tidal tributaries SINC	Woodland	16%	16%
Wennington, Aveley and Rainham Marshes SINC	Woodland	3%	3%
Erith Marshes SINC	Woodland	1%	1%
Belvedere Dykes SINC	Woodland	3%	3%
Franks Park, Belvedere SINC	Woodland	2%	2%
Erith Quarry and Fraser Road SINC	Woodland	1%	1%
Hollyhill Open Space SINC	Woodland	0.9%	0.9%
Southmere Park & Yarnton Way/Viridion Way SINC	Woodland	1%	1%
St John the Baptist Churchyard, Erith SINC	Woodland	3%	3%
Streamway, Chapman's Land and Erith Cemetery SINC	Woodland	0.7%	0.7%
Our Lady of Angels Cemetery SINC	Woodland	0.6%	0.6%
Rainham Marshes LNR	Woodland	2%	2%
Crossness LNR	Woodland	0.9%	0.9%
Lesnes Abbey Woods LNR	Woodland	1%	1%
Lesnes Abbey Woods AW	Woodland	1%	1%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

6.2.3.5 Effects of Acid Deposition on Local Designated Sites

The predicted PCs as a percentage of the CL for acid deposition are listed in **Table 6.15**. Qualifying interest features are listed as woodland as the CL for the most sensitive habitat type in the UK was used for the modelling.

The addition of the TO&S in Scenario 2 is predicted to greatly decrease the levels of acid deposition from the Site. While the predicted PCs do not exceed 100% of the CL for either scenario, the proposed future Site emissions and consequently the predicted impacts for Scenario 2 are considerably lower. Predicted acid deposition levels were considered insignificant and no likely significant effects on any local sites are expected.

Table 6.15: Local Designations – Predicted PCs as % of Critical Loads for Acid Deposition

Local Designations	Qualifying Interest Feature	Scenario 1 (current normal)	Scenario 2 (future normal)
		PC as % of CL (min)	PC as % of CL (min)
Lesnes Abbey Woods and Bostall Woods SINC	Woodland	35%	2%
River Thames and tidal tributaries SINC	Woodland	97%	49%
Wennington, Aveley and Rainham Marshes SINC	Woodland	91%	6%
Erith Marshes SINC	Woodland	45%	3%
Belvedere Dykes SINC	Woodland	18%	6%
Franks Park, Belvedere (SINC)	Woodland	50%	4%
Erith Quarry and Fraser Road SINC	Woodland	60%	3%
Hollyhill Open Space SINC	Woodland	52%	2%
Southmere Park & Yarnton Way/Viridion Way SINC	Woodland	50%	2%
St John the Baptist Churchyard, Erith SINC	Woodland	63%	8%
Streamway, Chapman's Land and Erith Cemetery SINC	Woodland	40%	2%
Our Lady of Angels Cemetery SINC	Woodland	28%	1%
Rainham Marshes LNR	Woodland	94%	5%
Crossness LNR	Woodland	40%	2%
Lesnes Abbey Woods LNR	Woodland	38%	2%
Lesnes Abbey Woods AW	Woodland	36%	2%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

6.2.3.6 Summary of Effects on Local Designated Sites

As for national sites, emissions of NO_x, ammonia and nitrogen are very similar for Scenario 1 and 2 and the proposed new TO&S (Scenario 2) results in considerable reductions in predicted SO_2 process contribution and acid deposition. In terms of the proposed future Site impacts, no critical levels or loads are predicted to be exceeded for any of the locally designated sites and therefore no likely significant effects on the local sites (SINCs, LNRs and AQ) within 2km of the Site are expected.

7. IN-COMBINATION ASSESSMENT

The proposed new thermal oxidiser (TO&S) for Scenario 2 is predicted to result in a reduction of H_2S, odour and SO_2 emissions to air from the future Site operations, and consequently a reduction of predicted risk of odour nuisance, process contributions to ambient H_2S and SO_2 concentration and acid deposition. No adverse cumulative effect with other projects is expected, as emissions from the Site either remain approximately the same or greatly reduce from the current situation, which is predicted to lead to a beneficial effect on local air quality.

8. AQIA AND ES CONCLUDING SUMMARY

The ADM Erith Oil Works primarily processes rapeseed to produce rapeseed oil and rape meal for feedstuffs with a throughput capacity of 1.4Million tonnes and operates under an Environmental Permit.

A variation to the EP is being requested for the following three main reasons:

- To include changes that have occurred at the Site since 2005;
- To include a proposed new thermal oxidiser and scrubber (TO&S); and
- To correct errors and omissions in the 2005 permit.

The Site uses a thermal oxidiser to abate the waste gases from the mineral oil extraction system. The TO is planned to be replaced in Q4 2021 by a new thermal oxidiser and integrated wet caustic scrubber. Combusted gases will be emitted through a new air emission point A28. The replacement of the TO will be associated with a change in emissions and emission patterns (new stack, lower exit temperature, different flow rate). It is also expected to result in a decrease in frequency and duration of bypass events due to the new plant and its design.

The results of the impact assessment are that process contributions are not predicted to be significant and are not predicted to exceed air quality standards for the protection of human health in the future situation during normal operations. This indicates a considerable improvement over the current situation and shows the likely beneficial effect (both for human health impacts as for potential odour nuisance) of the new treatment system for the exhaust of the mineral oil system.

As the new TO&S is designed to improve both the safety and reliability of the MOS exhaust treatment system, the maximum number of bypass events is expected to decrease to five per year with an average duration of one hour. The nature of the bypass emissions (mass flow, flow parameters and emission points), with regards to the main compounds of interest (H_2S, SO_2, hexane and VOCs) are however identical for current and future situation. The H_2S hourly and daily Process Contributions during a bypass event are predicted to be potentially 'significant' (>10% of the air quality standards for human health) albeit without breaching the standards.

The overall risk for odour nuisance at sensitive receptors is expected to be low either due to a combination of the low potential for odours to reach the receptors, the expected low occurrence of bypass operations and, for nearer receptors, the low receptor sensitivity.

The assessment of the potential effects of air emissions on ecological sites designated for their national and local importance for nature conservation has shown that the emissions associated with the future situation are not predicted to result in likely significant effects on any of the identified national (SSSIs) or locally designated sites (LNRs, AW and SINCs). This is a considerable improvement over modelling of the current situation and shows the expected beneficial effect of the new treatment system for the MOS exhaust.

No adverse effects in-combination with other projects are predicted as the proposed reduction in emissions from the current situation is expected to have a beneficial effect on local air quality.

As part of the Permit Variation, an updated Odour Management Plan has been drafted outlining further odour mitigation measures at the Site.

APPENDIX A MODEL INPUTS

A.1 Emissions Inventory

Table A.1 – Full Emissions Inventory, Scenario 1

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
NO_x (as NO_2)	A1: 0.352 A2: 0.294 A3: 0.423	n/a	n/a	n/a	n/a	0.0121*	n/a	n/a	0.00512	n/a
Total Particulate	n/a	0.000211	0.0154	0.0122	0.0159	0.000917	0.00894	0.00518	n/a	n/a
VOC	n/a	n/a	n/a	n/a	0.0347	0.00967	1.75	n/a	n/a	n/a
SO_2	n/a	n/a	n/a	n/a	0.00458	5.81	0.00375	n/a	n/a	n/a
H_2S	n/a	n/a	n/a	n/a	0.0475	0.252	0.00653	n/a	n/a	n/a
Hexane	n/a	n/a	n/a	n/a	0.00381	0.0131	1.00	n/a	n/a	n/a
xylene	n/a	n/a	n/a	n/a	n/a	n/a	0.0209	n/a	n/a	n/a
Acetone	n/a	n/a	n/a	n/a	0.00253	0.000536	n/a	n/a	n/a	n/a
Methylcyclopentane	n/a	n/a	n/a	n/a	n/a	n/a	0.105	n/a	n/a	n/a
Ethyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	<0.000033	<0.0037	n/a	n/a	n/a
Methyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	<0.000033	<0.0037	n/a	n/a	n/a
N-Butyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	<0.000028	<0.0030	n/a	n/a	n/a

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
3-methylpentane	n/a	n/a	n/a	n/a	n/a	n/a	0.136	n/a	n/a	n/a
Ammonia	n/a	n/a	n/a	n/a	n/a	n/a	0.0206	n/a	n/a	n/a
CO	A1: 2.26 A2: 1.33 A3: 4.91	n/a	n/a	n/a	n/a	0.00133	n/a	n/a	n/a	n/a
Tetrahydromethanoindene	n/a	n/a	n/a	n/a	n/a	n/a	<0.0523	n/a	n/a	n/a

n/a = not applicable

* most recent emission monitoring data for NO_x on A13 dates back to 2015, used average of February and December 2015

** limited data available:

- emission height assumed 1m above building height;
- actual max flow rate cfr. manufacturer specifications is 2,000m^3/h;
- emission velocity assumed to be 5m/s, internal diameter calculated accordingly;
- emission temperature assumed 5K above ambient;
- particulate concentration assumed 10mg/Nm^3 as per BREF on Emissions from Storage (Section 4.3.7 in https://eippcb.jrc.ec.europa.eu/reference/emissions-storage)

*** limited data available:

- flow rate based on annual average fuel consumption;
- emission temperature estimated at 523K;

NO_x emission concentration @ emission limit of 180mg/Nm^3

Table A.2 – Full Emissions Inventory, Scenario 2

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
NO_x (as NO_2)	A1: 0.352 A2: 0.294 A3: 0.423	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00512	0.0404
Total Particulate	n/a	0.000211	0.0154	0.0122	0.0159	n/a	0.00894	0.00518	n/a	0.00809
VOC	n/a	n/a	n/a	n/a	0.0347	n/a	1.75	n/a	n/a	0.00809
SO_2	n/a	n/a	n/a	n/a	0.00458	n/a	0.00375	n/a	n/a	0.310
H_2S	n/a	n/a	n/a	n/a	0.0475	n/a	0.00653	n/a	n/a	0.00121
Hexane	n/a	n/a	n/a	n/a	0.00381	n/a	1.00	n/a	n/a	n/a
xylene	n/a	n/a	n/a	n/a	n/a	n/a	0.0209	n/a	n/a	n/a
Acetone	n/a	n/a	n/a	n/a	0.00253	n/a	n/a	n/a	n/a	n/a
Methylcyclopentane	n/a	n/a	n/a	n/a	n/a	n/a	0.105	n/a	n/a	n/a
Ethyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	n/a	<0.0037	n/a	n/a	n/a
Methyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	n/a	<0.0037	n/a	n/a	n/a
N-Butyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	n/a	<0.0030	n/a	n/a	n/a
3-methylpentane	n/a	n/a	n/a	n/a	n/a	n/a	0.136	n/a	n/a	n/a

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S
Ammonia	n/a	n/a	n/a	n/a	n/a	n/a	0.0206	n/a	n/a	n/a
CO	A1: 2.26 A2: 1.33 A3: 4.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0404
Tetrahydromethanoindene	n/a	n/a	n/a	n/a	n/a	n/a	<0.0523	n/a	n/a	n/a

n/a = not applicable
** limited data available:

- emission height assumed 1m above building height;
- actual max flow rate cfr. manufacturer specifications is 2,000m^3/h;
- emission velocity assumed to be 5m/s, internal diameter calculated accordingly;
- emission temperature assumed 5K above ambient;
- particulate concentration assumed 10mg/Nm^3 as per BREF on Emissions from Storage (Section 4.3.7 in https://eippcb.jrc.ec.europa.eu/reference/emissions-storage)

*** limited data available:

- flow rate based on annual average fuel consumption;
- emission temperature estimated at 523K;

NO_x emission concentration @ emission limit of 180mg/Nm^3

Table A.3 – Full Emissions Inventory, Scenario 3

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S****
NO_x (as NO_2)	A1: 0.352 A2: 0.294 A3: 0.423	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00512	TO&S: 0.00598 Purge: n/a
Total Particulate	n/a	0.000211	0.0154	0.0122	0.0159	n/a	Biofilter: 0.00894 MOS: n/a	0.00518	n/a	TO&S: n/a Purge:
VOC	n/a	n/a	n/a	n/a	0.0347	n/a	Biofilter: 1.75 MOS: 0.443	n/a	n/a	TO&S: n/a Purge: 0.00623
SO_2	n/a	n/a	n/a	n/a	0.00458	n/a	Biofilter: 0.00375 MOS: 0.101	n/a	n/a	TO&S: n/a Purge: 0.00141
H_2S	n/a	n/a	n/a	n/a	0.0475	n/a	Biofilter: 0.00653 MOS: 1.69	n/a	n/a	TO&S: n/a Purge: 0.0238
Hexane	n/a	n/a	n/a	n/a	0.00381	n/a	Biofilter: 1.00	n/a	n/a	TO&S: n/a

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S****
xylene	n/a	n/a	n/a	n/a	n/a	n/a	MOS: $4.76E^{-5}$ Biofilter: 0.0209 MOS: $1.22E^{-7}$	n/a	n/a	Purge: $6.69E^{-7}$ TO&S: n/a Purge: $1.71E^{-9}$
Acetone	n/a	n/a	n/a	n/a	0.00253	n/a	Biofilter: n/a MOS: $1.20E^{-6}$	n/a	n/a	TO&S: n/a Purge: $1.69E^{-8}$
Methylcyclopentane	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: 0.105 MOS: $5.64E^{-6}$	n/a	n/a	TO&S: n/a Purge: $7.92E^{-8}$
Ethyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	n/a	Biofilter: <0.0037 MOS: $4.66E^{-10}$	n/a	n/a	TO&S: n/a Purge: $6.54E^{-12}$
Methyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	n/a	Biofilter: <0.0037	n/a	n/a	TO&S: n/a Purge: $5.51E^{-8}$

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S****
N-Butyl Mercaptan	n/a	n/a	n/a	n/a	<0.00011	n/a	MOS: $3.92E^{-6}$ Biofilter: <0.0030 MOS: $4.66E^{-10}$	n/a	n/a	TO&S: n/a Purge: $6.54E^{-12}$
2-methylpentane	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $1.80E^{-5}$	n/a	n/a	TO&S: n/a Purge: $2.53E^{-7}$
3-methylpentane	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: 0.136 MOS: $1.54E^{-5}$	n/a	n/a	TO&S: n/a Purge: $2.16E^{-7}$
Ammonia	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: 0.0206 MOS: n/a	n/a	n/a	n/a
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $1.75E^{-8}$	n/a	n/a	TO&S: n/a Purge: $2.45E^{-10}$

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S****
2.3-dimethylbutane	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $2.09E^{-6}$	n/a	n/a	TO&S: n/a Purge: $2.93E^{-8}$
Dicyclopentadiene	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $3.05E^{-8}$	n/a	n/a	TO&S: n/a Purge: $4.28E^{-10}$
Ethane-1,1-bis(methylthio)	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $1.17E^{-6}$	n/a	n/a	TO&S: n/a Purge: $1.64E^{-8}$
Acetaldehyde	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $1.49E^{-6}$	n/a	n/a	TO&S: n/a Purge: $2.09E^{-8}$
Dimethylsulphide	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $1.11E^{-6}$	n/a	n/a	TO&S: n/a Purge: $1.55E^{-8}$

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S****
Dimethyltrisulphide	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $2.70E^{-6}$	n/a	n/a	TO&S: n/a Purge: $3.80E^{-8}$
Dimethyldisulphide	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $2.28E^{-6}$	n/a	n/a	TO&S: n/a Purge: $3.20E^{-8}$
Dimethyltetrasulphide	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $2.14E^{-6}$	n/a	n/a	TO&S: n/a Purge: $3.00E^{-8}$
CO	A1: 2.26 A2: 1.33 A3: 4.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	TO&S: 0.00598 Purge: n/a
Pentane	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: n/a MOS: $1.07E^{-6}$	n/a	n/a	TO&S: n/a Purge: $1.50E^{-8}$

Emission (Avg) (g/s)	A1-A3 22GT1-3	A6 Vigan	A8 Raw Seed Screening	A9 Flaking Roll Aspiration	A10 Scrubber	A13 Existing TO	A14 Biofilter	A16 talc storage vent A22-A27 meal silo vents**	A21 Refinery High Pressure Boiler***	A28 New TO&S****
Tetrahydromethanoindene	n/a	n/a	n/a	n/a	n/a	n/a	Biofilter: <0.0523 MOS: n/a	n/a	n/a	n/a

n/a = not applicable
** limited data available:

- emission height assumed 1m above building height;
- actual max flow rate cfr. manufacturer specifications is 2,000m^3/h;
- emission velocity assumed to be 5m/s, internal diameter calculated accordingly;
- emission temperature assumed 5K above ambient;
- particulate concentration assumed 10mg/Nm^3 as per BREF on Emissions from Storage (Section 4.3.7 in https://eippcb.jrc.ec.europa.eu/reference/emissions-storage)

*** limited data available:

- flow rate based on annual average fuel consumption;
- emission temperature estimated at 523K;
- NO_x emission concentration @ emission limit of 180mg/Nm^3

**** the purge is limited to a released volume of 5m^3, over an estimated duration of 30s. The mass flow emission rates in the table are the hourly equivalent of the total released mass

A.2 Meteorological Data

The meteorological data used in the model must be reflective of the local conditions. There are only a limited number of meteorological stations in the UK which measure all of the parameters required by the model. A review of available meteorological sites was undertaken, which focussed on the surrounding land use, the surrounding terrain and relative proximity to the coast. On the basis of these criteria, the nearest meteorological station considered representative of conditions is at London City Airport (6km west of the ADM Erith facility).

Five years of meteorological data (2016 – 2020, inclusive) were used for this assessment. The wind roses for 2016 – 2020 are presented in **Figures A.1 to A.5** and show that the prevailing wind direction at London City Airport is mainly from the west-southwest.

Figure A.1: London City Airport Wind Rose - 2016

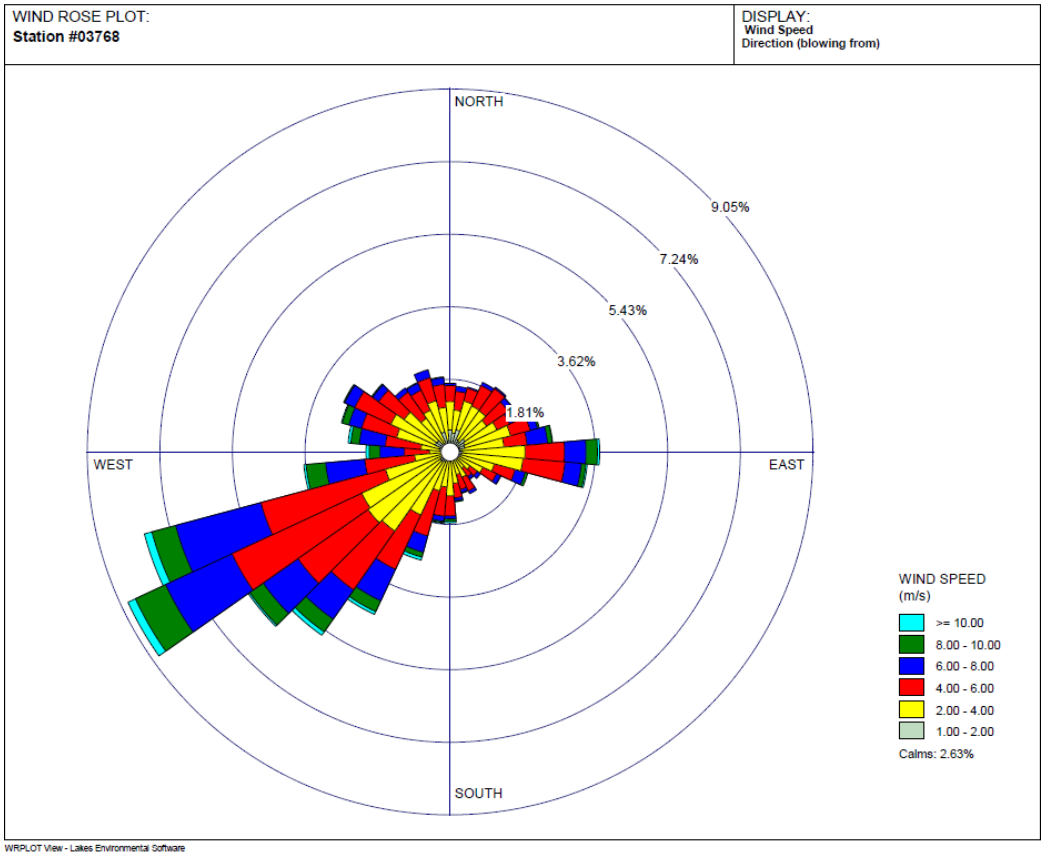


Figure A.2: London City Airport Wind Rose - 2017

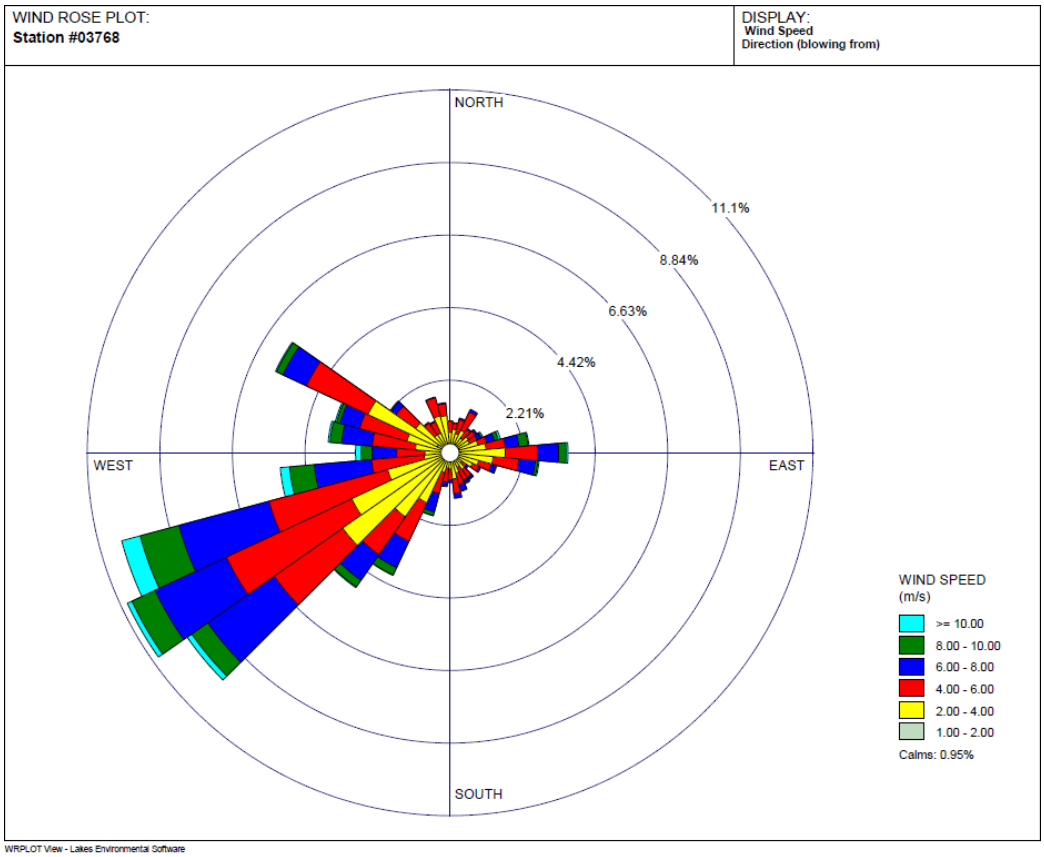


Figure A.3 London City Airport Wind Rose – 2018

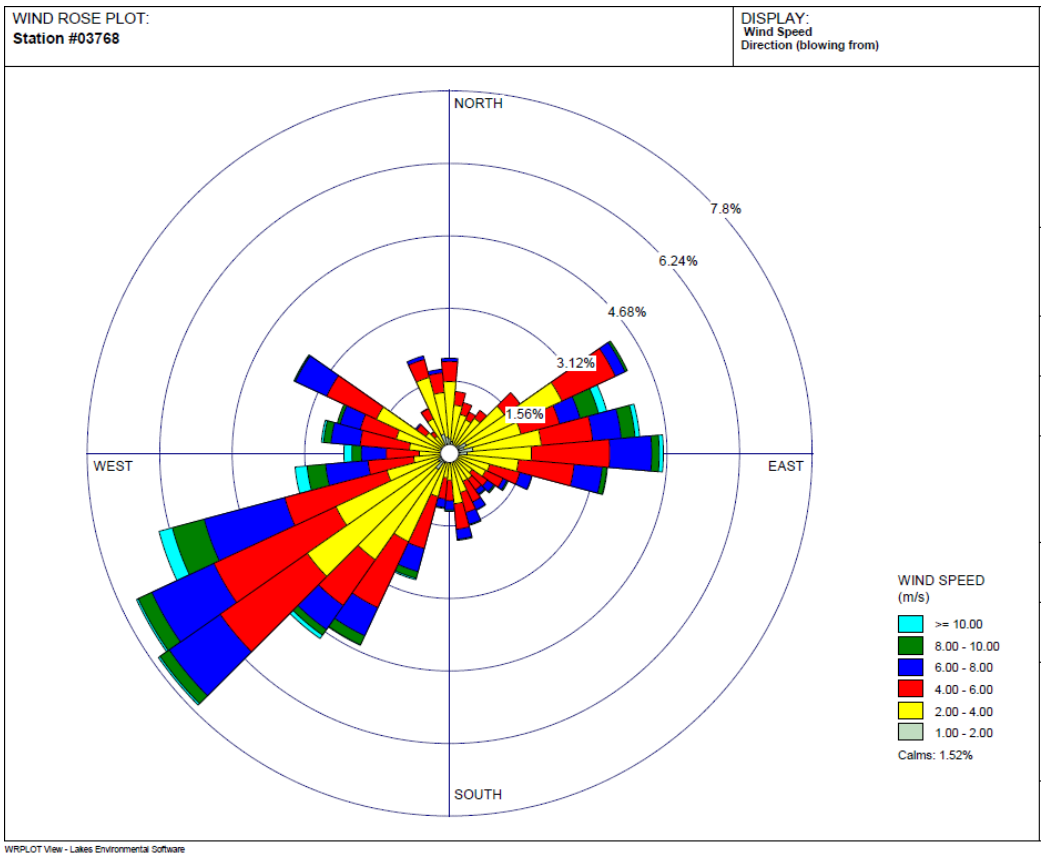


Figure A.4: London City Airport Wind Rose - 2019

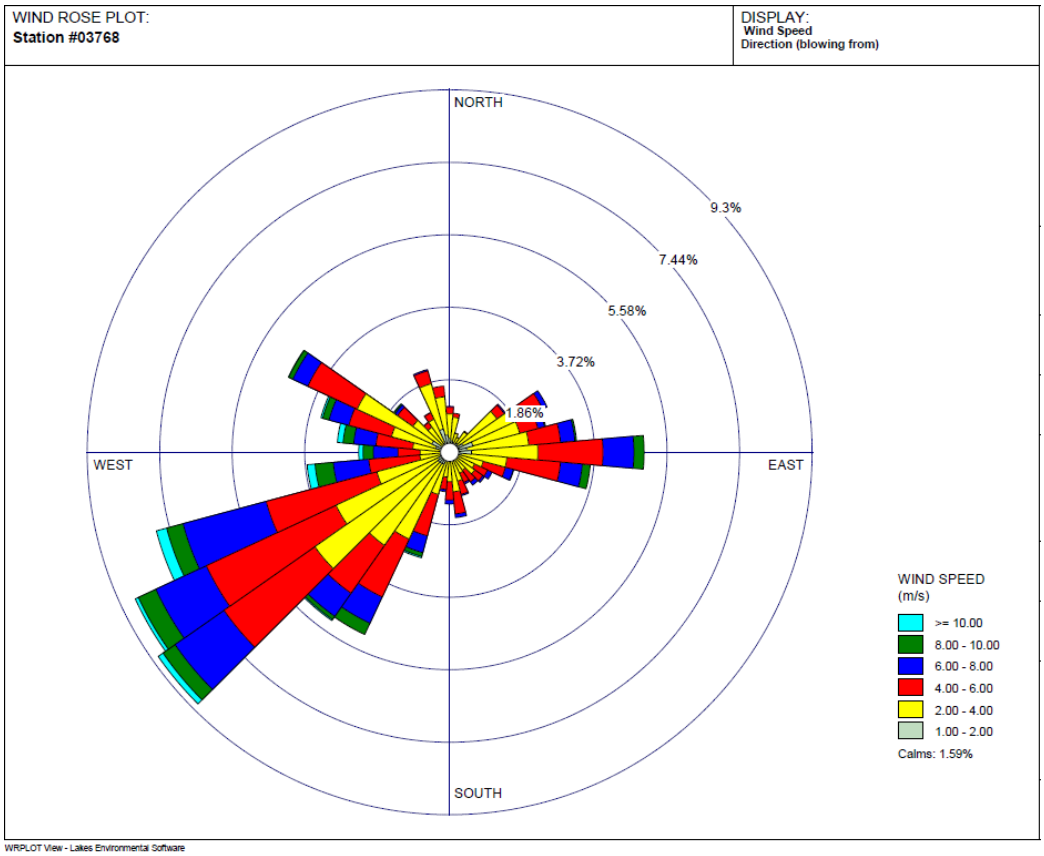
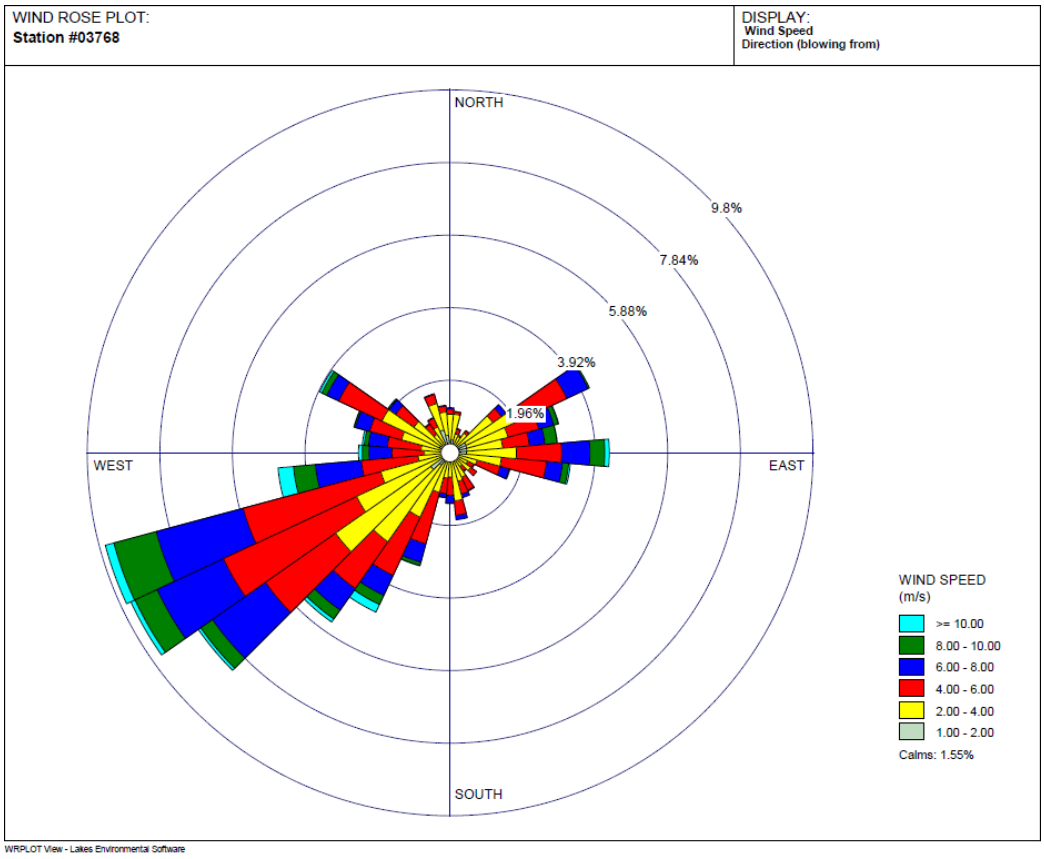


Figure A.5: London City Airport Wind Rose – 2020



A.3 AQIA Sensitivity Analysis

Meteorological Variation

The maximum annual average PCs for each year, at any location, for the Site's future emissions of SO_2 were compared with each other. SO_2 was chosen as the new TO&S is anticipated to have the most beneficial effect on SO_2 emissions. The results are shown in **Table A.4**. The year giving the highest predicted PCs, 2019, was identified as the worst-case year and further sensitivity testing was therefore carried out on the 2019 model.

Table A.4: Worst Meteorological Year Selection (µg SO_2/m^3)

Year	Annual mean, Maximum Anywhere offsite	4th highest 24 hour, Maximum Anywhere offsite	25th highest 1 hour SO_2 Concentration, Maximum Anywhere offsite	36th highest 15 min SO_2 Concentration, 1h SO_2 Concentration Anywhere offsite
2016	0.679	**3.09**	6.57	10.9
2017	**0.827**	2.99	6.96	11.6
2018	0.605	2.35	7.23	14.0
2019	0.721	2.91	**7.36**	**14.4**
2020	0.770	2.72	7.10	12.3

Model Sensitivity

After selecting 2019 as a worst-case year for the impact assessment, a sensitivity analysis of the model was carried out, observing following parameters, the results of which are presented in **Table A.5.**

- Change of meteorological data: changed to London City Airport 2014 (as most-up-to-date reference from previous modelling exercises);
- Change of meteorological data: changed to London City Airport 2015 (not included in previous modelling nor current AQIA); and
- Remove buildings.

Table A.5: Sensitivity Analysis Results (µg SO_2/m^3)

Parameter	Annual mean, Maximum Anywhere offsite		4th highest 24 hour, Maximum Anywhere offsite		25th highest 1 hour SO_2 Concentration, Maximum Anywhere offsite		36th highest 15 min SO_2 Concentration, 1h SO_2 Concentration Anywhere offsite	
	Concentration (µg/m^3)	Change (%)	Concentration (µg/m^3)	Change (%)	Concentration (µg/m^3)	Change (%)	Concentration (µg/m^3)	Change (%)
Base Case (London City Airport 2019)	0.721	0.0%	2.92	0.0%	7.36	0.0%	14.4	0.0%
London City Airport 2014	0.636	-12%	2.53	-13%	6.64	-9.7%	11.9	-18%
London City Airport 2015	0.669	-7.2%	2.52	-14%	7.73	+5.1%	11.4	-21%
Remove building	0.392	-46%	1.43	-51%	3.75	-49%	6.09	-58%

Model Sensitivity Conclusions

The analysis shows that using a different meteorological data period (London City Airport 2014 or 2015) leads to a clear (up to 21%) decrease of predicted long and short term PCs, apart from an increase for the 25th highest 1 hour PC with the 2015 meteorological data. This increase however is smaller (+5.1%) than the decrease predicted for the other statistics.

Considering the difference between the results over the complete seven years (2014-2020) of the meteorological London City data set, 2019 might be deemed a year with less than average dispersion conditions.

Removing the buildings from the model results in a significant decrease (45-60%) of predicted PCs.

The model used, using meteorological data from London City Airport 2016 – 2020 with the buildings as specified in **Section 4.6** of this AQIA is considered robust and captures the worst case. These data have been used in the predictive modelling used for Scenario 1, 2 and 3 and in the assessment of effects on designated sites including the Ecological Screening (see **Section 6**).

APPENDIX B DETAILED ASSESSMENT OF VOC IMPACT

B.1 Introduction

The results presented in **Section 5.4** indicate that significant impacts with regards to VOC emissions cannot be ruled out when evaluated against the AQS for benzene. This Appendix aims to provide a more detailed assessment of the identified VOC impacts by evaluating the calculated VOC impact against AQSs (in so far available) for the other compounds identified in the emissions inventory provided by ADM (see **Appendix A**).

B.2 Air Quality Standards

Table B.1 presents the organic compounds identified in the emissions inventory provided by ADM for which AQSs are available.

Table B.1 Air Quality Standards for VOCs

Parameter	Averaging time	AQS (µg/m^3)	Reference
Benzene	Annual, mean	5	Air emissions risk assessment for your environmental permit *
	1 hour, maximum	195	
Xylenes	Annual, mean	4,410	Air emissions risk assessment for your environmental permit *
	1 hour, maximum	66,200	
Acetone	Annual, mean	18,100	Air emissions risk assessment for your environmental permit *
	1 hour, maximum	362,000	
Pentane	Annual, mean	3,600	EH40/500**, H1 Annex F
Ethyl Mercaptane	Annual, mean	2.6	EH40 MEL/500**, H1 Annex F EH40 STEL/50**, H1 Annex F
	1 hour, maximum	104	
Methyl Mercaptane	Annual, mean	2	EH40 MEL/500**, H1 Annex F
Acetaldehyde	Annual, mean	370	Air emissions risk assessment for your environmental permit *
	1 hour, maximum	9,200	
Cyclohexane	Annual, mean	700	EH40 MEL/500**, H1 Annex F EH40 STEL/50**, H1 Annex F
	1 hour, maximum	21,000	
Dicyclopentadiene	Annual, mean	54	EH40 MEL/500**, H1 Annex F
2-methylbutane	Annual, mean	3,600	EH40 MEL/500**, H1 Annex F

* https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screen-out-insignificant-pecs

** http://epsassets.manchester.ac.uk/medialand/psi/formsandguidance/WorkplaceExposureLimits.pdf

B.3 Detailed Results

The tables below evaluate the impacts of emissions (see tables in **Appendix A**) of total VOCs for the three scenarios assessed in this study against the species-specific AQSs as per previous section.

Table B.2 Scenario 1: Current Situation, specific VOCs

Species of interest	Averaging Time	Air Quality Standards (AQS) µg/m³	Back-ground* µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
Benzene	Annual, mean	5	0.6	5.60	112%	6.20	124%	see **Section B.4**
	1 hour, maximum	195	1.2	104	53%	105	54%	see **Section B.4**
Xylenes	Annual, mean	4,410	0.6	5.60	0.13%	6.20	0.14%	no
	1 hour, maximum	66,200	1.2	104	0.16%	105	0.16%	no
Acetone	Annual, mean	18,100	0.6	5.60	0.031%	6.20	0.034%	no
	1 hour, maximum	362,000	1.2	104	0.029%	105	0.029%	no
Pentane	Annual, mean	3,600	0.6	5.60	0.16%	6.20	0.17%	no
Ethyl Mercaptane	Annual, mean	2.6	0.6	5.60	215%	6.20	238%	see **Section B.4**
	1 hour, maximum	104	1.2	104	100%	105	101%	see **Section B.4**
Methyl Mercaptane	Annual, mean	2	0.6	5.60	280%	6.20	310%	see **Section B.4**
Acetaldehyde	Annual, mean	370	0.6	5.60	1.5%	6.20	1.7%	no
	1 hour, maximum	9,200	1.2	104	1.1%	105	1.1%	no
Cyclohexane	Annual, mean	700	0.6	5.60	0.80%	6.20	0.89%	no
	1 hour, maximum	21,000	1.2	104	0.50%	105	0.50%	no
Dicyclopentadiene	Annual, mean	54	0.6	5.60	10%	6.20	11%	no
2-methylbutane	Annual, mean	3,600	0.6	5.60	0.16%	6.20	0.17%	no

* assumed equal to VOC background

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table B.3 Scenario 2: Future Situation, specific VOCs

Species of interest	Averaging Time	Air Quality Standards (AQS) µg/m³	Back-ground* µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
Benzene	Annual, mean	5	0.6	5.59	112%	6.19	124%	see **Section B.4**
	1 hour, maximum	195	1.2	104	53%	105	54%	see **Section B.4**
Xylenes	Annual, mean	4,410	0.6	5.59	0.13%	6.19	0.14%	no
	1 hour, maximum	66,200	1.2	104	0.16%	105	0.16%	no
Acetone	Annual, mean	18,100	0.6	5.59	0.031%	6.19	0.034%	no
	1 hour, maximum	362,000	1.2	104	0.029%	105	0.029%	no
Pentane	Annual, mean	3,600	0.6	5.59	0.16%	6.19	0.17%	no
Ethyl Mercaptane	Annual, mean	2.6	0.6	5.59	215%	6.19	238%	see **Section B.4**
	1 hour, maximum	104	1.2	104	100%	105	101%	see **Section B.4**
Methyl Mercaptane	Annual, mean	2	0.6	5.59	280%	6.19	310%	see **Section B.4**
Acetaldehyde	Annual, mean	370	0.6	5.59	1.5%	6.19	1.7%	no
	1 hour, maximum	9,200	1.2	104	1.1%	105	1.1%	no
Cyclohexane	Annual, mean	700	0.6	5.59	0.80%	6.19	0.88%	no
	1 hour, maximum	21,000	1.2	104	0.50%	105	0.50%	no
Dicyclopentadiene	Annual, mean	54	0.6	5.59	10%	6.19	11%	no
2-methylbutane	Annual, mean	3,600	0.6	5.59	0.16%	6.19	0.17%	no

* assumed equal to VOC background

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table B.4 Scenario 3: Bypass, specific VOCs

Species of interest	Averaging Time	Air Quality Standards (AQS) µg/m³	Back-ground* µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
Benzene	1 hour, maximum	195	1.2	117	60%	118	61%	see **Section B.4**
Xylenes	1 hour, maximum	66,200	1.2	117	0.18%	118	0.18%	no
Acetone	1 hour, maximum	362,000	1.2	117	0.032%	118	0.033%	no
Ethyl Mercaptane	1 hour, maximum	104	1.2	117	113%	118	114%	see **Section B.4**
Acetaldehyde	1 hour, maximum	9,200	1.2	117	1.3%	118	1.3%	no
Cyclohexane	1 hour, maximum	21,000	1.2	117	0.56%	118	0.56%	no

* assumed equal to VOC background

Impacts are not considered significant when:

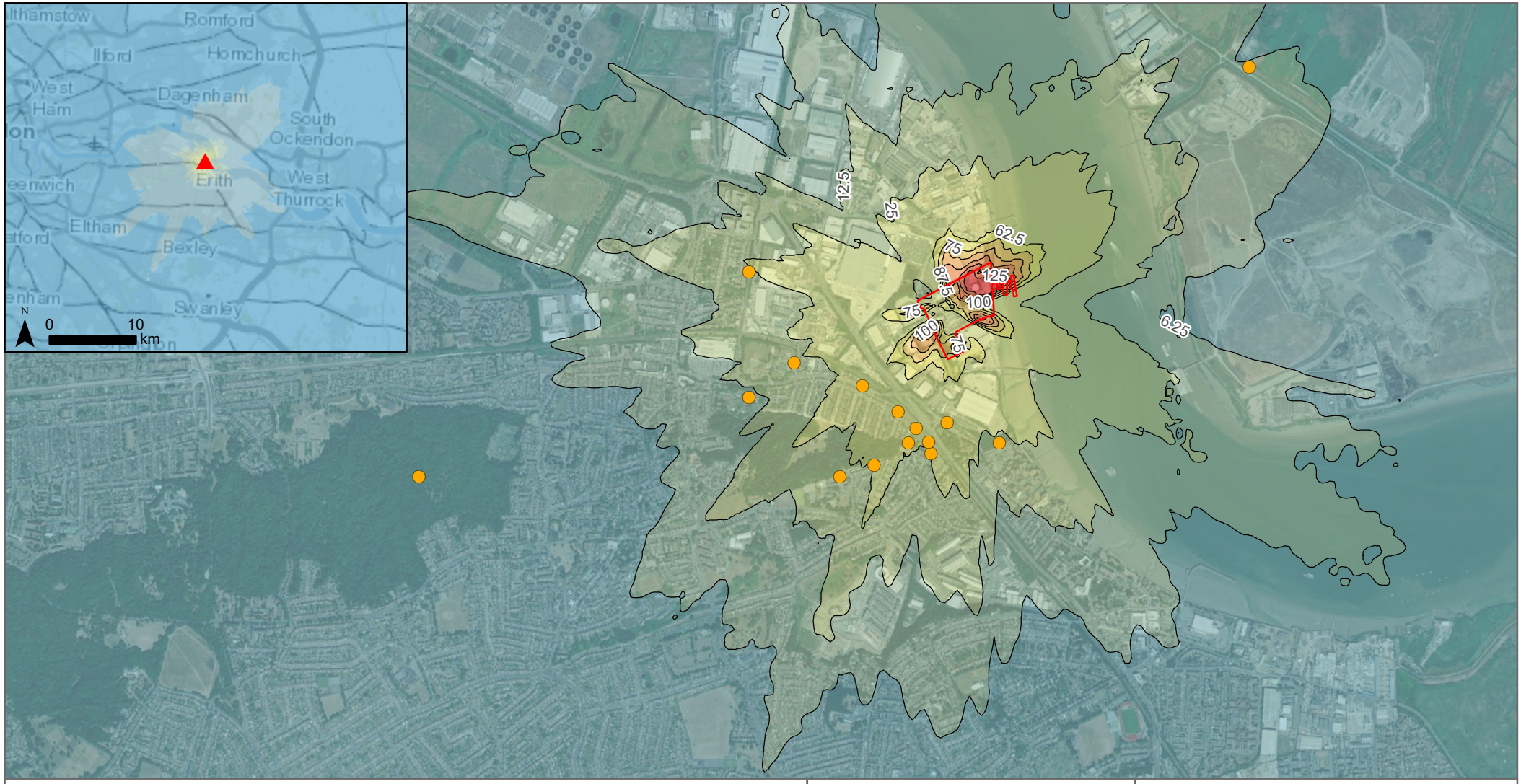
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

B.4 Discussion

The results presented in **Section B.3** predict VOC impacts are potentially significant when evaluated against AQS for benzene, ethyl mercaptane and methyl mercaptane. Of note is that the results are presented on the basis of all VOCs being emitted as the particular species of interest (e.g. benzene, xylenes, acetone, …). In practice, no one VOC species dominates, and actual impacts will be less, as is discussed below:

- benzene: annual PC predicted to exceed AQS and short term PC predicted to be potentially significant (>10% of AQS). Taking into account however that benzene emissions contribute less than 0.001% to ADM's VOC emissions (see **Appendix A**), impacts can be considered not significant;
- ethyl mercaptane: PCs predicted to exceed both long and short term AQSs. Taking into account however that ethyl mercaptane emissions contribute less than 0.2% to ADM's VOC emissions (see **Appendix A**), predicted impacts can be considered not significant;
- methyl mercaptane: PCs predicted to exceed long term AQS. Taking into account however that methyl mercaptane emissions contribute less than 0.2% to ADM's VOC emissions (see **Appendix A**), predicted impacts can be considered not significant.

APPENDIX C CONTOUR PLOTS - IMPACT ON HUMAN HEALTH



µg/m³

- < 1.25
- 1.25 - 6.25
- 6.25 - 12.5
- 12.5 - 25
- 25 - 62.5
- 62.5 - 75
- 75 - 87.5
- 87 - 100
- 100 - 112.5
- 112.5 - 125
- > 125
- Site Boundary

AQS: 125 µg/m³
Baseline: 3.46 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

SO_2
Current - Normal Operations
24 Hour, < 4 Exceedances Yearly
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_CS_SO2_24hr_A02.mxd

µg/m³

- < 1.25
- 1.25 - 6.25
- 6.25 - 12.5
- 12.5 - 25
- 25 - 62.5
- 62.5 - 75
- 75 - 87.5
- 87.5 - 100
- 100 - 112.5
- 112.5 - 125
- > 125
- Site Boundary

AQS: 125 µg/m³
Baseline: 3.46 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000
Meters

N

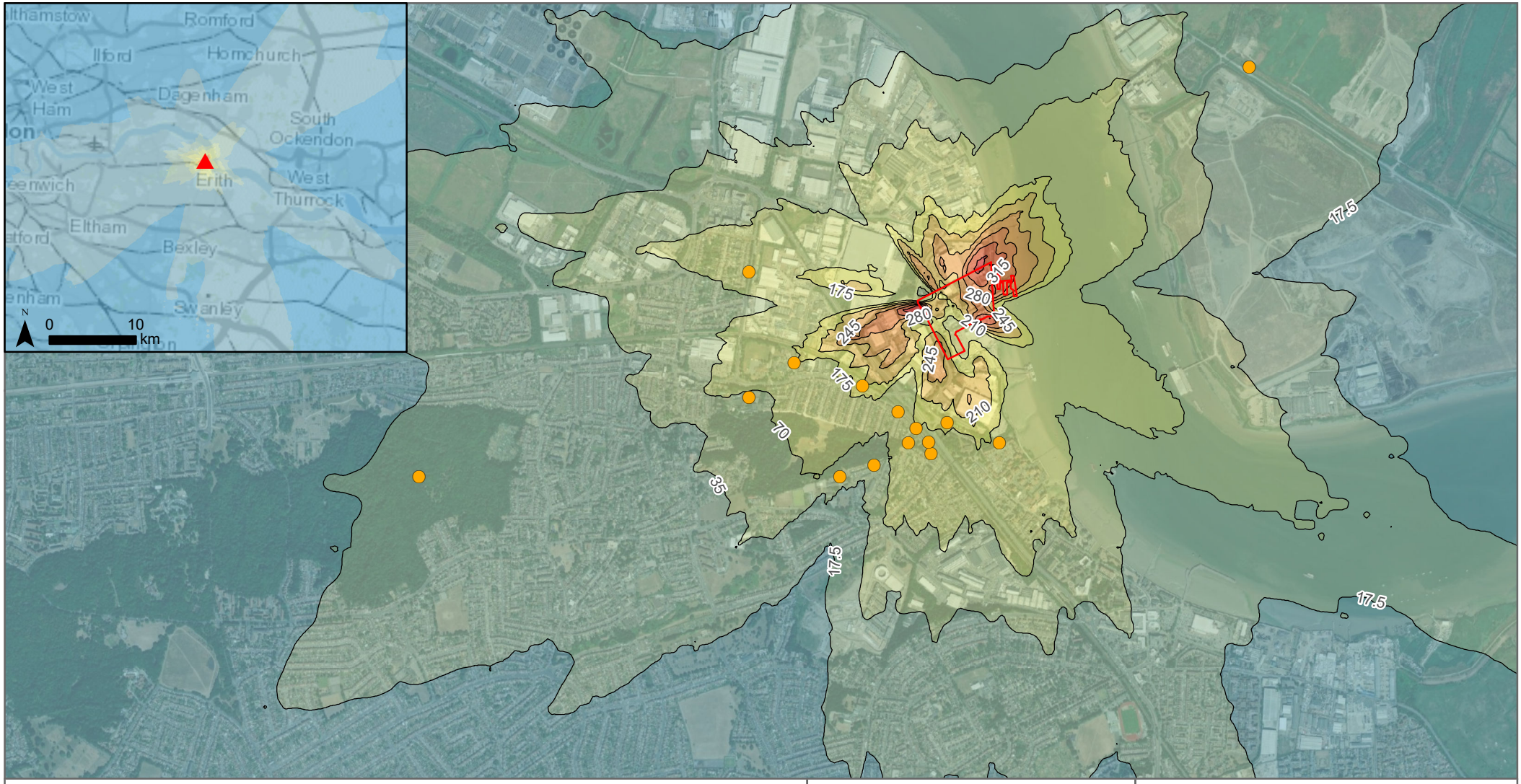
SO_2
Future - Normal Operations
24 Hour, < 4 Exceedances Yearly
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_FS_SO2_24hr_A02.mxd



µg/m³

- < 3.5
- 3.5 - 17.5
- 17.5 - 35
- 35 - 70
- 70 - 175
- 175 - 210
- 210 - 245
- 245 - 280
- 280 - 315
- 315 - 350
- > 350
- Site Boundary

AQS: 350 µg/m³
Baseline: 3.46 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000
Meters

N

SO_2
Current - Normal Operations
1 Hour, < 25 Exceedances Yearly
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 17/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_CS_SO2_1hr_A02.mxd

µg/m³

- < 3.5
- 3.5 - 17.5
- 17.5 - 35
- 35 - 70
- 70 - 175
- 175 - 210
- 210 - 245
- 2451 - 280
- 280 - 315
- 315 - 350
- > 350
- Site Boundary

AQS: 350 µg/m³
Baseline: 3.46 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000
Meters

N

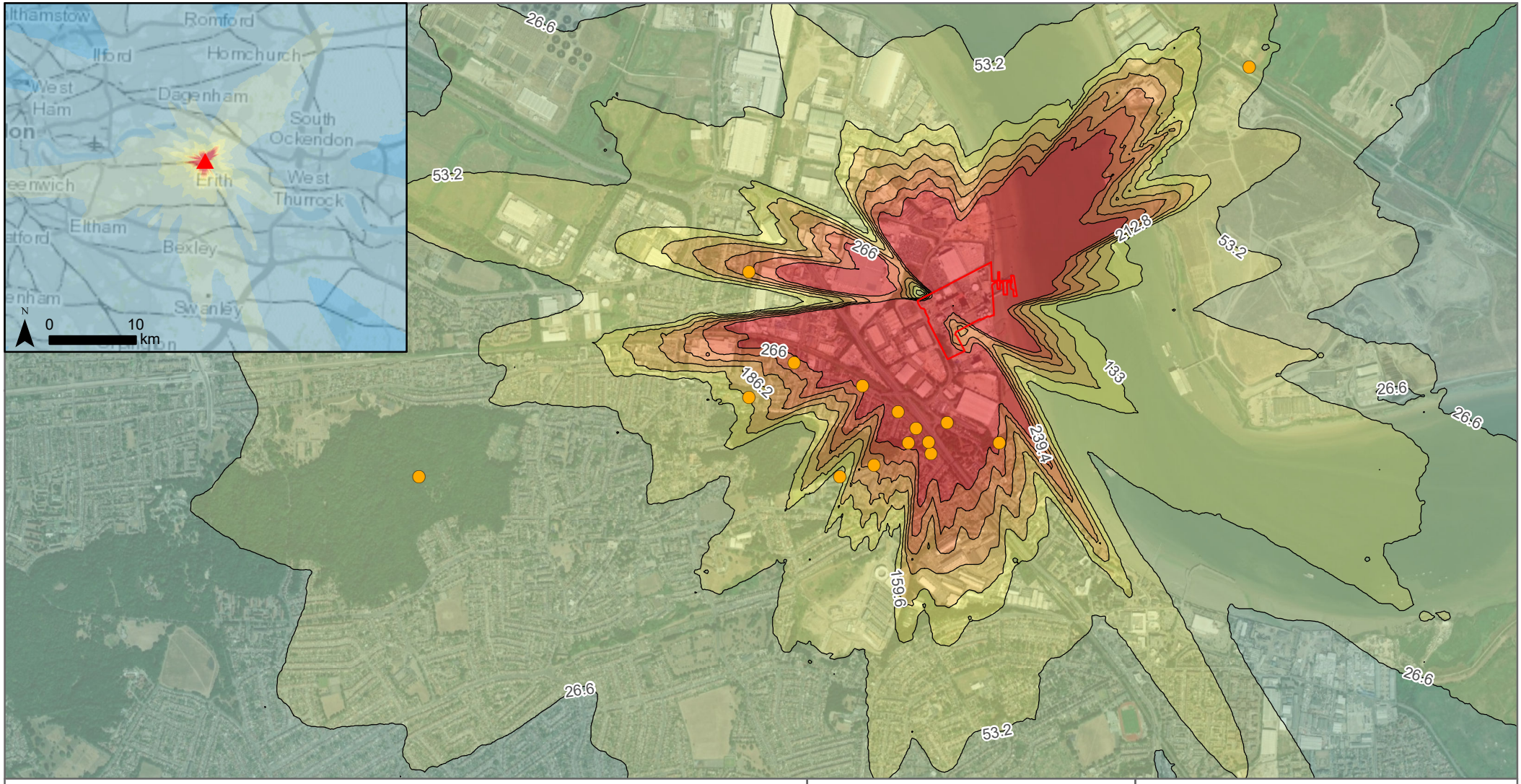
SO_2
Future - Normal Operations
1 Hour, < 25 Exceedances Yearly
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 17/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_FS_SO2_1hr_A02.mxd



µg/m³

- < 2.66
- 2.66 - 13.3
- 13.3 - 26.6
- 26.6 - 53.2
- 53.2 - 133
- 133 - 159.6
- 159.6 - 186.2
- 186.2 - 212.8
- 212.8 - 239.4
- 239.4 - 266
- > 266
- Site Boundary
- Discrete Modelled Receptors
- Project Site

AQS: 266 µg/m³
Baseline: 3.46 µg/m³

0 200 400 600 800 1,000 Meters

N

SO_2
Current - Normal Operations
15 min, < 36 Exceedances Yearly
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_CS_SO2_15min_A02.mxd

µg/m³

- < 2.66
- 2.6 - 13.3
- 13.3 - 26.6
- 26.6 - 53.2
- 53.2- 133
- 133 - 159.6
- 159.6- 186.2
- 186.2 - 212.8
- 212.8 - 239.4
- 239.4 - 266
- > 266
- Site Boundary

AQS: 266 µg/m³
Baseline: 3.46 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000
Meters

N

SO_2
Future - Normal Operations
15 min, < 36 Exceedances yearly
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 17/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_FS_SO2_15min_A02.mxd

µg/m³

- < 1.4
- 1.4 - 7
- 7 - 14
- 14 - 28
- 28 - 70
- 70 - 84
- 84 - 98
- 98 - 112
- 112 - 126
- 126 - 140
- > 140
- Site Boundary

AQS: 140 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

H_2S
Current - Normal Operations
Annual Mean
Predicted Process Contributions
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_CS_H2S_AM_A02.mxd

µg/m³

- < 1.4
- 1.4 - 7
- 7 - 14
- 14 - 28
- 28 - 70
- 70 - 84
- 84 - 98
- 98 - 112
- 112 - 126
- 126- 140
- > 140
- Site Boundary

AQS: 140 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 N

Meters

H_2S
Future - Normal Operations
Annual Mean
Predicted ProcessContribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_FS_H2S_AM_A02.mxd

µg/m³

- < 1.5
- 1.5 - 7.5
- 7.5 - 15
- 15 - 30
- 30 - 75
- 75 - 90
- 90 - 105
- 105 - 120
- 120 - 135
- 135 - 150
- > 150
- Site Boundary

AQS: 150 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

H_2S
Current - Normal Operations
24 Hour, Maximum
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

PROJECTION: British National Grid

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_CS_H2S_24hr_A02.mxd

µg/m³

- < 1.5
- 1.5 - 7.5
- 7.5 - 15
- 15 - 30
- 30 - 75
- 75 - 90
- 90 - 105
- 105 - 120
- 120 - 135
- 135 - 150
- > 150
- Site Boundary

- Discrete Modelled Receptors
- Project Site

AQS: 150 µg/m³

0 200 400 600 800 1,000 Meters

N

H_2S
Future - Normal Operations
24 Hour, Maximum
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 03/06/2021	APPROVED: YV

PROJECTION: British National Grid

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\A02\0584457_ADM_FS_H2S_24hr_A02.mxd

µg/m³

- < 1.5
- 1.5 - 7.5
- 7.5 - 15
- 15 - 30
- 30 - 75
- 75 - 90
- 90 - 105
- 105 - 120
- 120 - 135
- 135 - 150
- > 150
- Site Boundary

AQS: 150 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

H_2S
Bypass
24 Hour, Maximum
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

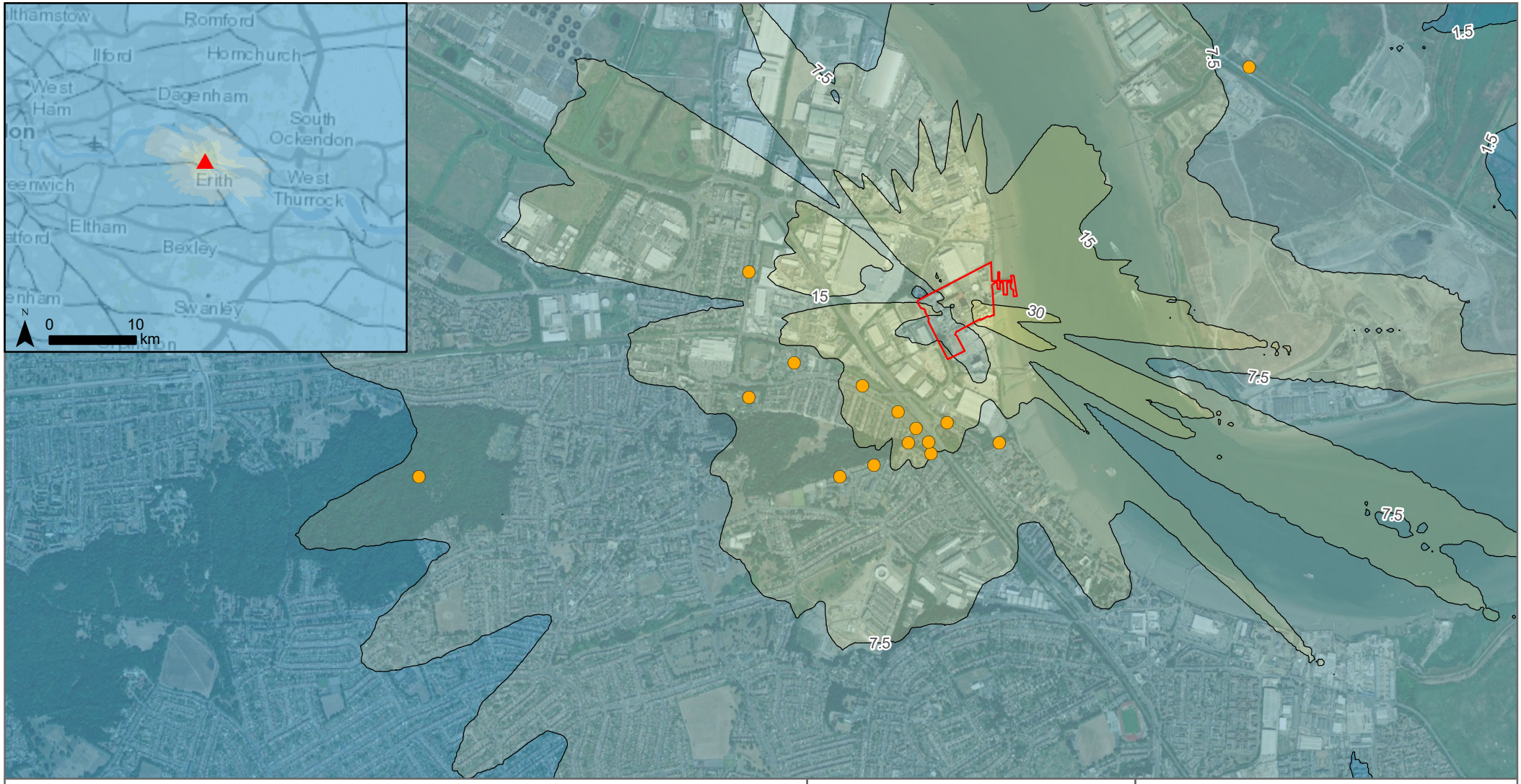
ERM

ADM

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_H2S_24hr_Bypass_A01.mxd



µg/m³

- < 1.5
- 1.5 - 7.5
- 7.5 - 15
- 15 - 30
- 30 - 75
- 75 - 90
- 90 - 105
- 105 - 120
- 120 - 135
- 135 - 150
- > 150
- Site Boundary

AQS: 150 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

H_2S
Current - Normal Operations
1 Hour, Maximum
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 17/06/2021	APPROVED: YV

ERM

ADM

PROJECTION: WGS 1984 Web Mercator Auxiliary Sphere

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_CS_H2S_1hr_A02.mxd

µg/m³

- < 1.5
- 1.5 - 7.5
- 7.5 - 15
- 15 - 30
- 30 - 75
- 75 - 90
- 90 - 105
- 105 - 120
- 120 - 135
- 135 - 150
- > 150
- Site Boundary

AQS: 150 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

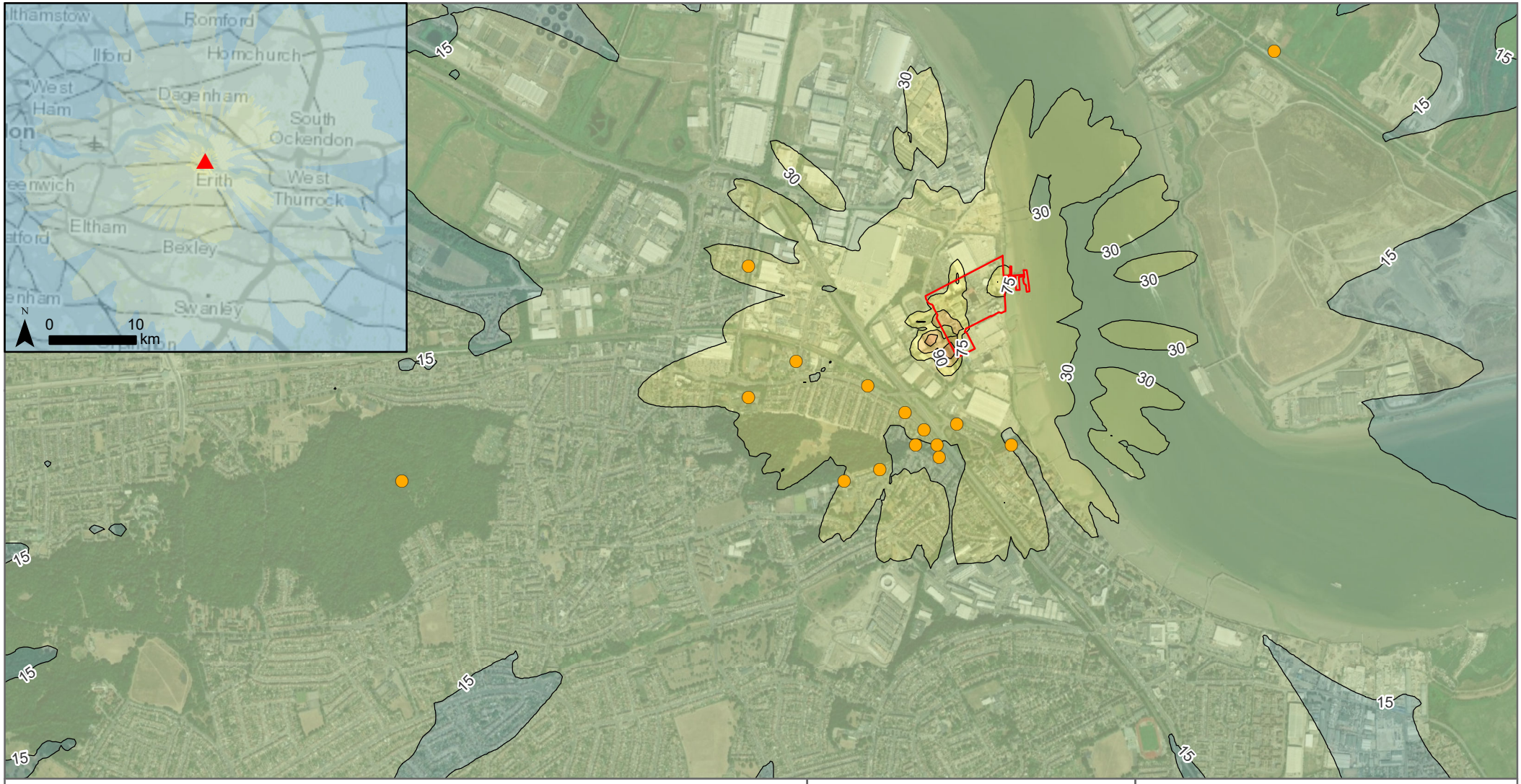
H_2S
Future - Normal Operations
1 Hour, Maximum
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_FS_H2S_1hr_A02.mxd



µg/m³

- < 1.5
- 1.5 - 7.5
- 7.5 - 15
- 15 - 30
- 30 - 75
- 75 - 90
- 90 - 105
- 105 - 120
- 120 - 135
- 135 - 150
- > 150
- Site Boundary

AQS: 150 µg/m³

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

H_2S
Bypass
1 Hour, Maximum
Predicted Process Contribution
ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 15/06/2021	APPROVED: YV

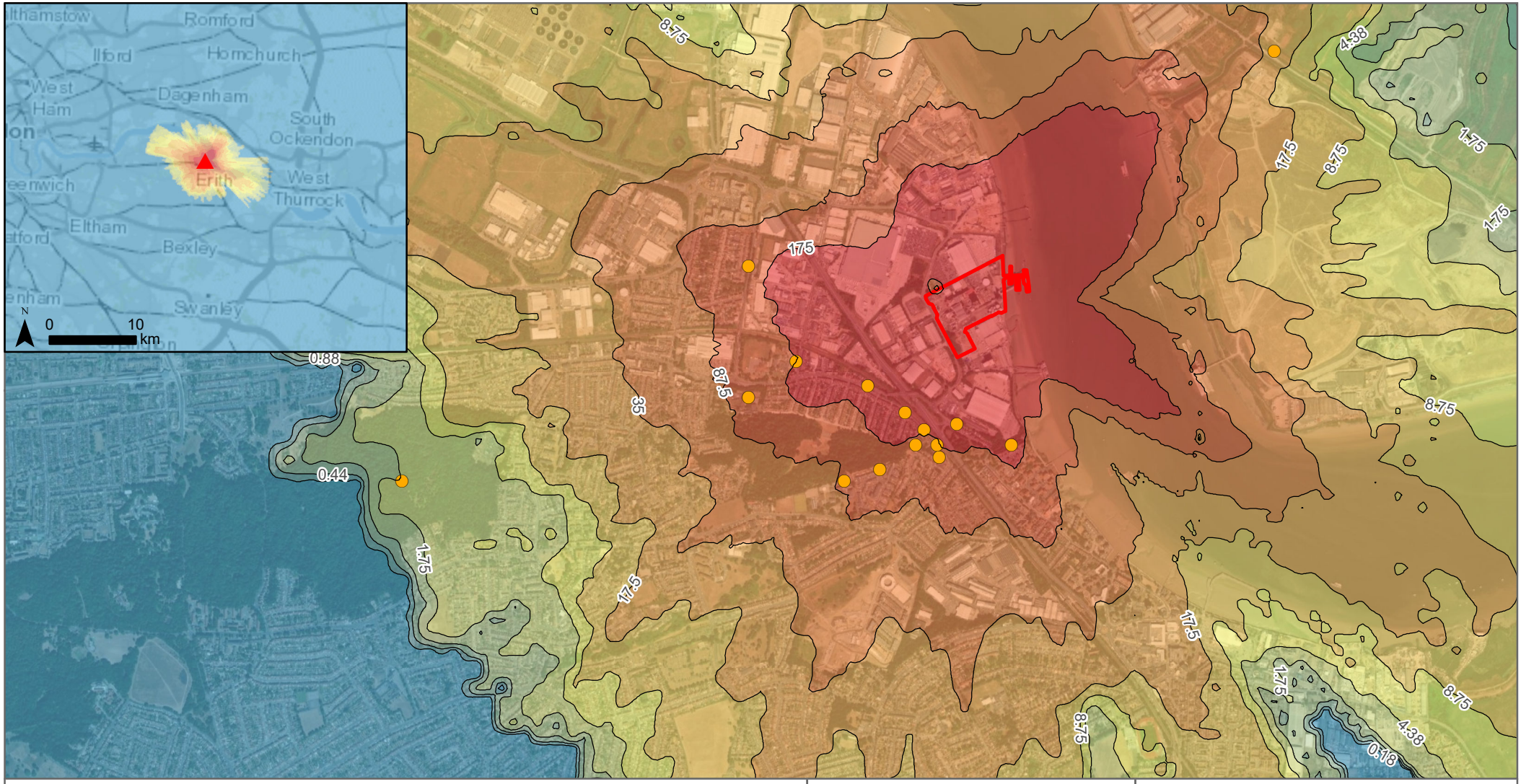
ERM

ADM

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukldcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning.YV\01 Data\03 GIS\MAPS\Air Quality\Final Outputs\0584457_ADM_H2S_1hr_Bypass_A01.mxd



hours per year

- < 0.18
- 0.18 - 0.44
- 0.44 - 0.88
- 0.88 - 1.75
- 1.75 - 4.38
- 4.38 - 8.75
- 8.75 - 17.5
- 17.5 - 35
- 35 - 87.5
- 87.5 - 175
- > **175 (AQS) (max residential receptor = 251)**
- Site Boundary

- Discrete Modelled Receptors
- Project Site

AQS: 175

0 200 400 600 800 1,000 Meters

N

H_2S - Odour
Current - Normal Operations
Exceedance of 1.65 µg/m^3 (1.5 OU/m^3)
Predicted Process Contribution
ADM Erith

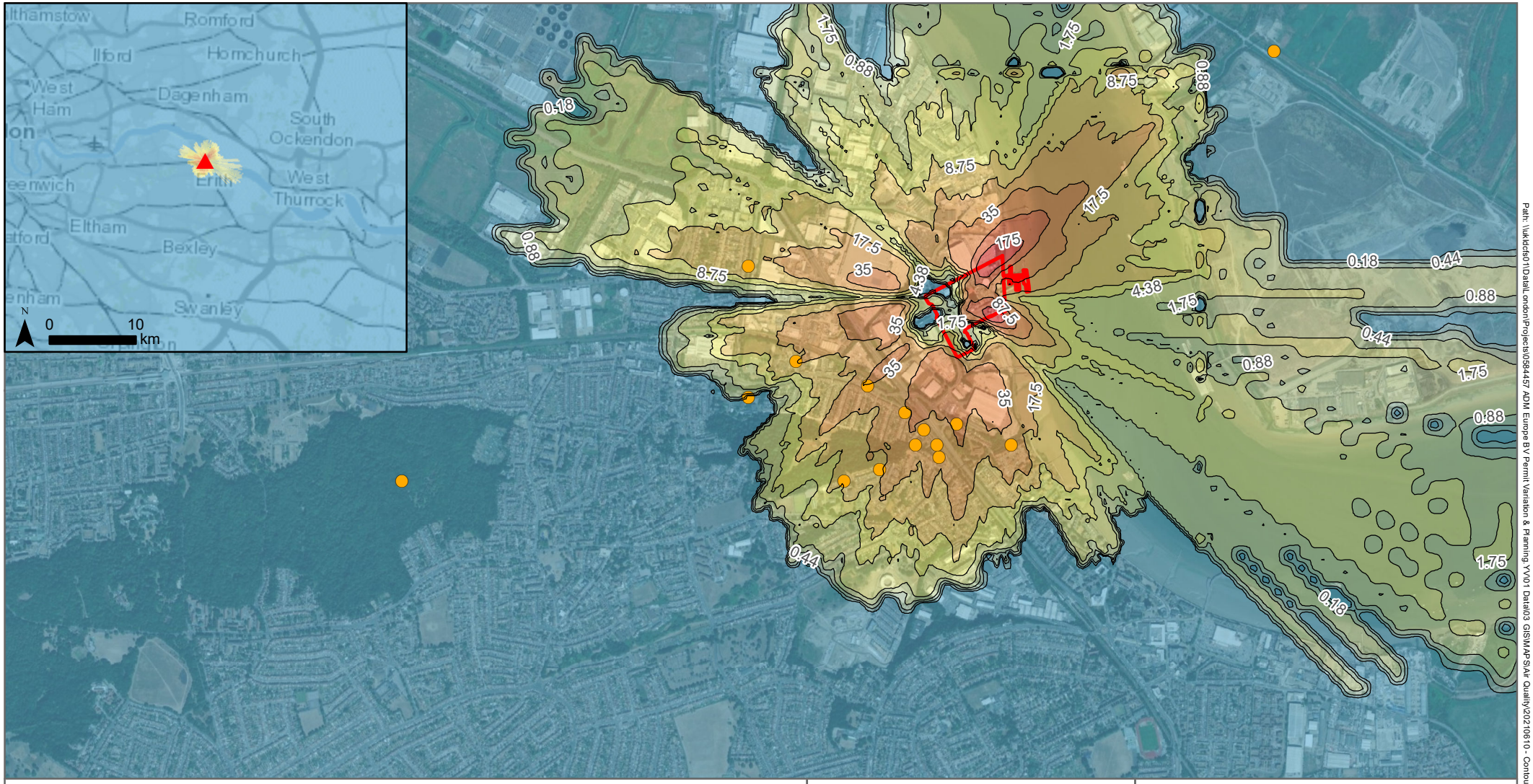
SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 14/06/2021	APPROVED: YV

ERM

ADM

PROJECTION: British National Grid

Path: \\uktdcfs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning\YV01 Data\03 GIS\MAPS\Air Quality\20210610 - Contour Plots\0584457_ADM_H2S_Current_Normal_Ops_A01.mxd



hours per year

- < 0.18
- 0.18 - 0.44
- 0.44 - 0.88
- 0.88 - 1.75
- 1.75 - 4.38
- 4.38 - 8.75
- 8.75 - 17.5
- 17.5 - 35
- **35 - 87.5 (max residential receptor)**
- 87.5 - 175
- > **175 (AQS)**
- Site Boundary

AQS: 175

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

H_2S - Odour
Future - Normal Operations
Exceedance of 1.65 µg/m^3 (1.5 OU/m^3)
Predicted Process Contribution
ADM Erith

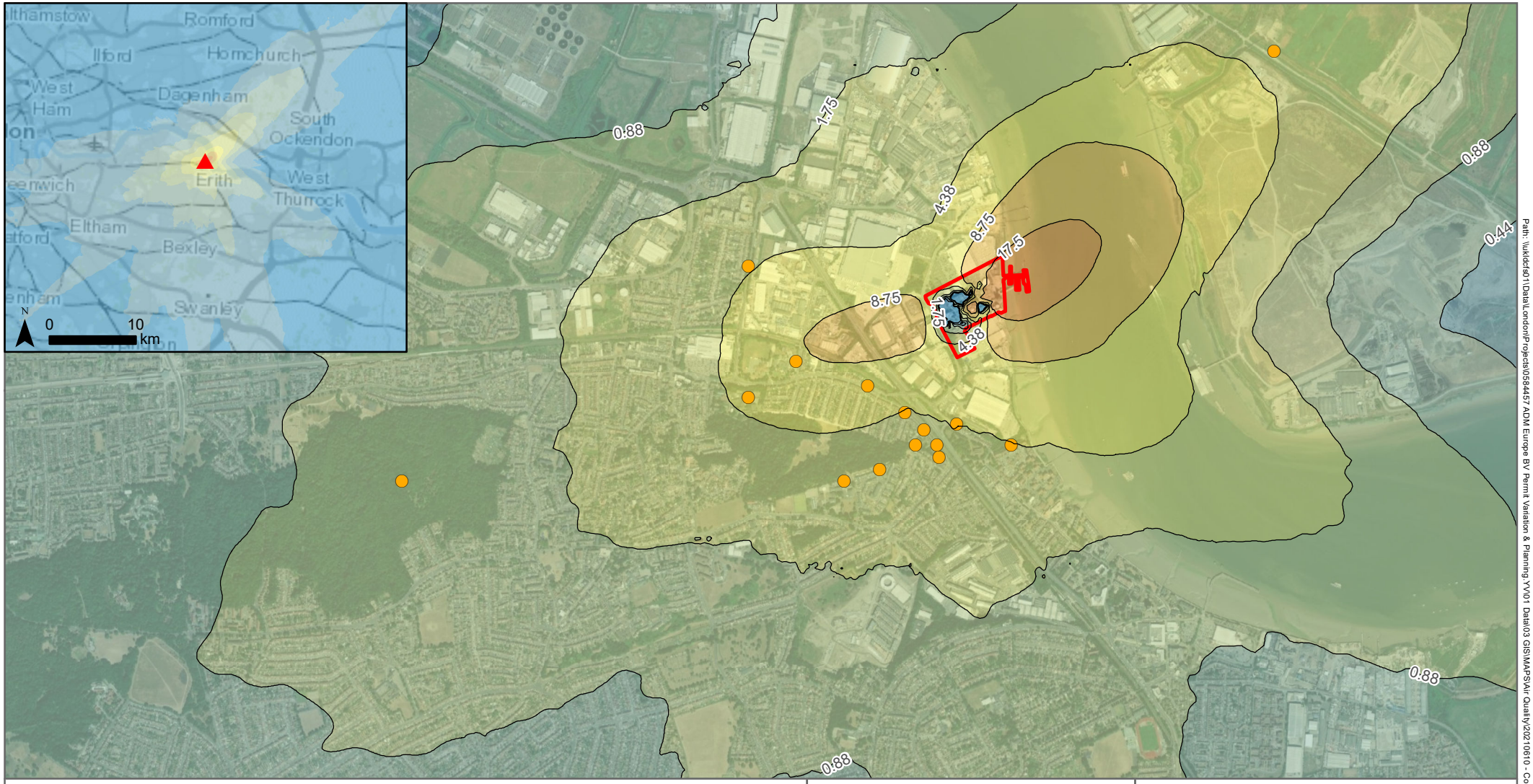
SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 14/06/2021	APPROVED: YV

ERM

ADM

PROJECTION: British National Grid

Path: \\ukukfc501\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning YV\01 Data\03 GIS\MAPS\Air Quality\20210610 - Contour Plots\0584457_ADM_H2S_Future_Normal_Ops_A01.mxd



hours per year

- < 0.18
- 0.18 - 0.44
- 0.44 - 0.88
- 0.88 - 1.75
- 1.75 - 4.38
- **4.38 - 8.75 (max residential receptor)**
- 8.75 - 17.5
- 17.5 - 35
- 35 - 87.5
- 87.5 - 175
- > **175 (AQS)**
- Site Boundary

AQS: 175

- Discrete Modelled Receptors
- Project Site

0 200 400 600 800 1,000 Meters

N

H_2S - Odour
Current - Bypass (max. observed 48hrs bypass operation)
Exceedance of 1.65 µg/m^3 (1.5 OU/m^3) Predicted Process Contribution ADM Erith

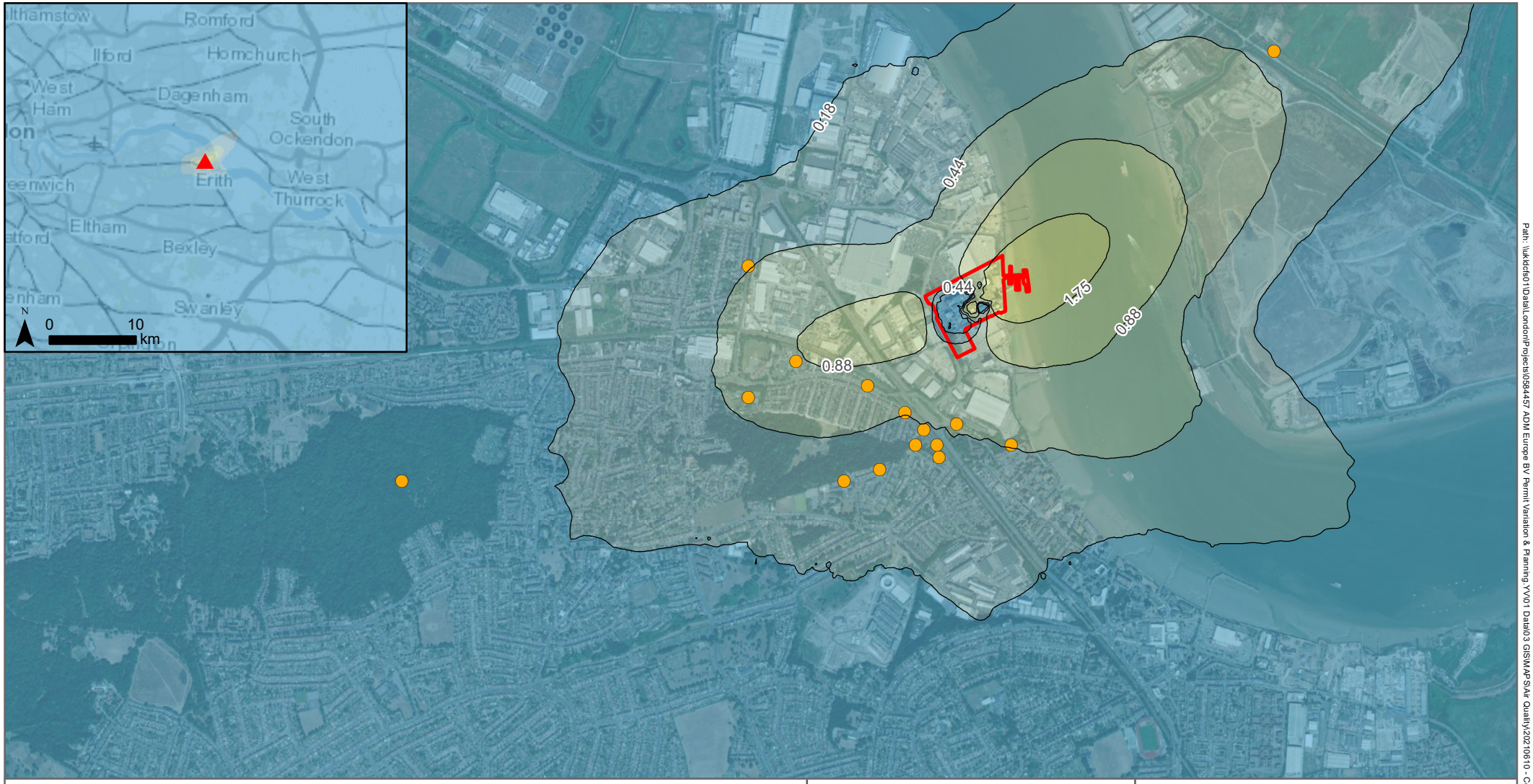
SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 11/06/2021	APPROVED: YV

ERM

ADM

PROJECTION: British National Grid

Path: \\uklds\fs01\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning\YV01 Data\03 GIS\MAPS\Air Quality\20210610 - Contour Plots\0584457_ADM_H2S_Current_Bypass_A01.mxd



hours per year

- < 0.18
- 0.18 - 0.44
- **0.44 - 0.88 (max. residential receptor)**
- 0.88 - 1.75
- 1.75 - 4.38
- 4.38 - 8.75
- 8.75 - 17.5
- 17.5 - 35
- 35 - 97.5
- 97.5 - 175
- **< 175 (AQS)**

AQS: 175

- Discrete Modelled Receptors
- Project Site
- Site Boundary

0 200 400 600 800 1,000 Meters

N

H_2S - Odour
Future - Bypass (max. expected 5 hrs bypass operation)
Exceedance of 1.65 µg/m^3 (1.5 OU/m^3) Predicted Process Contribution ADM Erith

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: JS
PROJECT: 0584457	CHECKED: YV
DATE: 11/06/2021	APPROVED: YV

ERM

ADM

PROJECTION: British National Grid

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: \\ukkfc501\Data\London\Projects\0584457 ADM Europe BV Permit Variation & Planning\YV\01 Data\03 GIS\MAPS\Air Quality\20210610 - Contour Plots\0584457_ADM_H2S_Future_Bypass_A01.mxd

APPENDIX D PREDICTED RESULTS AT DISCRETE RECEPTORS

D.1 Human Health Impact, Scenario 1 – Current Operations

Table D.1 Scenario 1, Predicted Impacts at Receptor 1

OS Grid , m	X: 550672 Y: 178837	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m³	µg/m³	µg/m³	% AQS	µg/m³	% AQS	
NO_2	Annual, mean	40	22.1	0.0925	0.23%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	1.03	0.51%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0983	0.25%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.359	0.72%	36.2	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	45.2	36%	48.8	39%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	250	71%	253	72%	**yes**
	15 min, <36 exceedances yearly	266	3.64	417	157%	421	158%	**yes**
H_2S	Annual, mean	140	n/a	0.211	0.15%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	3.75	2.5%	n/a	n/a	no
	1 hour, maximum	150	n/a	17.6	12%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.384	0.053%	n/a	n/a	no
	1 hour, maximum	21600	n/a	18.2	0.084%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.358	0.20%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00768	0.00031%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.2 Scenario 1, Predicted Impacts at Receptor 2

OS Grid , m Compound	X: 550535 Y: 178814 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0807	0.20%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.964	0.48%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0772	0.19%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.274	0.55%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	31.8	25%	35.4	28%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	209	60%	213	61%	**yes**
	15 min, <36 exceedances yearly	266	3.64	365	137%	369	139%	**yes**
H_2S	Annual, mean	140	n/a	0.182	0.13%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.71	1.8%	n/a	n/a	no
	1 hour, maximum	150	n/a	18.0	12%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.362	0.050%	n/a	n/a	no
	1 hour, maximum	21600	n/a	22.1	0.10%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.440	0.24%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00724	0.00029%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.3 Scenario 1, Predicted Impacts at Receptor 3

OS Grid , m Compound	X: 550456 Y: 178886 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0862	0.22%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	1.02	0.51%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0858	0.21%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.321	0.64%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	45.3	36%	48.9	39%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	224	64%	227	65%	**yes**
	15 min, <36 exceedances yearly	266	3.64	362	136%	366	138%	**yes**
H_2S	Annual, mean	140	n/a	0.224	0.16%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.96	2.0%	n/a	n/a	no
	1 hour, maximum	150	n/a	19.1	13%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.352	0.049%	n/a	n/a	no
	1 hour, maximum	21600	n/a	17.7	0.082%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.353	0.20%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00700	0.00028%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.4 Scenario 1, Predicted Impacts at Receptor 4

OS Grid , m Compound	X: 550589 Y: 178751 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0754	0.19%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.941	0.47%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0657	0.16%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.236	0.47%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	31.0	25%	34.7	28%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	207	59%	210	60%	**yes**
	15 min, <36 exceedances yearly	266	3.64	354	133%	358	134%	**yes**
H_2S	Annual, mean	140	n/a	0.156	0.11%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.19	1.5%	n/a	n/a	no
	1 hour, maximum	150	n/a	17.0	11%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.309	0.043%	n/a	n/a	no
	1 hour, maximum	21600	n/a	17.4	0.081%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.349	0.19%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00620	0.00025%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.5 Scenario 1, Predicted Impacts at Receptor 5

OS Grid , m Compound	X: 550000 Y: 179100 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.146	0.37%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	1.06	0.53%	45.3	23%	no
PM_{10}	Annual, mean	40	17.9	0.0819	0.20%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.257	0.51%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	29.3	23%	33.0	26%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	178	51%	181	52%	**yes**
	15 min, <36 exceedances yearly	266	3.64	313	118%	316	119%	**yes**
H_2S	Annual, mean	140	n/a	0.177	0.13%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.41	1.6%	n/a	n/a	no
	1 hour, maximum	150	n/a	13.3	8.9%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.467	0.065%	n/a	n/a	no
	1 hour, maximum	21600	n/a	21.7	0.10%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.444	0.25%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00942	0.00038%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.6 Scenario 1, Predicted Impacts at Receptor 6

OS Grid , m Compound	X: 549800 Y: 178950 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.102	0.26%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	0.874	0.44%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0496	0.12%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.157	0.31%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	14.6	12%	18.2	15%	no
	1 hour, <25 exceedances yearly	350	3.64	58.6	17%	62.2	18%	no
	15 min, <36 exceedances yearly	266	3.64	208	78%	212	80%	**yes**
H_2S	Annual, mean	140	n/a	0.106	0.076%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	1.49	0.99%	n/a	n/a	no
	1 hour, maximum	150	n/a	9.63	6.4%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.320	0.044%	n/a	n/a	no
	1 hour, maximum	21600	n/a	15.4	0.071%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.316	0.18%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00647	0.00026%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.7 Scenario 1, Predicted Impacts at Receptor 7

OS Grid , m Compound	X: 550200 Y: 178600 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0580	0.14%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.862	0.43%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0354	0.089%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.124	0.25%	35.9	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	21.2	17%	24.8	20%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	101	29%	104	30%	**yes**
	15 min, <36 exceedances yearly	266	3.64	269	101%	273	103%	**yes**
H_2S	Annual, mean	140	n/a	0.0926	0.066%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	1.88	1.3%	n/a	n/a	no
	1 hour, maximum	150	n/a	13.3	8.9%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.170	0.024%	n/a	n/a	no
	1 hour, maximum	21600	n/a	6.73	0.031%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.135	0.075%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00339	0.00014%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.8 Scenario 1, Predicted Impacts at Receptor 8

OS Grid , m	X: 550350 Y: 178650	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m³	µg/m³	µg/m³	% AQS	µg/m³	% AQS	
NO_2	Annual, mean	40	22.1	0.0616	0.15%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.901	0.45%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0484	0.12%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.186	0.37%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	25.7	21%	29.3	23%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	167	48%	171	49%	**yes**
	15 min, <36 exceedances yearly	266	3.64	280	105%	284	107%	**yes**
H_2S	Annual, mean	140	n/a	0.126	0.090%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.19	1.5%	n/a	n/a	no
	1 hour, maximum	150	n/a	14.9	9.9%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.228	0.032%	n/a	n/a	no
	1 hour, maximum	21600	n/a	12.9	0.060%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.252	0.14%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00455	0.00018%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.9 Scenario 1, Predicted Impacts at Receptor 9

OS Grid , m Compound	X: 550500 Y: 178750 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0724	0.18%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.983	0.49%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0666	0.17%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.243	0.49%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	29.3	23%	33.0	26%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	191	54%	194	56%	**yes**
	15 min, <36 exceedances yearly	266	3.64	342	129%	346	130%	**yes**
H_2S	Annual, mean	140	n/a	0.159	0.11%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.58	1.7%	n/a	n/a	no
	1 hour, maximum	150	n/a	17.1	11%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.320	0.044%	n/a	n/a	no
	1 hour, maximum	21600	n/a	17.9	0.083%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.354	0.20%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00641	0.00026%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.10 Scenario 1, Predicted Impacts at Receptor 10

OS Grid , m	X: 549800 Y: 179500	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m³	µg/m³	µg/m³	% AQS	µg/m³	% AQS	
NO_2	Annual, mean	40	22.1	0.125	0.31%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	0.966	0.48%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0469	0.12%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.159	0.32%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	23.5	19%	27.2	22%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	133	38%	137	39%	**yes**
	15 min, <36 exceedances yearly	266	3.64	316	119%	320	120%	**yes**
H_2S	Annual, mean	140	n/a	0.132	0.094%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.00	1.3%	n/a	n/a	no
	1 hour, maximum	150	n/a	13.8	9.2%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.339	0.047%	n/a	n/a	no
	1 hour, maximum	21600	n/a	30.1	0.14%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.614	0.34%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00683	0.00027%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.11 Scenario 1, Predicted Impacts at Receptor 11

OS Grid , m	X: 550300 Y: 179000	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
NO_2	Annual, mean	40	22.1	0.098	0.25%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	1.17	0.59%	45.4	23%	no
PM_{10}	Annual, mean	40	17.9	0.0985	0.25%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.347	0.69%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	44.9	36%	48.5	39%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	260	74%	263	75%	**yes**
	15 min, <36 exceedances yearly	266	3.64	417	157%	421	158%	**yes**
H_2S	Annual, mean	140	n/a	0.220	0.16%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	2.68	1.8%	n/a	n/a	no
	1 hour, maximum	150	n/a	17.7	12%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.531	0.074%	n/a	n/a	no
	1 hour, maximum	21600	n/a	15.6	0.072%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.313	0.17%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.01071	0.00043%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.12 Scenario 1, Predicted Impacts at Receptor 12

OS Grid , m Compound	X: 550600 Y: 178700 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0701	0.18%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.937	0.47%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0592	0.15%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.224	0.45%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	28.2	23%	31.8	25%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	168	48%	172	49%	**yes**
	15 min, <36 exceedances yearly	266	3.64	336	126%	340	128%	**yes**
H_2S	Annual, mean	140	n/a	0.142	0.10%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	1.80	1.2%	n/a	n/a	no
	1 hour, maximum	150	n/a	16.2	11%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.288	0.040%	n/a	n/a	no
	1 hour, maximum	21600	n/a	16.5	0.076%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.326	0.18%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00579	0.00023%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.13 Scenario 1, Predicted Impacts at Receptor 13

OS Grid , m Compound	X: 550900 Y: 178750 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	 % AQS	PEC (max) µg/m³	 % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0815	0.20%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.966	0.48%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0876	0.22%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.292	0.58%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	42.7	34%	46.3	37%	**yes**
	1 hour, <25 exceedances yearly	350	3.64	159	45%	163	47%	**yes**
	15 min, <36 exceedances yearly	266	3.64	257	97%	261	98%	**yes**
H_2S	Annual, mean	140	n/a	0.155	0.11%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	3.65	2.4%	n/a	n/a	no
	1 hour, maximum	150	n/a	11.9	8.0%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.434	0.060%	n/a	n/a	no
	1 hour, maximum	21600	n/a	32.3	0.15%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.659	0.37%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00877	0.00035%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.14 Scenario 1, Predicted Impacts at Receptor 14

OS Grid , m Compound	X: 552750 Y: 181500 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0539	0.13%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.362	0.18%	44.6	22%	no
PM_{10}	Annual, mean	40	17.9	0.0156	0.039%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.0434	0.087%	35.8	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	4.20	3.4%	7.84	6.3%	no
	1 hour, <25 exceedances yearly	350	3.64	21.4	6.13%	25.1	7.2%	no
	15 min, <36 exceedances yearly	266	3.64	30.3	11%	33.9	13%	no
H_2S	Annual, mean	140	n/a	0.0371	0.0265%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.271	0.18%	n/a	n/a	no
	1 hour, maximum	150	n/a	1.53	1.0%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.106	0.015%	n/a	n/a	no
	1 hour, maximum	21600	n/a	3.65	0.017%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.0735	0.041%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00215	0.000086%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.15 Scenario 1, Predicted Impacts at Receptor 15

OS Grid , m Compound	X: 552000 Y: 180400 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.131	0.33%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	0.549	0.27%	44.7	22%	no
PM_{10}	Annual, mean	40	17.9	0.0347	0.087%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.0952	0.19%	35.9	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	9.10	7.3%	12.7	10%	no
	1 hour, <25 exceedances yearly	350	3.64	31.6	9.0%	35.2	10%	no
	15 min, <36 exceedances yearly	266	3.64	104	39%	108	41%	**yes**
H_2S	Annual, mean	140	n/a	0.0931	0.067%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.622	0.41%	n/a	n/a	no
	1 hour, maximum	150	n/a	6.21	4.1%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.276	0.038%	n/a	n/a	no
	1 hour, maximum	21600	n/a	14.1	0.065%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.285	0.16%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00559	0.00022%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.16 Scenario 1, Predicted Impacts at Receptor 16

OS Grid , m Compound	X: 548350 Y: 178600 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0340	0.085%	22.1	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.406	0.20%	44.6	22%	no
PM_{10}	Annual, mean	40	17.9	0.0128	0.032%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.0381	0.076%	35.8	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	3.16	2.5%	6.80	5.4%	no
	1 hour, <25 exceedances yearly	350	3.64	18.4	5.3%	22.1	6.3%	no
	15 min, <36 exceedances yearly	266	3.64	33.7	12.7%	37.3	14%	no
H_2S	Annual, mean	140	n/a	0.0243	0.017%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.425	0.28%	n/a	n/a	no
	1 hour, maximum	150	n/a	1.69	1.1%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.0783	0.011%	n/a	n/a	no
	1 hour, maximum	21600	n/a	6.29	0.029%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.129	0.072%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00159	0.000064%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

D.2 Human Health Impact, Scenario 2 – Future Operations

Table D.17 Scenario 2, Predicted Impacts at Receptor 1

OS Grid , m	X: 550672 Y: 178837	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m³	µg/m³	µg/m³	% AQS	µg/m³	% AQS	
NO_2	Annual, mean	40	22.1	0.0986	0.25%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	1.06	0.53%	45.3	23%	no
PM_{10}	Annual, mean	40	17.9	0.101	0.25%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.379	0.76%	36.2	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	1.26	1.0%	4.90	3.9%	no
	1 hour, <25 exceedances yearly	350	3.64	5.75	1.6%	9.39	2.7%	no
	15 min, <36 exceedances yearly	266	3.64	10.3	3.9%	13.9	5.2%	no
H_2S	Annual, mean	140	n/a	0.0363	0.026%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.609	0.41%	n/a	n/a	no
	1 hour, maximum	150	n/a	3.14	2.1%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.381	0.053%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00768	0.000036%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.358	0.20%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00768	0.00031%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.18 Scenario 2, Predicted Impacts at Receptor 2

OS Grid , m	X: 550535 Y: 178814	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m³	µg/m³	µg/m³	% AQS	µg/m³	% AQS	
NO_2	Annual, mean	40	22.1	0.0826	0.21%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.988	0.49%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0801	0.20%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.286	0.57%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.688	0.55%	4.33	3.5%	no
	1 hour, <25 exceedances yearly	350	3.64	2.35	0.67%	5.99	1.7%	no
	15 min, <36 exceedances yearly	266	3.64	5.72	2.1%	9.36	3.5%	no
H_2S	Annual, mean	140	n/a	0.0315	0.022%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.460	0.31%	n/a	n/a	no
	1 hour, maximum	150	n/a	3.09	2.1%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.357	0.050%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00724	0.000034%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.440	0.24%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00724	0.00029%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.19 Scenario 2, Predicted Impacts at Receptor 3

OS Grid , m Compound	X: 550456 Y: 178886 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0872	0.22%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	1.05	0.53%	45.3	23%	no
PM_{10}	Annual, mean	40	17.9	0.0894	0.22%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.331	0.66%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.762	0.61%	4.40	3.5%	no
	1 hour, <25 exceedances yearly	350	3.64	1.76	0.50%	5.40	1.5%	no
	15 min, <36 exceedances yearly	266	3.64	2.67	1.0%	6.31	2.4%	no
H_2S	Annual, mean	140	n/a	0.0370	0.026%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.484	0.32%	n/a	n/a	no
	1 hour, maximum	150	n/a	3.17	2.1%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.346	0.048%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00700	0.000032%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.353	0.20%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00700	0.00028%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.20 Scenario 2, Predicted Impacts at Receptor 4

OS Grid , m	X: 550589 Y: 178751	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m³	µg/m³	µg/m³	% AQS	µg/m³	% AQS	
NO_2	Annual, mean	40	22.1	0.0794	0.20%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.988	0.49%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0684	0.17%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.246	0.49%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.830	0.66%	4.47	3.6%	no
	1 hour, <25 exceedances yearly	350	3.64	4.27	1.22%	7.91	2.3%	no
	15 min, <36 exceedances yearly	266	3.64	8.92	3.4%	12.6	4.7%	no
H_2S	Annual, mean	140	n/a	0.0268	0.019%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.374	0.25%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.90	1.9%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.307	0.043%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00620	0.000029%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.349	0.19%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00620	0.00025%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.21 Scenario 2, Predicted Impacts at Receptor 5

OS Grid , m Compound	X: 550000 Y: 179100 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.153	0.38%	22.3	56%	no
	1 hour, <19 exceedances yearly	200	44.2	1.09	0.55%	45.3	23%	no
PM_{10}	Annual, mean	40	17.9	0.0848	0.21%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.267	0.53%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.769	0.62%	4.41	3.5%	no
	1 hour, <25 exceedances yearly	350	3.64	2.01	0.57%	5.65	1.6%	no
	15 min, <36 exceedances yearly	266	3.64	3.18	1.2%	6.82	2.6%	no
H_2S	Annual, mean	140	n/a	0.0314	0.022%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.382	0.25%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.29	1.5%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.465	0.065%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00942	0.000044%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.444	0.25%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00942	0.00038%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.22 Scenario 2, Predicted Impacts at Receptor 6

OS Grid , m Compound	X: 549800 Y: 178950 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.107	0.27%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	0.900	0.45%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0513	0.13%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.165	0.33%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.602	0.48%	4.24	3.4%	no
	1 hour, <25 exceedances yearly	350	3.64	1.82	0.52%	5.46	1.6%	no
	15 min, <36 exceedances yearly	266	3.64	2.88	1.1%	6.52	2.4%	no
H_2S	Annual, mean	140	n/a	0.0192	0.014%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.246	0.16%	n/a	n/a	no
	1 hour, maximum	150	n/a	1.56	1.0%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.319	0.044%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00647	0.000030%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.316	0.18%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00647	0.00026%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.23 Scenario 2, Predicted Impacts at Receptor 7

OS Grid , m Compound	X: 550200 Y: 178600 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0598	0.15%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.881	0.44%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0372	0.09%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.128	0.26%	35.9	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.528	0.42%	4.17	3.3%	no
	1 hour, <25 exceedances yearly	350	3.64	1.49	0.43%	5.13	1.5%	no
	15 min, <36 exceedances yearly	266	3.64	2.40	0.90%	6.04	2.3%	no
H_2S	Annual, mean	140	n/a	0.0158	0.011%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.320	0.21%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.22	1.5%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.168	0.023%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00339	0.000016%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.135	0.075%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00339	0.00014%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.24 Scenario 2, Predicted Impacts at Receptor 8

OS Grid , m Compound	X: 550350 Y: 178650 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	 % AQS	PEC (max) µg/m³	 % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0630	0.16%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.924	0.46%	45.1	23%	no
PM_{10}	Annual, mean	40	17.9	0.0507	0.13%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.191	0.38%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.512	0.41%	4.15	3.3%	no
	1 hour, <25 exceedances yearly	350	3.64	1.54	0.44%	5.18	1.5%	no
	15 min, <36 exceedances yearly	266	3.64	2.48	0.93%	6.12	2.3%	no
H_2S	Annual, mean	140	n/a	0.0213	0.015%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.354	0.24%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.46	1.6%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.225	0.031%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00455	0.000021%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.252	0.14%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00455	0.00018%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.25 Scenario 2, Predicted Impacts at Receptor 9

OS Grid , m Compound	X: 550500 Y: 178750 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0738	0.18%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	1.02	0.51%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0691	0.17%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.249	0.50%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.615	0.49%	4.26	3.4%	no
	1 hour, <25 exceedances yearly	350	3.64	1.93	0.55%	5.57	1.6%	no
	15 min, <36 exceedances yearly	266	3.64	3.14	1.2%	6.78	2.6%	no
H_2S	Annual, mean	140	n/a	0.0276	0.020%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.430	0.29%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.89	1.9%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.316	0.044%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00641	0.000030%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.354	0.20%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00641	0.00026%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.26 Scenario 2, Predicted Impacts at Receptor 10

OS Grid , m Compound	X: 549800 Y: 179500 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.129	0.32%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	0.984	0.49%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0499	0.12%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.166	0.33%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.631	0.51%	4.27	3.4%	no
	1 hour, <25 exceedances yearly	350	3.64	1.81	0.52%	5.45	1.6%	no
	15 min, <36 exceedances yearly	266	3.64	2.68	1.0%	6.32	2.4%	no
H_2S	Annual, mean	140	n/a	0.0235	0.017%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.360	0.24%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.95	2.0%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.337	0.047%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00683	0.000032%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.614	0.34%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00683	0.00027%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.27 Scenario 2, Predicted Impacts at Receptor 11

OS Grid , m Compound	X: 550300 Y: 179000 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	 % AQS	PEC (max) µg/m³	 % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.101	0.25%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	1.21	0.607%	45.4	23%	no
PM_{10}	Annual, mean	40	17.9	0.102	0.3%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.366	0.73%	36.2	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.945	0.76%	4.58	3.7%	no
	1 hour, <25 exceedances yearly	350	3.64	1.88	0.54%	5.52	1.6%	no
	15 min, <36 exceedances yearly	266	3.64	2.80	1.1%	6.44	2.4%	no
H_2S	Annual, mean	140	n/a	0.0366	0.026%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.427	0.28%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.98	2.0%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.526	0.073%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.0107	0.000050%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.313	0.17%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.01071	0.00043%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.28 Scenario 2, Predicted Impacts at Receptor 12

OS Grid , m Compound	X: 550600 Y: 178700 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	 % AQS	PEC (max) µg/m³	 % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0742	0.19%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.975	0.49%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0617	0.15%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.228	0.46%	36.0	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.858	0.69%	4.50	3.6%	no
	1 hour, <25 exceedances yearly	350	3.64	4.97	1.42%	8.61	2.5%	no
	15 min, <36 exceedances yearly	266	3.64	9.04	3.4%	12.7	4.8%	no
H_2S	Annual, mean	140	n/a	0.0244	0.017%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.311	0.21%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.75	1.8%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.286	0.040%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00579	0.000027%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.326	0.18%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00579	0.00023%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.29 Scenario 2, Predicted Impacts at Receptor 13

OS Grid , m Compound	X: 550900 Y: 178750 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0867	0.22%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	1.01	0.50%	45.2	23%	no
PM_{10}	Annual, mean	40	17.9	0.0897	0.22%	18.0	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.298	0.60%	36.1	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	1.42	1.13%	5.06	4.0%	no
	1 hour, <25 exceedances yearly	350	3.64	5.29	1.51%	8.93	2.6%	no
	15 min, <36 exceedances yearly	266	3.64	9.48	3.6%	13.1	4.9%	no
H_2S	Annual, mean	140	n/a	0.0290	0.021%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.747	0.50%	n/a	n/a	no
	1 hour, maximum	150	n/a	2.17	1.4%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.432	0.060%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00877	0.000041%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.659	0.37%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00877	0.00035%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.30 Scenario 2, Predicted Impacts at Receptor 14

OS Grid , m Compound	X: 552750 Y: 181500 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0560	0.14%	22.2	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.378	0.19%	44.6	22%	no
PM_{10}	Annual, mean	40	17.9	0.0164	0.041%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.0460	0.092%	35.8	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.222	0.18%	3.86	3.1%	no
	1 hour, <25 exceedances yearly	350	3.64	1.07	0.31%	4.71	1.3%	no
	15 min, <36 exceedances yearly	266	3.64	1.49	0.56%	5.13	1.9%	no
H_2S	Annual, mean	140	n/a	0.00688	0.0049%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.0503	0.034%	n/a	n/a	no
	1 hour, maximum	150	n/a	0.294	0.20%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.106	0.015%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00215	0.000010%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.0735	0.041%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00215	0.000086%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.31 Scenario 2, Predicted Impacts at Receptor 15

OS Grid , m Compound	X: 552000 Y: 180400 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	 % AQS	PEC (max) µg/m³	 % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.137	0.34%	22.2	56%	no
	1 hour, <19 exceedances yearly	200	44.2	0.567	0.28%	44.8	22%	no
PM_{10}	Annual, mean	40	17.9	0.0365	0.091%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.099	0.20%	35.9	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.354	0.28%	3.99	3.2%	no
	1 hour, <25 exceedances yearly	350	3.64	1.19	0.34%	4.83	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	1.93	0.72%	5.57	2.1%	no
H_2S	Annual, mean	140	n/a	0.0173	0.012%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.118	0.078%	n/a	n/a	no
	1 hour, maximum	150	n/a	0.999	0.67%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.276	0.038%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00559	0.000026%	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.285	0.16%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00559	0.00022%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.32 Scenario 2, Predicted Impacts at Receptor 16

OS Grid , m Compound	X: 548350 Y: 178600 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	PC (max) % AQS	PEC (max) µg/m³	PEC (max) % AQS	Potentially Significant?
NO_2	Annual, mean	40	22.1	0.0355	0.089%	22.1	55%	no
	1 hour, <19 exceedances yearly	200	44.2	0.424	0.212%	44.6	22%	no
PM_{10}	Annual, mean	40	17.9	0.0133	0.033%	17.9	45%	no
	24 hour, <36 exceedances yearly	50	35.8	0.0405	0.081%	35.8	72%	no
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.152	0.12%	3.79	3.0%	no
	1 hour, <25 exceedances yearly	350	3.64	0.924	0.26%	4.56	1.3%	no
	15 min, <36 exceedances yearly	266	3.64	1.64	0.62%	5.28	2.0%	no
H_2S	Annual, mean	140	n/a	0.00454	0.0032%	n/a	n/a	no
	24 hour, maximum (WHO)	150	n/a	0.0817	0.054%	n/a	n/a	no
	1 hour, maximum	150	n/a	0.336	0.22%	n/a	n/a	no
VOC	see **Appendix B**							
Hexane	Annual, mean	720	n/a	0.0783	0.011%	n/a	n/a	no
	1 hour, maximum	21600	n/a	0.00159	0.0000074 %	n/a	n/a	no
NH_3	Annual, mean	180	n/a	0.129	0.072%	n/a	n/a	no
	1 hour, maximum	2500	n/a	0.00159	0.000064%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Long Term: PC<1% of the AQS or the PEC<70% of the AQS
- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

D.3 Human Health Impact, Scenario 3 – Bypass

Table D.33 Scenario 3, Predicted Impacts at Receptor 1

OS Grid , m	X: 550672 Y: 178837	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.510	0.41%	4.15	3.3%	no
	1 hour, <25 exceedances yearly	350	3.64	1.61	0.46%	5.25	1.5%	no
	15 min, <36 exceedances yearly	266	3.64	2.63	0.99%	6.27	2.4%	no
H_2S	24 hour, maximum (WHO)	150	n/a	12.4	8.3%	n/a	n/a	no
	1 hour, maximum	150	n/a	60.4	40%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	17.6	0.081%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.34 Scenario 3, Predicted Impacts at Receptor 2

OS Grid , m	X: 550535 Y: 178814	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.410	0.33%	4.05	3.2%	no
	1 hour, <25 exceedances yearly	350	3.64	1.43	0.41%	5.07	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	2.46	0.93%	6.10	2.3%	no
H_2S	24 hour, maximum (WHO)	150	n/a	9.33	6.2%	n/a	n/a	no
	1 hour, maximum	150	n/a	53.3	36%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	21.5	0.10%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.35 Scenario 3, Predicted Impacts at Receptor 3

OS Grid , m	X: 550456 Y: 178886	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	**Averaging Time**	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.531	0.42%	4.17	3.3%	no
	1 hour, <25 exceedances yearly	350	3.64	1.53	0.44%	5.17	1.5%	no
	15 min, <36 exceedances yearly	266	3.64	2.57	0.96%	6.21	2.3%	no
H_2S	24 hour, maximum (WHO)	150	n/a	12.9	8.6%	n/a	n/a	no
	1 hour, maximum	150	n/a	54.8	37%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	17.3	0.080%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.36 Scenario 3, Predicted Impacts at Receptor 4

OS Grid , m	X: 550589 Y: 178751	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.391	0.31%	4.03	3.2%	no
	1 hour, <25 exceedances yearly	350	3.64	1.38	0.39%	5.02	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	2.35	0.88%	5.99	2.3%	no
H_2S	24 hour, maximum (WHO)	150	n/a	8.27	5.5%	n/a	n/a	no
	1 hour, maximum	150	n/a	39.4	26%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	17.0	0.079%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.37 Scenario 3, Predicted Impacts at Receptor 5

OS Grid , m	X: 550000 Y: 179100	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.331	0.26%	3.97	3.2%	no
	1 hour, <25 exceedances yearly	350	3.64	1.27	0.36%	4.91	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	2.12	0.80%	5.76	2.2%	no
H_2S	24 hour, maximum (WHO)	150	n/a	9.09	6.1%	n/a	n/a	no
	1 hour, maximum	150	n/a	45.0	30%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	21.6	0.10%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.38 Scenario 3, Predicted Impacts at Receptor 6

OS Grid , m	X: 549800 Y: 178950	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.255	0.20%	3.89	3.1%	no
	1 hour, <25 exceedances yearly	350	3.64	1.27	0.36%	4.91	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	1.89	0.71%	5.53	2.1%	no
H_2S	24 hour, maximum (WHO)	150	n/a	9.94	6.6%	n/a	n/a	no
	1 hour, maximum	150	n/a	31.3	21%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	15.3	0.071%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.39 Scenario 3, Predicted Impacts at Receptor 7

OS Grid , m	X: 550200 Y: 178600	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.256	0.20%	3.90	3.1%	no
	1 hour, <25 exceedances yearly	350	3.64	1.02	0.29%	4.66	1.3%	no
	15 min, <36 exceedances yearly	266	3.64	1.74	0.65%	5.38	2.0%	no
H_2S	24 hour, maximum (WHO)	150	n/a	5.76	3.8%	n/a	n/a	no
	1 hour, maximum	150	n/a	35.1	23%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	6.60	0.031%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.40 Scenario 3, Predicted Impacts at Receptor 8

OS Grid , m	X: 550350 Y: 178650	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m³	µg/m³	µg/m³	% AQS	µg/m³	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.300	0.24%	3.94	3.2%	no
	1 hour, <25 exceedances yearly	350	3.64	1.23	0.35%	4.87	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	1.93	0.73%	5.57	2.1%	no
H_2S	24 hour, maximum (WHO)	150	n/a	7.38	4.9%	n/a	n/a	no
	1 hour, maximum	150	n/a	33.0	22%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	12.4	0.057%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.41 Scenario 3, Predicted Impacts at Receptor 9

OS Grid , m	X: 550500 Y: 178750	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.366	0.29%	4.01	3.2%	no
	1 hour, <25 exceedances yearly	350	3.64	1.40	0.40%	5.04	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	2.23	0.84%	5.87	2.2%	no
H_2S	24 hour, maximum (WHO)	150	n/a	8.02	5.3%	n/a	n/a	no
	1 hour, maximum	150	n/a	47.1	31%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	17.4	0.080%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.42 Scenario 3, Predicted Impacts at Receptor 10

OS Grid , m	X: 549800 Y: 179500	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.271	0.22%	3.91	3.1%	no
	1 hour, <25 exceedances yearly	350	3.64	1.13	0.32%	4.77	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	1.90	0.71%	5.54	2.1%	no
H_2S	24 hour, maximum (WHO)	150	n/a	5.79	3.9%	n/a	n/a	no
	1 hour, maximum	150	n/a	32.8	22%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	29.9	0.14%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.43 Scenario 3, Predicted Impacts at Receptor 11

OS Grid , m	X: 550300 Y: 179000	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.569	0.46%	4.21	3.4%	no
	1 hour, <25 exceedances yearly	350	3.64	1.62	0.46%	5.26	1.5%	no
	15 min, <36 exceedances yearly	266	3.64	2.57	0.97%	6.21	2.3%	no
H_2S	24 hour, maximum (WHO)	150	n/a	11.2	7.5%	n/a	n/a	no
	1 hour, maximum	150	n/a	40.3	27%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	15.3	0.071%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.44 Scenario 3, Predicted Impacts at Receptor 12

OS Grid , m Compound	X: 550600 Y: 178700 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	 % AQS	PEC (max) µg/m³	 % AQS	Potentially Significant?
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.352	0.28%	3.99	3.2%	no
	1 hour, <25 exceedances yearly	350	3.64	1.36	0.39%	5.00	1.4%	no
	15 min, <36 exceedances yearly	266	3.64	2.19	0.82%	5.83	2.2%	no
H_2S	24 hour, maximum (WHO)	150	n/a	7.68	5.1%	n/a	n/a	no
	1 hour, maximum	150	n/a	36.7	24%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	16.0	0.074%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.45 Scenario 3, Predicted Impacts at Receptor 13

OS Grid , m	X: 550900 Y: 178750	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.427	0.34%	4.07	3.3%	no
	1 hour, <25 exceedances yearly	350	3.64	1.44	0.41%	5.08	1.5%	no
	15 min, <36 exceedances yearly	266	3.64	2.25	0.85%	5.89	2.2%	no
H_2S	24 hour, maximum (WHO)	150	n/a	13.4	8.9%	n/a	n/a	no
	1 hour, maximum	150	n/a	39.6	26%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	32.1	0.15%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.46 Scenario 3, Predicted Impacts at Receptor 14

OS Grid , m Compound	X: 552750 Y: 181500 Averaging Time	AQS µg/m³	Back-ground µg/m³	PC (max) µg/m³	 % AQS	PEC (max) µg/m³	 % AQS	Potentially Significant?
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.143	0.11%	3.78	3.0%	no
	1 hour, <25 exceedances yearly	350	3.64	0.642	0.18%	4.28	1.2%	no
	15 min, <36 exceedances yearly	266	3.64	1.24	0.47%	4.88	1.8%	no
H_2S	24 hour, maximum (WHO)	150	n/a	3.14	2.1%	n/a	n/a	no
	1 hour, maximum	150	n/a	17.0	11%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	3.59	0.017%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.47 Scenario 3, Predicted Impacts at Receptor 15

OS Grid , m	X: 552000 Y: 180400	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.194	0.16%	3.83	3.1%	no
	1 hour, <25 exceedances yearly	350	3.64	0.875	0.25%	4.52	1.3%	no
	15 min, <36 exceedances yearly	266	3.64	1.27	0.48%	4.91	1.8%	no
H_2S	24 hour, maximum (WHO)	150	n/a	4.51	3.0%	n/a	n/a	no
	1 hour, maximum	150	n/a	23.6	16%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	13.9	0.064%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

Table D.48 Scenario 3, Predicted Impacts at Receptor 16

OS Grid , m	X: 548350 Y: 178600	AQS	Back-ground	PC (max)		PEC (max)		Potentially Significant?
Compound	Averaging Time	µg/m^3	µg/m^3	µg/m^3	% AQS	µg/m^3	% AQS	
SO_2	24 hour, <4 exceedances yearly	125	3.64	0.115	0.092%	3.75	3.0%	no
	1 hour, <25 exceedances yearly	350	3.64	0.653	0.19%	4.29	1.2%	no
	15 min, <36 exceedances yearly	266	3.64	1.08	0.41%	4.72	1.8%	no
H_2S	24 hour, maximum (WHO)	150	n/a	3.43	2.3%	n/a	n/a	no
	1 hour, maximum	150	n/a	18.8	13%	n/a	n/a	**yes**
VOC	see **Appendix B**							
Hexane	1 hour, maximum	21600	n/a	6.27	0.029%	n/a	n/a	no

n/a = not available

Impacts are not considered significant when:

- Short Term: PC<10% of the AQS or the PC<20% of AQS minus twice the background concentration

D.4 Odour Impact

Table D.49 Predicted H_2S Odour Impact

Parameter	Unit	AQS	Current – Normal Operations	Future – Normal Operations	Current – Bypass Events	Future – Bypass Events
Maximum Operational hours	h/yr	-	8760	8760	Maximum observed: 48	Maximum expected: 5
Receptor 1, x: 550672, y: 178837						
Odour threshold exceedance	h/yr (%)	175 (2%)	232 (2.6%)	38 (0.43%)	Maximum estimated: 4.42 (0.05%)	Maximum predicted: 0.461 (0.0053%)
Receptor 2, x: 550535, y: 178814						
Odour criterion exceedance	h/yr (%)	175 (2%)	194 (2.2%)	26 (0.30%)	Maximum estimated: 4.13 (0.047%)	Maximum predicted: 0.430 (0.0049%)
Receptor 3, x: 550456, y: 178886						
Odour criterion exceedance	h/yr (%)	175 (2%)	251 (2.9%)	34 (0.39%)	Maximum estimated: 4.25 (0.048%)	Maximum predicted: 0.442 (0.0050%)
Receptor 4, x: 550589, y: 178571						
Odour criterion exceedance	h/yr (%)	175 (2%)	158 (1.8%)	26 (0.30%)	Maximum estimated: 3.93 (0.045%)	Maximum predicted: 0.409 (0.0047%)
Receptor 5, x: 550000, y: 179100						
Odour criterion exceedance	h/yr (%)	175 (2%)	176 (2.0%)	16 (0.18%)	Maximum estimated: 8.10 (0.092%)	Maximum predicted: 0.844 (0.0096%)
Receptor 6, x: 549800, y: 178950						
Odour criterion exceedance	h/yr (%)	175 (2%)	109 (1.2%)	0 (0%)	Maximum estimated: 4.98 (0.057%)	Maximum predicted: 0.518 (0.0059%)

Parameter	Unit	AQS	Current – Normal Operations	Future – Normal Operations	Current – Bypass Events	Future – Bypass Events
Receptor 7, x: 550200, y: 178600						
Odour criterion exceedance	h/yr (%)	175 (2%)	98 (1.1%)	9 (0.10%)	Maximum estimated: 2.88 (0.033%)	Maximum predicted: 0.300 (0.0034%)
Receptor 8, x: 550350, y: 178650						
Odour criterion exceedance	h/yr (%)	175 (2%)	138 (1.6%)	13 (0.15%)	Maximum estimated: 3.19 (0.036%)	Maximum predicted: 0.333 (0.0038%)
Receptor 9, x: 550500, y: 178750						
Odour criterion exceedance	h/yr (%)	175 (2%)	147 (1.7%)	24 (0.27%)	Maximum estimated: 3.83 (0.044%)	Maximum predicted: 0.399 (0.0046%)
Receptor 10, x: 549800, y: 179500						
Odour criterion exceedance	h/yr (%)	175 (2%)	147 (1.7%)	13 (0.15%)	Maximum estimated: 4.06 (0.046%)	Maximum predicted: 0.423 (0.0048%)
Receptor 11, x: 550300, y: 179000						
Odour criterion exceedance	h/yr (%)	175 (2%)	244 (2.8%)	32 (0.37%)	Maximum estimated: 6.49 (0.074%)	Maximum predicted: 0.676 (0.0077%)
Receptor 12, x: 550600, y: 178700						
Odour criterion exceedance	h/yr (%)	175 (2%)	155 (1.8%)	19 (0.22%)	Maximum estimated: 3.68 (0.042%)	Maximum predicted: 0.384 (0.0044%)
Receptor 13, x: 550900, y: 178750						
Odour criterion exceedance	h/yr (%)	175 (2%)	203 (2.3%)	25 (0.29%)	Maximum estimated: 4.28 (0.049%)	Maximum predicted: 0.446 (0.0051%)
Receptor 14, x: 552750, y: 181500						
Odour criterion exceedance	h/yr (%)	175 (2%)	0 (0.0%)	0 (0.0%)	Maximum estimated: 1.82 (0.021%)	Maximum predicted: 0.190 (0.0022%)

Parameter	Unit	AQS	Current – Normal Operations	Future – Normal Operations	Current – Bypass Events	Future – Bypass Events
				Receptor 15, x: 552000, y: 180400		
Odour criterion exceedance	h/yr (%)	175 (2%)	28 (0.32%)	0 (0.0%)	Maximum estimated: 3.92 (0.045%)	Maximum predicted: 0.408 (0.0047%)
				Receptor 16, x: 548350, y: 178600		
Odour criterion exceedance	h/yr (%)	175 (2%)	2 (0.023%)	0 (0.0%)	Maximum estimated: 1.14 (0.013%)	Maximum predicted: 0.119 (0.0014%)

APPENDIX E AQMAU RECOMMENDATIONS AND ADM/ERM RESPONSES

AQMAU comment	ADM/ERM Response
There are high uncertainties in the processes and modelled source terms.	Acknowledged
The consultant should provide 24-hour mean H_2S predictions for comparison to the short-term EAL of 150µg/m^3.	ERM has included evaluation against the WHO 24h guideline value. As per Emma Moore's mail (dd. 10 December 2020), the source reference for the H_2S EAL (within the H1 – Annex F) is the "World Health Organization WHO, Air quality guidelines 2000". During the EA transition from paper based to online resources this did not transfer correctly. The EAL source references were lost in translation when H1-Annex F guidance moved online (https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit). The online guidance should be corrected in time to reflect the appropriate averaging time of 24 hours but at this time EA cannot say when this will happen.
The emissions across all parameters and emission points is highly varied. ADM are unclear as to why this is. This is especially noticeable for sulphur containing compounds. The monitoring shows the emissions are subject to variation. The consultant has modelled average and peak emission rates. However, all other parameters, such as volumetric flows and temperatures are fixed for both average and peak modelled emission rates. Typically emission rates increase with increases in volumetric flow. For SO_2 the emission rates will depend on the sulphur content of the feed, however peak emission rates would be expected from high sulphur content feed and peak feed rates. The volumetric flow rate and temperature affects the plume rise, with higher flows and higher temperatures increasing the plume rise which leads to better dispersion. If peak emissions rates coincide with higher flows and temperatures then modelling peak emission rates with lower flow and temperature values could be excessively conservative. However, due to the stated variation shown by the monitoring further work is required to understand the processes to ensure the source terms are representative of actual operations. The consultant has modelled average and peak emissions throughout the entire year for each scenario. For normal operations average emissions have been used for long-term and short-term assessment, whilst peak emissions have been used for short-term assessment only. Due to the uncertainties in the operations and source term, we would recommend long-term impacts of peak emissions are also considered. We have conducted check modelling to this.	Discussed on call with EA dd. 3 December 2020. The model approach was pragmatic to avoid an excessive number of models. This approach is reasonable given the variations in flow and concentrations. It is to be noted that max flow and max concentration do not typically coincide. ERM provided commentary in the report on the selection of SO_2 and H_2S release rates (averages/maxima), in the context of the observed variation in measured concentrations and flow rates, and taking into account that different measurements occurred at different times/locations. As this AQIA-ES focuses on the effect on emissions due to the new TO&S, emissions and dispersion modelling for current and future scenario are based on one and the same set of emissions data for all sources apart from the old and new TO.
Given that we are not clear why the emissions from site vary so much, we cannot be sure that we have encountered the worst case emissions. The uncertainty on some of the SO_2 monitoring is quite large so the numbers could be higher or lower than the results reported.	The model is considered to be a reasonable worst case. Modelling itself is inherently conservative, so even if the worst case emissions are missed, these are unlikely to coincide with the worst case dispersion conditions (and therefore highest impacts) that are presented in the report.

AQMAU comment	ADM/ERM Response
We also note that H_2S is an odorous compound and the consultant has not considered the odour risks within this piece of work. We presume this was not a requirement. However, the detection threshold for H_2S is between 0.2 and 2µg/m^3 and the recognition threshold is between 0.6 and 6µg/m^3 according to the WHO. The WHO recommends a guideline of 7µg/m^3, with a 30-minute averaging time to avoid substantial complaints about odour annoyance among the exposed population. The predicted H_2S hourly concentrations for all scenarios are well in excess of this odour 'annoyance' guideline.	ADM will review the 2016 odour assessment report, and consider what supporting information may be needed for forthcoming variation application. Nothing additional required for the modelling report.

APPENDIX F DETAILED RESULTS OF ECOLOGY SCREENING

F.1 Introduction

This appendix sets out the tabulated results of the air quality dispersion modelling for the existing operations (Scenario 1) and the proposed future operations (Scenario 2). The reporting of the results follows the Defra / EA guidance on 'Air Emissions Risk Assessment for Your Environmental Permit' .

F.2 Air Dispersion Modelling Results for NO_x

F.2.1 NO_x National Sites

Table F.1 and Table F.2 detail the results of the modelling for NOx for Scenario 1 and Scenario 2 respectively.

Table F.1: Scenario 1: SSSIs – Predicted PCs for NO_x and % of Critical Level

SSSI	Background NO_x (µg m^{-3})	Critical Level (µg m^{-3})	PC (µg m^{-3})	PC as % of Critical Level
NO_x Annual Mean				
Inner Thames Marshes SSSI	31.72	30	0.19	0.6%
Ingrebourne Marshes SSSI	32.17	30	0.03	0.1%
Oxleas Woodlands SSSI	29.92	30	0.01	0.05%
West Thurrock Lagoon & Marshes SSSI	38.63	30	0.01	0.03%
Darenth Wood SSSI	42.53	30	0.004	0.01%
Ruxley Gravel Pits SSSI	33.63	30	0.004	0.01%
Grays Thurrock Chalk Pit SSSI	36.69	30	0.004	0.01%
NO_x 24hr				
Inner Thames Marshes SSSI	63.44	75	0.84	1.1%
Ingrebourne Marshes SSSI	64.34	75	0.25	0.3%
Oxleas Woodlands SSSI	59.84	75	0.13	0.2%
West Thurrock Lagoon & Marshes SSSI	77.26	75	0.11	0.1%
Darenth Wood SSSI	85.06	75	0.06	0.1%
Ruxley Gravel Pits SSSI	67.26	75	0.06	0.1%
Grays Thurrock Chalk Pit SSSI	73.38	75	0.05	0.1%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

Table F.2: Scenario 2: SSSIs – Predicted PCs for NO_x and % of Critical Level

SSSI	Background NO_x (µg m^{-3})	Critical Level (µg m^{-3})	PC (µg m^{-3})	PC as % of Critical Level
NO_x Annual Mean				
Inner Thames Marshes SSSI	31.72	30	0.20	0.7%
Ingrebourne Marshes SSSI	32.17	30	0.03	0.1%
Oxleas Woodlands SSSI	29.92	30	0.01	0.05%
West Thurrock Lagoon & Marshes SSSI	38.63	30	0.01	0.03%
Darenth Wood SSSI	42.53	30	0.005	0.02%
Ruxley Gravel Pits SSSI	33.63	30	0.004	0.01%
Grays Thurrock Chalk Pit SSSI	36.69	30	0.004	0.01%
NO_x 24hr				
Inner Thames Marshes SSSI	63.44	75	0.88	1.2%
Ingrebourne Marshes SSSI	64.34	75	0.26	0.3%
Oxleas Woodlands SSSI	59.84	75	0.14	0.2%
West Thurrock Lagoon & Marshes SSSI	77.26	75	0.11	0.2%
Darenth Wood SSSI	85.06	75	0.07	0.1%
Ruxley Gravel Pits SSSI	67.26	75	0.06	0.1%
Grays Thurrock Chalk Pit SSSI	73.38	75	0.05	0.1%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

F.2.2 NO_x – Local Sites

Table F.3 details the results for NO_x for Scenario 1 and **Table F.4** sets out the results for Scenario 2.

Table F.3: Scenario 1: Local Sites – Predicted PCs for NOx and % of Critical Level

Local Designations	Background NO_x ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
NO_x Annual Mean				
Lesnes Abbey Woods and Bostall Woods SINC	28.33	30	0.07	0.2%
River Thames and tidal tributaries SINC	34.30	30	0.69	2.3%
Wennington, Aveley and Rainham Marshes SINC	27.56	30	0.19	0.6%
Erith Marshes SINC	33.76	30	0.07	0.2%
Belvedere Dykes SINC	34.30	30	0.10	0.3%
Franks Park, Belvedere SINC	30.29	30	0.10	0.3%
Erith Quarry and Fraser Road SINC	30.29	30	0.05	0.2%
Hollyhill Open Space SINC	30.29	30	0.05	0.2%
Southmere Park & Yarnton Way/Viridion Way SINC	33.76	30	0.08	0.3%
St John the Baptist Churchyard, Erith SINC	30.29	30	0.13	0.4%
Streamway, Chapman's Land and Erith Cemetery SINC	28.91	30	0.04	0.1%
Our Lady of Angels Cemetery SINC	28.97	30	0.03	0.1%
Rainham Marshes LNR	31.72	30	0.17	0.6%
Crossness LNR	33.76	30	0.06	0.2%
Lesnes Abbey Woods LNR	28.33	30	0.07	0.2%
Lesnes Abbey Woods AW	28.33	30	0.07	0.2%
NO_x 24hr				
Lesnes Abbey Woods and Bostall Woods SINC	56.66	75	0.46	0.6%
River Thames and tidal tributaries SINC	68.60	75	2.84	3.8%
Wennington, Aveley and Rainham Marshes SINC	55.12	75	0.84	1.1%
Erith Marshes SINC	67.52	75	0.98	1.3%
Belvedere Dykes SINC	68.60	75	0.91	1.2%
Franks Park, Belvedere SINC	60.58	75	1.71	2.3%
Erith Quarry and Fraser Road SINC	60.58	75	0.94	1.3%
Hollyhill Open Space (SINC)	60.58	75	1.12	1.5%
Southmere Park & Yarnton Way/Viridion Way SINC	67.52	75	0.81	1.1%

Local Designations	Background NO_x ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
St John the Baptist Churchyard, Erith SINC	60.58	75	2.03	2.7%
Streamway, Chapman's Land and Erith Cemetery SINC	57.82	75	0.95	1.3%
Our Lady of Angels Cemetery SINC	57.94	75	0.57	0.8%
Rainham Marshes LNR	63.44	75	0.76	1.0%
Crossness LNR	67.52	75	0.97	1.3%
Lesnes Abbey Woods LNR	56.66	75	0.51	0.7%
Lesnes Abbey Woods AW	56.66	75	0.50	0.7%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

Table F.4: Scenario 2: Local Sites – Predicted PCs for NOx and % of Critical Level

Local Designations	Background NO_x ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
NO_x Annual Mean				
Lesnes Abbey Woods and Bostall Woods SINC	28.33	30	0.07	0.2%
River Thames and tidal tributaries SINC	34.30	30	0.72	2.4%
Wennington, Aveley and Rainham Marshes SINC	27.56	30	0.20	0.7%
Erith Marshes SINC	33.76	30	0.07	0.2%
Belvedere Dykes SINC	34.30	30	0.10	0.3%
Franks Park, Belvedere SINC	30.29	30	0.11	0.4%
Erith Quarry and Fraser Road SINC	30.29	30	0.06	0.2%
Hollyhill Open Space SINC	30.29	30	0.06	0.2%
Southmere Park & Yarnton Way/Viridion Way SINC	33.76	30	0.08	0.3%
St John the Baptist Churchyard, Erith SINC	30.29	30	0.13	0.4%
Streamway, Chapman's Land and Erith Cemetery SINC	28.91	30	0.05	0.2%
Our Lady of Angels Cemetery SINC	28.97	30	0.03	0.1%
Rainham Marshes LNR	31.72	30	0.17	0.6%
Crossness LNR	33.76	30	0.07	0.2%
Lesnes Abbey Woods LNR	28.33	30	0.07	0.2%
Lesnes Abbey Woods AW	28.33	30	0.07	0.2%
NO_x 24hr				

Local Designations	Background NO_x ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
Lesnes Abbey Woods and Bostall Woods SINC	56.66	75	0.48	0.6%
River Thames and tidal tributaries SINC	68.60	75	2.96	3.9%
Wennington, Aveley and Rainham Marshes SINC	55.12	75	0.88	1.2%
Erith Marshes SINC	67.52	75	1.01	1.4%
Belvedere Dykes SINC	68.60	75	0.98	1.3%
Franks Park, Belvedere SINC	60.58	75	1.76	2.4%
Erith Quarry and Fraser Road SINC	60.58	75	0.96	1.3%
Hollyhill Open Space SINC	60.58	75	1.16	1.5%
Southmere Park & Yarnton Way/Viridion Way SINC	67.52	75	0.84	1.1%
St John the Baptist Churchyard, Erith SINC	60.58	75	2.12	2.8%
Streamway, Chapman's Land and Erith Cemetery SINC	57.82	75	0.98	1.3%
Our Lady of Angels Cemetery SINC	57.94	75	0.59	0.8%
Rainham Marshes LNR	63.44	75	0.78	1.0%
Crossness LNR	67.52	75	1.00	1.3%
Lesnes Abbey Woods LNR	56.66	75	0.52	0.7%
Lesnes Abbey Woods AW	56.66	75	0.52	0.7%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

F.3 Air Dispersion Modelling Results for Ammonia

F.3.1 NH_3 - National Sites

Table F.5 and Table F.6 detail the results of the modelling for NH_3 for Scenario 1 and Scenario 2 respectively. The results for both scenarios are identical.

Table F.5: Scenario 1: SSSIs – Predicted PCs for NH_3 and % of Critical Level

SSSI	Background NH_3 (µg m^{-3})	Critical Level (µg m^{-3})	PC (µg m^{-3})	PC as % of Critical Level
Inner Thames Marshes SSSI	1.43	3	0.01	0.2%
Ingrebourne Marshes SSSI	2.08	3	0.001	0.03%
Oxleas Woodlands SSSI	2.07	1	0.0004	0.04%
West Thurrock Lagoon & Marshes SSSI	1.43	3	0.0002	0.01%
Darenth Wood SSSI	1.72	1	0.0001	0.01%
Ruxley Gravel Pits SSSI	1.88	1	0.0002	0.02%
Grays Thurrock Chalk Pit SSSI	1.63	1	0.0001	0.01%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

Table F.6: Scenario 2: SSSIs – Predicted PCs for NH_3 and % of Critical Level

SSSI	Background NH_3 (µg m^{-3})	Critical Level (µg m^{-3})	PC (µg m^{-3})	PC as % of Critical Level
Inner Thames Marshes SSSI	1.43	3	0.01	0.2%
Ingrebourne Marshes SSSI	2.08	3	0.001	0.03%
Oxleas Woodlands SSSI	2.07	1	0.0004	0.04%
West Thurrock Lagoon & Marshes SSSI	1.43	3	0.0002	0.01%
Darenth Wood SSSI	1.72	1	0.0001	0.01%
Ruxley Gravel Pits SSSI	1.88	1	0.0002	0.02%
Grays Thurrock Chalk Pit SSSI	1.63	1	0.0001	0.01%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

F3.2 NH_3 – Local Sites

Table F.7 details the results for NH_3 for Scenario 1 and **Table F.8** sets out the results for Scenario 2. The results for both scenarios are identical.

Table F.7: Scenario 1: Local Sites – Predicted PCs for NH_3 and % of Critical Level

Local Designations	Background NH_3 ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
Lesnes Abbey Woods and Bostall Woods SINC	2.01	1	0.002	0.2%
River Thames and tidal tributaries SINC	1.74	1	0.04	4.4%
Wennington, Aveley and Rainham Marshes SINC	2.08	1	0.01	0.6%
Erith Marshes SINC	2.01	1	0.002	0.2%
Belvedere Dykes SINC	1.74	1	0.01	1.0%
Franks Park, Belvedere SINC	1.74	1	0.005	0.5%
Erith Quarry and Fraser Road SINC	1.74	1	0.003	0.3%
Hollyhill Open Space SINC	1.74	1	0.002	0.2%
Southmere Park & Yarnton Way/Viridion Way SINC	2.01	1	0.002	0.2%
St John the Baptist Churchyard, Erith SINC	1.74	1	0.01	0.8%
Streamway, Chapman's Land and Erith Cemetery SINC	2.01	1	0.002	0.2%
Our Lady of Angels Cemetery SINC	1.74	1	0.001	0.1%
Rainham Marshes LNR	2.08	1	0.005	0.5%
Crossness LNR	2.01	1	0.002	0.2%
Lesnes Abbey Woods LNR	2.01	1	0.002	0.2%
Lesnes Abbey Woods AW	2.01	1	0.002	0.2%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

Table F.8: Scenario 2: Local Sites – Predicted PCs for NH_3 and % of Critical Level

Local Designations	Background NH_3 ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
Lesnes Abbey Woods and Bostall Woods SINC	2.01	1	0.002	0.2%
River Thames and tidal tributaries SINC	1.74	1	0.04	4.4%
Wennington, Aveley and Rainham Marshes SINC	2.08	1	0.01	0.6%

Local Designations	Background NH_3 ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
Erith Marshes SINC	2.01	1	0.002	0.2%
Belvedere Dykes SINC	1.74	1	0.01	1.0%
Franks Park, Belvedere SINC	1.74	1	0.005	0.5%
Erith Quarry and Fraser Road SINC	1.74	1	0.003	0.3%
Hollyhill Open Space SINC	1.74	1	0.002	0.2%
Southmere Park & Yarnton Way/Viridion Way SINC	2.01	1	0.002	0.2%
St John the Baptist Churchyard, Erith SINC	1.74	1	0.01	0.8%
Streamway, Chapman's Land and Erith Cemetery SINC	2.01	1	0.002	0.2%
Our Lady of Angels Cemetery SINC	1.74	1	0.001	0.1%
Rainham Marshes LNR	2.08	1	0.005	0.5%
Crossness LNR	2.01	1	0.002	0.2%
Lesnes Abbey Woods LNR	2.01	1	0.002	0.2%
Lesnes Abbey Woods AW	2.01	1	0.002	0.2%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

F.4 Air Dispersion Modelling Results for SO_2

F.4.1 SO_2 - National Sites

Table F.9 and Table F.10 detail the results of the modelling for SO_2 for Scenario 1 and Scenario 2 respectively.

Table F.9: Scenario 1: SSSIs – Predicted PCs for SO_2 and % of Critical Level

SSSI	Background SO_2 ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level	PEC as % of Critical Level
Inner Thames Marshes SSSI	2.29	20	1.76	8.8%	20%
Ingrebourne Marshes SSSI	2.29	20	0.28	1.4%	13%
Oxleas Woodlands SSSI	1.67	10	0.13	1.3%	18%
West Thurrock Lagoon & Marshes SSSI	2.85	20	0.08	0.4%	-
Darenth Wood SSSI	1.39	10	0.05	0.5%	-
Ruxley Gravel Pits SSSI	1.62	10	0.07	0.7%	-
Grays Thurrock Chalk Pit SSSI	1.96	10	0.04	0.4%	-

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

Table F.10: Scenario 2: SSSIs – Predicted PCs for SO_2 and % of Critical Level

SSSI	Background SO_2 ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level	PEC as % of Critical Level
Inner Thames Marshes SSSI	2.29	20	0.08	0.4%	-
Ingrebourne Marshes SSSI	2.29	20	0.02	0.1%	-
Oxleas Woodlands SSSI	1.67	10	0.01	0.1%	-
West Thurrock Lagoon & Marshes SSSI	2.85	20	0.004	0.02%	-
Darenth Wood SSSI	1.39	10	0.003	0.03%	-
Ruxley Gravel Pits SSSI	1.62	10	0.004	0.04%	-
Grays Thurrock Chalk Pit SSSI	1.96	10	0.002	0.02%	-

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

F.4.2 SO_2 – Local Sites

Table F.11 details the results for SO_2 for Scenario 1 and **Table F.12** sets out the results for Scenario 2.

Table F.11: Scenario 1: Local Sites – Predicted PCs for SO_2 and % of Critical Level

Local Designations	Background SO_2 ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level	PEC as % of Critical Level
Lesnes Abbey Woods and Bostall Woods SINC	1.84	10	0.67	6.7%	-
River Thames and tidal tributaries SINC	1.99	10	32.72	327.2%	347%
Wennington, Aveley and Rainham Marshes SINC	2.29	10	1.76	17.6%	-
Erith Marshes SINC	1.84	10	0.86	8.6%	-
Belvedere Dykes SINC	1.99	10	7.45	74.5%	-
Franks Park, Belvedere SINC	1.99	10	2.59	25.9%	-
Erith Quarry and Fraser Road SINC	1.99	10	1.17	11.7%	-
Hollyhill Open Space SINC	1.99	10	1.00	10.0%	-
Southmere Park & Yarnton Way/Viridion Way SINC	1.84	10	0.97	9.7%	-
St John the Baptist Churchyard, Erith SINC	1.99	10	3.82	38.2%	-
Streamway, Chapman's Land and Erith Cemetery SINC	1.84	10	0.78	7.8%	-
Our Lady of Angels Cemetery SINC	1.99	10	0.55	5.5%	-
Rainham Marshes LNR	2.29	10	1.81	18.1%	-
Crossness LNR	1.84	10	0.77	7.7%	-
Lesnes Abbey Woods LNR	1.84	10	0.73	7.3%	-
Lesnes Abbey Woods AW	1.84	10	0.70	7.0%	-

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

Table F.12: Scenario 2: Local Sites – Predicted PCs for SO_2 and % of Critical Level

Local Designations	Background SO_2 ($\mu g\ m^{-3}$)	Critical Level ($\mu g\ m^{-3}$)	PC ($\mu g\ m^{-3}$)	PC as % of Critical Level
Lesnes Abbey Woods and Bostall Woods SINC	1.84	10	0.03	0.3%
River Thames and tidal tributaries SINC	1.99	10	0.80	8.0%
Wennington, Aveley and Rainham Marshes SINC	2.29	10	0.08	0.8%
Erith Marshes SINC	1.84	10	0.04	0.4%

Local Designations	Background SO_2 (µg m^{-3})	Critical Level (µg m^{-3})	PC (µg m^{-3})	PC as % of Critical Level
Belvedere Dykes SINC	1.99	10	0.09	0.9%
Franks Park, Belvedere SINC	1.99	10	0.07	0.7%
Erith Quarry and Fraser Road SINC	1.99	10	0.04	0.4%
Hollyhill Open Space SINC	1.99	10	0.03	0.3%
Southmere Park & Yarnton Way/Viridion Way SINC	1.84	10	0.04	0.4%
St John the Baptist Churchyard, Erith SINC	1.99	10	0.13	1.3%
Streamway, Chapman's Land and Erith Cemetery SINC	1.84	10	0.03	0.3%
Our Lady of Angels Cemetery SINC	1.99	10	0.02	0.2%
Rainham Marshes LNR	2.29	10	0.08	0.8%
Crossness LNR	1.84	10	0.04	0.4%
Lesnes Abbey Woods LNR	1.84	10	0.04	0.4%
Lesnes Abbey Woods AW	1.84	10	0.03	0.3%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

F.5 Air Dispersion Modelling Results for Nitrogen Deposition

F.5.1 Nitrogen Deposition - National Sites

Table F.13 and Table F.14 detail the results of the modelling for nutrient nitrogen deposition for Scenario 1 and Scenario 2 respectively. Results use the critical load for the most sensitive habitat at any designated site in the UK (Step 1) for all sites except Inner Thames Marshes SSSI (where the PC was exceeded for Step 1, so Step 2 was applied i.e. using the critical load for the most sensitive habitat type for that site).

Table F.13: Scenario 1: SSSIs – Predicted PCs for Deposited Nitrogen and % of Critical Load

SSSI	Qualifying Interest Feature	Background Nitrogen Deposition (kg N/ha/yr)	Critical Load (kg N/ha/yr) (min)	PC (kg N /ha/yr)	PC as % of CL (min)
Inner Thames Marshes SSSI	Littoral sediment (saltmarshes) supporting teal (*Anas crecca*)	17.3	20	0.05	0.2%
Ingrebourne Marshes SSSI	Woodland	3	3	0.01	0.5%
Oxleas Woodlands SSSI	Woodland	3	3	0.01	0.2%
West Thurrock Lagoon & Marshes SSSI	Woodland	3	3	0.004	0.1%
Darenth Wood SSSI	Woodland	3	3	0.002	0.1%
Ruxley Gravel Pits SSSI	Woodland	3	3	0.002	0.1%
Grays Thurrock Chalk Pit SSSI	Woodland	3	3	0.002	0.1%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

Table F.14: Scenario 2: SSSIs – Predicted PCs for Deposited Nitrogen and % of Critical Load

SSSI	Qualifying Interest Feature	Background Nitrogen Deposition (kg N/ha/yr)	Critical Load (kg N/ha/yr) (min)	PC (kg N /ha/yr)	PC as % of CL (min)
Inner Thames Marshes SSSI	Littoral sediment (saltmarshes) supporting teal (*Anas crecca*)	17.3	20	0.05	0.2%
Ingrebourne Marshes SSSI	Woodland	3	3	0.01	0.5%
Oxleas Woodlands SSSI	Woodland	3	3	0.01	0.2%
West Thurrock Lagoon & Marshes SSSI	Woodland	3	3	0.004	0.1%

Darenth Wood SSSI	Woodland	3	3	0.002	0.1%
Ruxley Gravel Pits SSSI	Woodland	3	3	0.002	0.1%
Grays Thurrock Chalk Pit SSSI	Woodland	3	3	0.002	0.1%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

F.5.2 Nitrogen Deposition – Local Sites

Table F.15 details the modelling results for nitrogen deposition for Scenario 1 and **Table F.16** sets out the results for Scenario 2. Results are based on the critical load for the most sensitive habitat at any designated site in the UK.

Table F.15: Scenario 1: Local Sites – Predicted PCs for Deposited Nitrogen and % of Critical Loa

Local Designations	Qualifying Interest Feature	Background Nitrogen Deposition (kg N /ha /yr)	Critical Load (kg N /ha/yr) (min)	PC (kg N /ha/yr)	PC as % of CL (min)
Lesnes Abbey Woods and Bostall Woods SINC	Woodland	3	3	0.03	1.0%
River Thames and tidal tributaries SINC	Woodland	3	3	0.48	16.0%
Wennington, Aveley and Rainham Marshes SINC	Woodland	3	3	0.08	2.7%
Erith Marshes SINC	Woodland	3	3	0.03	1.0%
Belvedere Dykes SINC	Woodland	3	3	0.10	3.3%
Franks Park, Belvedere SINC	Woodland	3	3	0.06	1.9%
Erith Quarry and Fraser Road SINC	Woodland	3	3	0.03	1.0%
Hollyhill Open Space SINC	Woodland	3	3	0.03	0.9%
Southmere Park & Yarnton Way/Viridion Way SINC	Woodland	3	3	0.03	1.1%
St John the Baptist Churchyard, Erith SINC	Woodland	3	3	0.08	2.8%
Streamway, Chapman's Land and Erith Cemetery SINC	Woodland	3	3	0.02	0.7%
Our Lady of Angels Cemetery SINC	Woodland	3	3	0.02	0.6%
Rainham Marshes LNR	Woodland	3	3	0.07	2.4%
Crossness LNR	Woodland	3	3	0.03	0.9%
Lesnes Abbey Woods LNR	Woodland	3	3	0.03	1.1%
Lesnes Abbey Woods AW	Woodland	3	3	0.03	1.0%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

Table F.16: Scenario 2: Local Sites – Predicted PCs for Deposited Nitrogen and % of Critical Load

Local Designations	Qualifying Interest Feature	Background Nitrogen Deposition (kg N /ha/yr)	Critical Load (kg N /ha/yr) (min)	PC (kg N /ha/yr)	PC as % of CL (min)
Lesnes Abbey Woods and Bostall Woods SINC	Woodland	3	3	0.03	1.0%
River Thames and tidal tributaries SINC	Woodland	3	3	0.49	16.2%
Wennington, Aveley and Rainham Marshes SINC	Woodland	3	3	0.08	2.8%
Erith Marshes SINC	Woodland	3	3	0.03	1.1%
Belvedere Dykes SINC	Woodland	3	3	0.10	3.3%
Franks Park, Belvedere SINC	Woodland	3	3	0.06	1.9%
Erith Quarry and Fraser Road SINC	Woodland	3	3	0.03	1.1%
Hollyhill Open Space SINC	Woodland	3	3	0.03	0.9%
Southmere Park & Yarnton Way/Viridion Way SINC	Woodland	3	3	0.04	1.2%
St John the Baptist Churchyard, Erith SINC	Woodland	3	3	0.09	2.9%
Streamway, Chapman's Land and Erith Cemetery SINC	Woodland	3	3	0.02	0.7%
Our Lady of Angels Cemetery SINC	Woodland	3	3	0.02	0.6%
Rainham Marshes LNR	Woodland	3	3	0.07	2.4%
Crossness LNR	Woodland	3	3	0.03	0.9%
Lesnes Abbey Woods LNR	Woodland	3	3	0.03	1.1%
Lesnes Abbey Woods AW	Woodland	3	3	0.03	1.0%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

F.6 Air Dispersion Modelling Results for Acid Deposition

F.6.1 Acid Deposition - National Sites

Table F.17 and Table F.18 detail the modelling results for acid deposition for Scenario 1 and Scenario 2 respectively.

For both scenarios, all results use the critical load for the most sensitive habitat type for that site (Step 2).

Table F.17: Scenario 1: SSSIs – Predicted PCs for Acid Deposition and % of Critical Load

SSSI	Qualifying Interest Feature	Critical Load (keq ha^{-1} yr^{-1}) (min)			Back-ground S (keq ha^{-1} yr^{-1})	Back-ground N (keq ha^{-1} yr^{-1})	S PC total (keq ha^{-1} yr^{-1})	N PC total (keq ha^{-1} yr^{-1})	PC as % of Critical Load (min)	PEC as % of Critical Load (min)
		CL max S	CL min N	CL max N						
Inner Thames Marshes SSSI	Neutral grassland - lowland	4.00	1.07	5.07	0.21	0.75	0.21	0.003	5.2%	10%
Ingrebourne Marshes SSSI	Neutral grassland - lowland	4.00	1.07	5.07	0.19	1.30	0.03	0.001	0.7%	-
Oxleas Woodlands SSSI	Broadleaved, mixed and yew woodland	2.36	0.36	2.72	0.21	2.32	0.03	0.0004	1.2%	94%
West Thurrock Lagoon & Marshes SSSI	Acid grassland	4.14	0.44	4.58	0.18	1.04	0.01	0.0002	0.2%	-
Darenth Wood SSSI	Unmanaged broadleaved/ / coniferous woodland	1.20	0.14	1.34	0.20	2.08	0.01	0.0001	0.9%	-
Ruxley Gravel Pits SSSI	Broadleaved, mixed and yew woodland	1.72	0.14	1.86	0.19	2.18	0.02	0.0002	0.9%	-
Grays Thurrock Chalk Pit SSSI	Unmanaged broadleaved/ / coniferous woodland	1.60	0.14	1.74	0.24	2.05	0.01	0.0001	0.5%	-

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

Table F.18: Scenario 2: SSSIs – Predicted PCs for Acid Deposition and % of Critical Load

SSSI	Qualifying Interest Feature	Critical Load (keq ha^{-1} yr^{-1}) (min)			Back-ground S (keq ha^{-1} yr^{-1})	Back-ground N (keq ha^{-1} yr^{-1})	S PC total (keq ha^{-1} yr^{-1})	N PC total (keq ha^{-1} yr^{-1})	PC as % of Critical Load (min)	PEC as % of Critical Load (min)
		CL max S	CL min N	CL max N						
Inner Thames Marshes SSSI	Neutral grassland - lowland	4.00	1.07	5.07	0.21	0.75	0.01	0.003	0.3%	6%
Ingrebourne Marshes SSSI	Neutral grassland - lowland	4.00	1.07	5.07	0.19	1.30	0.002	0.0006	0.05%	29%
Oxleas Woodlands SSSI	Broadleaved, mixed and yew woodland	2.36	0.36	2.72	0.21	2.32	0.002	0.0004	0.1%	93%
West Thurrock Lagoon & Marshes SSSI	Acid grassland	4.14	0.44	4.58	0.18	1.04	0.0005	0.0002	0.01%	27%
Darenth Wood SSSI	Unmanaged broadleaved/ / coniferous woodland	1.20	0.14	1.34	0.20	2.08	0.0006	0.0001	0.06%	170%
Ruxley Gravel Pits SSSI	Broadleaved, mixed and yew woodland	1.72	0.14	1.86	0.19	2.18	0.0009	0.0002	0.06%	127%
Grays Thurrock Chalk Pit SSSI	Unmanaged broadleaved/ / coniferous woodland	1.60	0.14	1.74	0.24	2.05	0.0005	0.0001	0.03%	132%

Impacts are not considered significant when:

- PC < 1% of CL (long) and / or PC <10% of CL (short); or
- PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL

F.6.2 Acid Deposition – Local Sites

Table F.19 details the modelling results for acid deposition for Scenario 1 and **Table F.20** sets out the results for Scenario 2.

For both scenarios 1, results use the critical load for the most sensitive habitat at any designated site in the UK (Step 1) for all sites except for four SINCs where the PC was exceeded for Step 1, so Step 2 was applied (i.e. using the critical load for the most sensitive habitat type for that site). These SINCs are:

- River Thames and tidal tributaries SINC;
- Belvedere Dykes SINC;
- Franks Park, Belvedere SINC; and
- St John the Baptist Churchyard, Erith SINC.

Table F.19: Scenario 1: Local Sites – Predicted PCs for Acid Deposition and % of Critical Load

Local Designations	Qualifying Interest Feature	Critical Load (keq ha^{-1} yr^{-1}) (min)			Back-ground S (keq ha^{-1} yr^{-1})	Back-ground N (keq ha^{-1} yr^{-1})	S PC total (keq ha^{-1} yr^{-1})	N PC total (keq ha^{-1} yr^{-1})	PC as % of Critical Load (min)
		CL max S	CL min N	CL max N					
Lesnes Abbey Woods and Bostall Woods SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	35%
River Thames and tidal tributaries SINC	Coastal saltmarsh	4	4	4	0.19	1.12	3.9	0.02	97%
Wennington, Aveley and Rainham Marshes SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.4	0.01	91%
Erith Marshes SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	45%
Belvedere Dykes SINC	Broadleaved, mixed and yew woodland	4.15	0.71	4.86	0.19	1.12	0.9	0.004	18%
Franks Park, Belvedere SINC	Broadleaved, mixed and yew woodland	1.10	0.14	1.24	0.24	2.02	0.6	0.004	50%
Erith Quarry and Fraser Road SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.3	0.002	60%

Local Designations	Qualifying Interest Feature	Critical Load (keq ha^{-1} yr^{-1}) (min)			Back-ground S (keq ha^{-1} yr^{-1})	Back-ground N (keq ha^{-1} yr^{-1})	S PC total (keq ha^{-1} yr^{-1})	N PC total (keq ha^{-1} yr^{-1})	PC as % of Critical Load (min)
		CL max S	CL min N	CL max N					
Hollyhill Open Space SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	52%
Southmere Park & Yarnton Way/Viridion Way SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	50%
St John the Baptist Churchyard, Erith SINC	Acid grassland	0.50	0.22	0.72	0.19	1.12	0.5	0.004	63%
Streamway, Chapman's Land and Erith Cemetery SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	40%
Our Lady of Angels Cemetery SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.1	0.001	28%
Rainham Marshes LNR	Woodland	0.14	0.32	0.46	0.14	0.32	0.4	0.01	94%
Crossness LNR	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	40%
Lesnes Abbey Woods LNR	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	38%
Lesnes Abbey Woods AW	Woodland	0.14	0.32	0.46	0.14	0.32	0.2	0.002	36%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

Table F.20: Scenario 2: Local Sites – Predicted PCs for Acid Deposition and % of Critical Load

Local Designations	Qualifying Interest Feature	Critical Load (keq ha^{-1} yr^{-1}) (min)			Back-ground S (keq ha^{-1} yr^{-1})	Back-ground N (keq ha^{-1} yr^{-1})	S PC total (keq ha^{-1} yr^{-1})	N PC total (keq ha^{-1} yr^{-1})	PC as % of Critical Load (min)
		CL max S	CL min N	CL max N					
Lesnes Abbey Woods and Bostall Woods SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	2%
River Thames and tidal tributaries SINC	Coastal saltmarsh	4	4	4	0.19	1.12	0.09	0.02	2%
Wennington, Aveley and Rainham Marshes SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.02	0.006	6%
Erith Marshes SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	3%
Belvedere Dykes SINC	Broadleaved, mixed and yew woodland	4.15	0.71	4.86	0.19	1.12	0.01	0.004	0.3%
Franks Park, Belvedere SINC	Broadleaved, mixed and yew woodland	1.10	0.14	1.24	0.24	2.02	0.02	0.004	2%
Erith Quarry and Fraser Road SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	3%
Hollyhill Open Space SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	2%
Southmere Park & Yarnton Way/Viridion Way SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	2%
St John the Baptist Churchyard, Erith SINC	Acid grassland	0.50	0.22	0.72	0.19	1.12	0.02	0.004	3%
Streamway, Chapman's Land and Erith Cemetery SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	2%
Our Lady of Angels Cemetery SINC	Woodland	0.14	0.32	0.46	0.14	0.32	0.004	0.001	1%
Rainham Marshes LNR	Woodland	0.14	0.32	0.46	0.14	0.32	0.02	0.005	5%

Local Designations	Qualifying Interest Feature	Critical Load (keq ha^{-1} yr^{-1}) (min)			Back-ground S (keq ha^{-1} yr^{-1})	Back-ground N (keq ha^{-1} yr^{-1})	S PC total (keq ha^{-1} yr^{-1})	N PC total (keq ha^{-1} yr^{-1})	PC as % of Critical Load (min)
		CL max S	CL min N	CL max N					
Crossness LNR	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	2%
Lesnes Abbey Woods LNR	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	2%
Lesnes Abbey Woods AW	Woodland	0.14	0.32	0.46	0.14	0.32	0.01	0.002	2%

Impacts are not considered significant when:

- PC < 100% of CL (long and short term)

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SITE LEVEL AUDIT REPORT: ADM Erith SITE AUDIT DATE 11/09/19

1 Contact detail

References Issues

		Guidance		
a	Site name	Some detail is repeated so that this section can be printed as a separate document if necessary	Erith (ADM Erith Ltd - Oilseeds)	
b	Site address		ADM Erith Ltd, Church Manorway	
c	Contact name		Renos Kontiatis	
d	Date(s) of visit		11/09/2019	

2 Executive summary

		Guidance		
a	Rank all energy efficiency improvement opportunities identified by the criteria agreed with the participant, and suggest a feasible programme of implementation according to circumstances.	Do not include too much detail at this stage	Ranking of opportunities is in order of projects simple payback. Equal ranked opportunities in terms of payback are listed in order of potential savings, greatest savings first. 1 Tank Agitation CTE 2 Take one flaker roll out of use for a day; procedure needs to be changed 3 Machinery belts 4 Air Compressor Pressure Reduction 5 Flaking Roll Aspirator Fan 6 OAS cooling pump 7 Put in-service Extraction Economizer 8 Refinery Condensate Return to CHP 9 Plant Lighting 10 Plant thermal insulation 11 Air Compressor Leak Reduction Implementation is planned as part of site projects organisation in line with available resources.	

3 Background information

	Guidance		
a	Provide general information regarding the site, e.g. site operations, location, age, operating hours, number of employees. Make a record of a unit of scale or metric which can be used to calculate benchmarks (e.g. floor area, number of buildings, production units, raw material input).Outline information on the current monitoring methods in place.	Production of refined vegetable oil from rapeseed. Seed delivered by truck or vessel. Expelling (crush) and (solvent) extraction processes to obtain crude oil. Refinery produces finished product. By product of meal (cattlefeed) which is seed residues. Highly energy intensive. CHP comprising 3 x 5.5MWe GTs with WHBs provide majority of electricity and heat for site. Some electricity export to grid. Heat and electricity export to Edible Oils (packing) not included as covered by Princes Foods ESOS. Details are available in CHPQA support files if required. In January 2019 a team of experienced employees, ADM US energy experts and consultants carried out an "Energy Treasure Hunt" over one week from 28/01/19 - 01/02/19 with the objective of identifying significant energy savings. The result was a series of opportunities described and costed in a presentation made to the site management team. The opportunities are listed and tracked in an excel file named "Energy treasure Hunt Action List update". For ESOS CP2 this initiative is used as the ESOS energy report. Apart from completed or cancelled projects the opportunities described in the Treasure Hunt are repeated for ESOS. A new smaller high pressure refinery boiler was installed in Oct 2018. Lower gas consumption through this boiler has occurred as a result.	

4 Energy audit description

	Guidance		

a	Describe the scope, aim, thoroughness, timeframe and boundaries of the audit undertaken	The scope of the audit was all gas and mains electricity used at Erith, including energy outputs from the CHP. The approach was a combined effort between local plant experts and energy experts from the wider ADM community as well as two specialist energy consultants. The time period assessed was the 12 months to 31/12/2018.	

5 Energy audit methodology

	Guidance		
a	Provide a brief description of the methodology used, including a statement about which data was used, and whether it was measured or estimated. Comment on the consistency and quality of data; the rationale for the measurements and how they contribute to analysis and; the difficulties encountered in data collection and field work. Refer to key data used and calibration certificates where applicable.	The methodology is described in the reference material.	

6 Analysis of energy consumption

	Guidance		
a	Describe energy use at the site including energy use profile and record of total and significant energy use	> 99% of energy considered in the audit originates from natural gas with just 0.2% grid electricity imported. See energy use profiles tab in this report.The initiatives are aimed at either reducing gas consumption directly, e.g. by improving thermal insulation around steam pipes, or by reducing power electrical power consumption which would allow greater electricity exports and resulting revenue.The site participates in EU ETS, CCA and CHPQA. The CCA has a relative target vs rapeseed crush tonnes. There is a significant degree of cross comparison of plant performances within ADM Europe and worldwide including comparisons of energy consumption per tonnes processed. These	

		comparisons have not been repeated in this ESOS audit report.	

7 Energy saving opportunities

	Guidance		
a	Rank the proposed recommendations by cost-effectiveness. Explain the criteria used for ranking the energy saving opportunities identified. Explain all assumptions used in calculating savings and provide a statement on the limits to the accuracy of estimated costs and savings.	Energy savings have been ranked according to financial savings estimated/simple payback. Equal ranked opportunities in terms of payback are listed in order of potential savings, greatest savings first. Payback years is listed as a principle measure of project effectiveness in the company project tracking tool. In addition the IRR has been calculated for each project based on an estimated lifetime for each project.	

8 Implementation of energy saving opportunities

	Guidance		
a	Provide details of the identified opportunities with a plan and potential timeline for implementation. Disclose any information concerning relevant grants and subsidies, as well as potential interactions with other proposed recommendations. Suggest any measurement and verification methods which could be used to track the effectiveness of the proposed recommendations	The energy saving opportunities are shown above and implementation is planned as part of the Site projects organisation in line with available resources.	

9 Conclusions

	Guidance		
a	A summary of the findings and the next steps for implementation of proposed recommendations	The ranking of costed savings are shown above in order of financial payback years. Equal ranked opportunities in terms of payback are listed in order of potential savings, greatest savings first. Implementation is planned as part of site projects organisation in line with available resources.	

UNDERLYING CLIMATE CHANGE AGREEMENT FOR THE FOOD AND DRINK SECTOR
Agreement Dated: 19 December 2020
TU Identifier: FDF1/T00017

THIS AGREEMENT is made on the 19th December 2020

BETWEEN:

(1) the Environment Agency ("the Administrator"); and

(2) the operator set out in Schedule 2 ("the Operator")

RECITALS

(A) Section 30 of and Schedule 6 to the Finance Act 2000 ("the Act") make provision for a tax known as the climate change levy ("the Levy"). The Levy is charged on the supply of taxable commodities as defined in paragraph 3 of Schedule 6 to the Finance Act 2000.

(B) Paragraphs 42(1)(ba) and 42(1)(c) of Schedule 6 to the Act provide that the amount payable by way of the Levy shall be discounted from the full rate where the supply is a reduced-rate supply. A reduced-rate supply is a taxable supply supplied to a facility specified in a certificate given by the Administrator to the Commissioners for Her Majesty's Revenue and Customs as a facility which is covered by a climate change agreement for a period specified in the certificate in accordance with paragraphs 42 to 52F of Schedule 6 to the Act.

(C) A climate change agreement is defined in paragraph 46 of Schedule 6 to the Act. It may consist of a combination of agreements that falls within paragraph 48. A combination of agreements falls within paragraph 48 if a number of conditions are satisfied. The first condition is that the combination of agreements is a combination of an umbrella agreement and an agreement that, in relation to the umbrella agreement, is an underlying agreement.

(D) This agreement is an underlying agreement in relation to an umbrella agreement, entered into for the purposes of the reduced rate of Levy. It is not intended to give rise to contractual obligations between the parties.

(E) The facility or facilities set out in Schedule 4 to this agreement are a facility or facilities to which an agreement applies.

(F) The Operator is a representative of each facility to which this agreement applies, as defined in paragraph 47(2) of Schedule 6.

AGREED TERMS

IT IS AGREED as follows:

1. INTERPRETATION

1.1 In this Agreement, unless the context otherwise requires:

"account" means the account in the Register of a sector association or an operator;

"agreement" means an umbrella agreement or an underlying agreement;

"amendments window" means the period from 1st July 2021 to 30th September 2021 where the Administrator can vary underlying agreements in accordance with the amendments provided for in the technical annex;

"base year", for a target period, means—

a) for a target unit which includes a greenfield facility, the 12 month period starting on the date of an underlying agreement which provides for that target period;

b) for a target unit which does not include a greenfield facility, a 12 month period which—

i) ends before the date of an underlying agreement which provides for that target period or before the date an underlying agreement is first varied to provide for that target period; and

ii) is agreed between an operator and the administrator before they enter into the underlying agreement or before the underlying agreement is first varied to provide for that target period;

"buy-out fee" means the fee calculated in accordance with Rule 7;

"certification period" means, any of the following periods:

(a) 1st April 2013 to 30th June 2015;

(b) 1st July 2015 to 30th June 2017;

(c) 1st July 2017 to 30th June 2019;

(d) 1st July 2019 to 30th June 2021;

(e) 1st July 2021 to 30th June 2023; or

(f) 1st July 2023 to 31st March 2025.

"charges" means charges due to the Administrator under the charging scheme;

"charging scheme" means the Climate Change Agreements Charges Scheme 2012 made by the Administrator or any replacement or revision of that charging scheme;

"emissions" means the total emissions in tCO_2 equivalent for a target period;

"facility" means a facility within the meaning of paragraph 50(2) to (6) of Schedule 6 to the Act;

"facility number" means the unique identification number of a facility set out in schedule 6 of this Agreement;

"greenfield facility" means a facility which started to carry out the process by virtue of which it is a facility within the meaning of paragraph 50 of Schedule 6 during the 12 month period ending on the date the operator applies for the facility to be covered by an agreement;

"Novem ratio target" has the meaning set out in the technical annex;

"operator" means, as the context requires, either:

a) the party to this Agreement other than the Administrator; or

b) a party to an underlying agreement other than the Administrator;

"personal information" means:

a) the address of the registered office of the sector association or operator;

b) the name, address and email address of:

i) in the case of a sector association, a person who can be contacted in respect of the sector association;

ii) in the case of an Operator, the responsible person; and

c) the name, address and email address of a person who can be contacted in respect of the facility or each facility covered by an agreement;

"the Register" means the electronic system established and operated by the Administrator for the administration of agreements;

"the Regulations" means the Climate Change Agreements (Administration) Regulations 2012 S.I. 2012/1976, as amended by S.I. 2013/508, S.I. 2016/1189 and S.I. 2020/958;

"responsible person" means an individual who is legally authorised by the Operator to enter as the Operator's agent into an underlying agreement, to agree any amendments to an underlying agreement, and to accept service of notices on behalf of the Operator;

"Rule or Rules" means the Rules for the Operation of Climate Change Agreements or any of them set out in Schedule 1 to this Agreement as varied from time to time;

"Schedule 6" means Schedule 6 to the Finance Act 2000;

"sector" means the sector consisting of facilities which are covered by the same umbrella agreement;

"sector association" means the sector association set out in Schedule 3;

"sector commitment" means the commitment set out in Schedule 5 of the umbrella agreement, as varied from time to time;

"surplus" means the amount by which the emissions have fallen below the target for any target period;

"target" (for a target period) means the percentage improvement in energy efficiency or carbon efficiency from the base year (for that target period) applicable to the target unit, set out in Schedule 6 to this Agreement, as varied from time to time;

"target period 1" means the target period from 1st January 2013 to 31st December 2014;

"target period 2" means the target period from 1st January 2015 to 31st December 2016;

"target period 3" means the target period from 1st January 2017 to 31st December 2018;

"target period 4" means the target period from 1st January 2019 to 31st December 2020;

"target period 5" means the target period from 1st January 2021 to 31st December 2022;

"target unit" means the facility or group of facilities to which this Agreement applies;

"tCO_2 equivalent" means tonnes of carbon dioxide equivalent;

"technical annex" means the technical annex to this Agreement dated 18 December 2020 and published by the Administrator or the Secretary of State available via the Administrator's website;

"throughput" means the measure of production, or factor related to production, used to determine the relationship between the amount of energy used by the target unit and the levels of activity of the target unit, as set out in Schedule 6 of this agreement;

"the Tribunal" means the First-tier Tribunal established under the Tribunal Courts and Enforcement Act 2007[1];

"umbrella agreement" means an agreement that is an umbrella agreement for the purposes of paragraph 48 of Schedule 6 to the Act;

"underlying agreement" means, as the context requires, either:

a) this Agreement; or

b) an agreement that is an underlying agreement for the purposes of paragraph 48 of Schedule 6 to the Act.

1.2 Other words and expressions used in this Agreement have the same meaning as they bear in Schedule 6 to the Finance Act 2000 or the Regulations.

2. FACILITIES TO WHICH THIS AGREEMENT APPLIES

2.1 This Agreement applies to the facility or facilities set out in Schedule 5 to this Agreement which carry out some or all of the activities set out in Schedule 4 to this Agreement.

3. TARGET

3.1 The target is set out in Schedule 6 to this Agreement, as varied from time to time.

3.2 Whether the target has been met must be determined in accordance with Rule 6.

3.3 N/A.

3.4 The target may also be varied in accordance with Rules 6, 9, 10 and 11.

3.5 The procedure set out in Rule 12 will be used where a sector commitment for target period 5 is to be added.

[1] Appeals are assigned to the General Regulatory Chamber of the First-tier Tribunal by virtue of article 3(a) of the First-tier Tribunal and Upper Tribunal (Chambers) Order 2010 (S.I. 2010/2655). The Tribunal Procedure (First-tier Tribunal) (General Regulatory Chamber) Rules 2009 (S.I. 2009/1976) sets out procedural rules relating to such appeals.

4. THE RULES

4.1 Schedule 1 to this Agreement which sets out the Rules for the operation of Climate Change Agreements has effect.

4.2 The Operator agrees to comply with the Rules.

5. DURATION AND TERMINATION OF THIS AGREEMENT

5.1 Subject to clause 5.2 below, this Agreement takes effect on 1st April 2013 or, if later, the date on which this Agreement is first activated by the Administrator, and ends on 31st March 2025.

5.2 This Agreement may be terminated before 31st March 2025:

5.2.1 at any time by a notice served by the Operator giving at least 20 working days notice served on the Administrator; or

5.2.2 in accordance with the Regulations.

5.3 Any variation to this Agreement made under regulation 14A of the Regulations in respect of target period 5 takes effect on 1st January 2021 or, if later, the date on which the variation is activated by the Administrator.

5.4 Any variation made to this Agreement to provide a value for the target period 5 target takes effect on the date the Administrator activates the variation to this Agreement.

6. VARIATION OF AGREEMENT

6.1 Subject to clauses 6.2 and 6.3 below, this Agreement may be varied at any time if agreed between the Administrator and the Operator.

6.2 The facilities to which this Agreement applies may be varied in accordance with Rules 9 and 10.

6.3 Under the power in regulation 14A of the Regulations, this Agreement may be varied by the Administrator to take account of changes in the terms specified by the Regulations from time to time as terms which must be included in Agreements.

7. AUTHORITY

7.1 The Operator warrants that it has the power to enter into this Agreement and is authorised and has obtained all necessary approvals to enter into this Agreement on behalf of the included facilities and the responsible person warrants that he or she is authorised to sign this Agreement on behalf of the operator.

Signed on behalf of
the Environment Agency

Karl Sydney
Operations Manager (Energy Efficiency)

Signed by the responsible person on behalf of
the Operator

……

Vadym Fushtey
vadim.fushtey@adm.com

SCHEDULE 1

RULES FOR THE OPERATION OF CLIMATE CHANGE AGREEMENTS

1. OBLIGATIONS OF A SECTOR ASSOCIATION AND OF AN OPERATOR

1.1 An Operator and a Sector Association must:

1.1.1 supply such information to the Administrator as the Administrator may request in connection with an agreement, by the date specified in the request;

1.1.2 notify the Administrator of any changes to its personal information within 20 working days of the change;

1.1.3 co-operate with any person appointed by the Administrator to undertake an independent audit of information provided to the Administrator; and

1.1.4 comply with the provisions of the charging scheme. If a charge remains unpaid after the date on which it is due, it may be recovered by the Administrator as a civil debt.

2. OBLIGATIONS OF A SECTOR ASSOCIATION

2.1 Following the setting of the sector commitment by the Secretary of State or following a variation in respect of a new sector commitment for target period 5 under Rule 12, a Sector Association must distribute the sector commitment between each target unit under the umbrella agreement.

3. OBLIGATIONS OF AN OPERATOR

3.1 An Operator must:

3.1.1 notify the Administrator and the Sector Association within 20 working days of the date when the Operator has reason to believe that a facility covered by an underlying agreement may not be eligible for inclusion in the underlying agreement;

3.1.2 notify the Administrator within 20 working days of becoming aware of any structural change or other change set out in the technical annex which may give rise to a variation to the target in accordance with Rule 11;

3.1.3 notify the Administrator within 20 working days of discovering any error in the data provided to the Administrator for the base year;

3.1.4 provide to the Administrator on or before 1st May following the end of a target period such information as has been requested by the Administrator in order to determine whether progress towards meeting the target is, or is likely to be, taken to be satisfactory;

3.1.5 provide any other information requested at any time by the Administrator by the date specified in the request to enable the Administrator to determine that:

(a) the target has been met; or

(b) the Operator is complying with the terms of the underlying agreement;

3.1.6 notify the Administrator within 20 working days of the Operator or a facility in a target unit becoming a firm in difficulty, within the meaning of the European Commission Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty (2014/C 249/01);

3.1.7 provide the responsible person with full authority to carry out his or her functions, including authorisation to accept on behalf of the Operator the service of any notice; and

3.1.8 provide a current UK postal address and an operational email address of the responsible person for service of any notice.

3.2 If the Administrator enters into an underlying agreement before a target has been agreed, conditional upon the Operator providing sufficient information within a specified period in order to set the target for the target unit, the Operator must supply any data requested by the Administrator within the period specified by the Administrator on energy use and throughput of the target unit.

4. OPERATION OF THE REGISTER

4.1 Subject to Rules 4.2 and 4.3, to the extent possible, a Sector Association and an Operator must communicate with the Administrator using the Register.

4.2 Until a Sector Association and an Operator have been notified by the Administrator that the Operator is able to operate an account on its own behalf, an Operator must provide all information to the Sector Association to comply with the obligations of an Operator under an underlying agreement. The Sector Association must then operate the Register on behalf of the Operator to provide the information to the Administrator.

4.3 After receiving notification from the Administrator that an Operator is able to operate an account on its own behalf, an Operator must notify the Administrator if it wishes to access its account directly to comply with its obligations under an underlying agreement. If an Operator makes such notification, the Operator must then operate the Register on its own behalf in order to comply with its obligations under an underlying agreement. If an Operator does not make such notification, the Operator must continue to provide all information to the Sector Association to comply with the obligations of an Operator under an underlying agreement and the Sector Association must continue to operate the Register on behalf of the Operator to provide information to the Administrator.

5. CERTIFICATION OF A FACILITY

5.1 The Administrator must certify that a facility is covered by an agreement from the date on which an underlying agreement takes effect to the end of the first certification period. The first certification period in respect of new agreements that take effect on or after 1st January 2021 is provided for in Rule 5A.

5.2 The Administrator must certify that a facility is covered by an agreement for any subsequent certification period other than the certification period in which the underlying agreement is first activated, where it appears to the Administrator that progress made in the immediately preceding certification period, whether under the underlying agreement or under any previous underlying agreement, towards meeting targets set for the target unit is, or is likely to be, satisfactory.

5.3 For the purposes of this Rule, progress made in the immediately preceding certification period towards meeting targets set for the target unit is, or is likely to be, satisfactory only where condition 1 and condition 2 are satisfied.

5.4 Condition 1 is that:

5.4.1 the target set for the target unit for the relevant target period is met, in accordance with Rule 6; or

5.4.2 if the target set for the target unit has not been met, the target unit has paid the buy-out fee in accordance with Rule 7.

5.5 Condition 2 is that obligations imposed under or by virtue of regulations made for the purpose of implementing the Greenhouse Gas Emissions Trading Scheme Regulations 2012, as amended from time to time, have been complied with in respect of each facility comprising the target unit.

5.6 If:

5.6.1 a target unit has failed to meet its target in accordance with Rule 6 and the Operator has failed to pay the buy-out fee in accordance with Rule 7;

5.6.2 obligations imposed under or by virtue of regulations made for the purpose of implementing the Greenhouse Gas Emissions Trading Scheme Regulations 2012, as amended from time to time, have not been complied with in respect of any facility in a target unit; or

5.6.3 the underlying agreement or umbrella agreement is terminated in accordance with Regulation 17(3) or Regulation 18,

the Administrator must not certify that the facility or facilities comprising the target unit are covered by an agreement or, where a certificate has been issued, the Administrator must vary the certificate in accordance with paragraph 45 of Schedule 6.

5.7 If:

5.7.1 a facility is not or ceases to be eligible for inclusion in an agreement; or

5.7.2 a facility is excluded from an underlying agreement under Rule 10;

the Administrator must not certify that the facility is covered by an agreement or, where a certificate has been issued, the Administrator must vary the certificate in accordance with paragraph 45 of Schedule 6.

5.8 If the information supplied to the Administrator is insufficient to determine whether:

5.8.1 the target for the target period has been met; or

5.8.2 obligations imposed under or by virtue of regulations made for the purpose of implementing the Greenhouse Gas Emissions Trading Scheme Regulations 2012, as amended from time to time, have been complied with in respect of each facility comprising the target unit;

the Administrator may refuse to certify that the facility or facilities are covered by an agreement or, where a certificate has been issued, the Administrator may vary that certificate in accordance with paragraph 45 of Schedule 6.

5.9 Subject to Rule 5.10, if the Administrator does not certify a facility or varies a certificate that has been issued, the Administrator must serve a decision notice on the Sector Association and the Operator of the facility setting out the reasons for the decision, unless a notice of termination has already been served.

5.10 The Administrator is not required to serve a decision notice where a facility has been certified under this Rule and it is subsequently discovered that the target unit for the relevant target period had not been met because of an error in the information originally supplied to the Administrator provided that:

5.10.1 the Sector Association and the Operator have satisfied the Administrator that the error was unintentional; and

5.10.2 the Operator has paid any buy-out fee in accordance with Rule 7.

5A. FIRST CERTIFICATION PERIOD

5A.1 This rule applies in respect of any new agreements first activated after the coming into force of SI 2020/958.

5A.2 The first certification period that applies to the facilities covered by this Agreement begins on the date on which the Administrator activates the Agreement and ends on 30th June 2021.

5A.3 The subsequent certification periods are:

5A.3.1 1st July 2021 to 30th June 2023;

5A.3.2 1st July 2023 to 31st March 2025.

6. MEETING THE TARGET

6.1 A target unit meets its target for the purpose of Rule 5 if it meets or exceeds the percentage improvement in energy efficiency or carbon efficiency from the base year set out in Schedule 6 to the underlying agreement.

6.2 The Administrator must determine whether the target has been met in accordance with the principles, methodologies and procedures set out in the technical annex.

6.3 An Operator must notify the Administrator on or before 31st January in the year following the end of a target period of any circumstances which may give rise to an adjustment to the target for the previous target period, as set out in the technical annex.

6.4 If an Operator makes a notification under Rule 6.3, the Administrator may adjust the previous target in accordance with the principles, methodologies and calculations set out in the technical annex and must serve a notice on the Operator, setting out:

6.4.1 whether or not it had decided to vary the target; and

6.4.2 any revised target (as varied) for the target unit.

7. BUY-OUT MECHANISM

7.1 If the administrator finds that the target unit has failed to meet its targets:

7.1.1 at any time in the period beginning with 1st May in the year following the end of a target period and ending immediately before the first day of the next certification period; or

7.1.2 at any other time,

the obligation to make progress towards meeting targets may instead be satisfied by the payment to the administrator of a fee in accordance with Rule 7.2.

7.2 If Rule 7.1 applies, the administrator must serve a notice on the Operator containing the following information:

7.2.1 that the target unit has failed to meet its target;

7.2.2 the fee to be paid, calculated in accordance with Rule 7.3 or Rule 7.4;

7.2.3 the date by which the fee must be paid, determined in accordance with Rule 7.5 or Rule 7.6;

7.2.4 to whom the fee must be paid;

7.2.5 how the fee is to be paid; and

7.2.6 that failure to pay the fee in accordance with the notice will result in the issue of a variation certificate in accordance with paragraph 45 of Schedule 6.

7.3 If Rule 7.1.1 applies, the amount of the fee is:

$$A \times (W - S)$$

Where:

(a) A is £12 where the finding is of a failure to meet a target for target period 1 or target period 2, £14 where the finding is of a failure to meet a target for target period 3 or target period 4, or £18 where the finding is of a failure to meet a target for target period 5;

(b) W in units of tCO_2 equivalent represents the amount by which the emissions for the target period exceed the target;

(c) S, for target periods 1 to 4, in units of tCO_2 equivalent represents any surplus; and

(d) S, for target period 5, is zero.

7.4 If Rule 7.1.2 applies, the amount of the fee is:

$$A \times W$$

Where:

(a) A is £12 where the finding is of a failure to meet a target for target period 1 or target period 2, £14 where the finding is of a failure to meet a target for target period 3 or target period 4, or £18 where the finding is of a failure to meet a target for target period 5;

(b) W in units of tCO_2 equivalent represents the amount by which the emissions for the target period exceed the target.

7.5 If Rule 7.1.1 applies, the fee must be paid on or before 1st July in the year in which the target unit is found to have failed to meet its targets.

7.6 If Rule 7.1.2 applies, the fee must be paid within 30 working days beginning with the date of the notice.

7.7 Payment of the fee is deemed to have been made when the person to whom the fee must be paid as specified in the notice receives full cleared funds.

7.8 For the purposes of calculating the buy-out fee under this Rule and for calculating the amount of any surplus, the Administrator must calculate the difference between the target for the target period and the actual performance achieved during the target period, where the target and the actual performance achieved are expressed in the same units, and convert any difference between the two into a quantity of carbon dioxide equivalent, expressed in units of tCO_2 equivalent, using the principles, methodologies and calculations set out in the technical annex.

8. SURPLUS

8.1 If a facility is excluded from a target unit, the Operator must determine how any surplus should be distributed between the facilities that have been excluded from the target unit and the facilities remaining in the target unit and must notify the Administrator of the redistribution within 20 working days of the facility being excluded from the target unit.

8.2 If an Operator fails to notify the Administrator of the redistribution in accordance with Rule 8.1 any surplus remains with the facilities remaining in the target unit.

8.3 If facilities join a target unit, any surplus attributable to those joining facilities may be used by the target unit as a whole.

9. VARIATION BY INCLUSION OF ADDITIONAL FACILITIES

9.1 A facility which is not already included in another umbrella agreement is eligible at any time to be considered for inclusion in an umbrella agreement where:

9.1.1 it is a facility within the meaning of paragraph 50 of Schedule 6; and

9.1.2 it is a facility undertaking the activities set out in Schedule 3 to an umbrella agreement.

9.2 A facility which is not already included in another underlying agreement is eligible at any time to be considered for inclusion in an underlying agreement where:

9.2.1 it is a facility within the meaning of paragraph 50 of Schedule 6;

9.2.2 it is a facility undertaking the activities set out in Schedule 3 to an umbrella agreement; and

9.2.3 it has the same operator as the operator of the underlying agreement under which it will be included, as set out in the technical annex.

9.3 A facility which is already included in another underlying agreement is eligible to be considered for inclusion in a different underlying agreement on or before 30 September 2013 where:

9.3.1 it is a facility within the meaning of paragraph 50 of Schedule 6;

9.3.2 it is a facility undertaking the activities set out in Schedule 3 to an umbrella agreement; and

9.3.3 it has the same operator as the operator of the underlying agreement under which it will be included, as set out in the technical annex.

9.4 A facility which is already included in another underlying agreement is eligible to be considered for inclusion in a different underlying agreement on or after 1st October 2013 where:

9.4.1 it is a facility within the meaning of paragraph 50 of Schedule 6;

9.4.2 it is a facility undertaking the activities set out in Schedule 3 to an umbrella agreement;

9.4.3 it has the same operator as the operator of the underlying agreement under which it will be included, as set out in the technical annex; and

9.4.4 there has been a change of operator of the facility, or to allow a new entrant to be grouped into an existing agreement as part of the amendments window.

9.5 An additional facility cannot be added to an umbrella agreement unless the Administrator has determined that a facility is eligible and makes a variation to the umbrella agreement to add that facility to the scheme by 31st March 2021.

9.6 The Administrator may vary the target of a target unit to take account of the inclusion of additional facilities following the principles, methodologies and calculations set out in the technical annex.

9.7 If a Sector Association wishes to add an additional facility to an umbrella agreement or an Operator wishes to add an additional facility to an underlying agreement in accordance with Rule 9.5, the Sector Association or the Operator must notify the Administrator setting out:

9.7.1 the name of the Operator of the facility;

9.7.2 the address of the facility;

9.7.3 a description of the facility;

9.7.4 such information as will enable the Administrator to reach a decision on establishing eligibility of the facility, as requested by the Administrator; and

9.7.5 such information as will enable the Administrator to determine the revised target for the target unit, as requested by the Administrator.

9.8 If the Administrator receives a notification under Rule 9.7, the Administrator must serve a notice on the Operator, copied to the Sector Association:

9.8.1 consenting to include the additional facility in an umbrella agreement or an underlying agreement and setting out whether or not it has decided to vary the target, and if so, the revised target (as varied) for the target unit;

9.8.2 refusing consent to include the facility in an umbrella agreement or an underlying agreement, giving reasons for the decision; or

9.8.3 requesting such further information as is required in order to establish eligibility of the facility or reach a decision on the target for the facility.

10. VARIATION BY EXCLUSION OF FACILITIES

10.1 If a Sector Association or an Operator wishes to exclude a facility, or part of it, from an umbrella agreement or an underlying agreement, it must notify the Administrator of the proposed exclusion, setting out:

10.1.1 the name of the Operator of the facility;

10.1.2 the facility number, or a description of the part that is to be excluded; and

10.1.3 the reason for the exclusion.

10.2 If:

10.2.1 a Sector Association or an Operator has notified the Administrator that it wishes to exclude a facility under Rule 10.1; or

10.2.2 the Administrator has terminated an agreement so far as it relates to an individual facility under Regulation 17(4),

the Administrator may vary the target to take account of the exclusion or termination following the principles, methodologies and calculations set out in the technical annex, and may request such information from the Sector Association or the Operator as it requires in order to determine the revised target.

10.3 If the Administrator decides to vary or not to vary the target under Rule 10.2, it must serve a notice on the Operator, copied to the Sector Association, setting out whether or not it has decided to vary the target, and if so the revised target (as varied) for the target unit.

11. VARIATION OF TARGETS IN OTHER CIRCUMSTANCES

11.1 The Administrator may vary the target to take account of:

11.1.1 any structural changes or other changes to the target unit which the Operator must notify to the Administrator under Rule 3.1.2;

11.1.2 any errors in the data provided to the Administrator for the base year; or

11.1.3 in respect of a target unit which has a Novem ratio target, the removal of a product produced in the target period which was produced in the base year.

following the principles, methodologies and calculations set out in the technical annex.

11.2 The Administrator may request any information of a Sector Association or an Operator as it requires in order to determine the revised target under Rule 11.1.

11.3 If the Administrator decides to vary or not to vary a target under Rule 11.1, it must serve a notice on the Operator, copied to the Sector Association, setting out:

11.3.1 whether or not it has decided to vary the target; and

11.3.2 any revised target (as varied) for the target unit.

12. ADDITION OF SECTOR COMMITMENT FOR TARGET PERIOD 5

12.1 If the Sector Association and the Secretary of State agree on a variation to the sector commitment following the agreement of a new sector commitment for target period 5, the Secretary of State may issue a direction to the Administrator that the sector commitment must be varied and then the Administrator must serve a variation notice on the Sector Association.

12.2 The variation notice must state:

12.2.1 the agreed variation; and

12.2.2 the date from which the agreed variation will take effect.

12.3 The Sector Association must, within 20 working days of receipt of a variation notice, serve notice on the Administrator setting out the proposed distribution of the new target period 5 sector commitment between each target unit under the umbrella agreement.

12.4 The Administrator must:

12.4.1 agree to the proposed distribution and vary the targets of each target unit accordingly;

12.4.2 request further information in relation to the proposed distribution; or

12.4.3 refuse the proposed distribution and propose an alternative distribution, giving reasons for the decision.

13. RIGHT OF APPEAL

13.1 If the Administrator:

13.1.1 decides not to certify a facility or to vary a certificate which has been issued;

13.1.2 serves a notice imposing a buy-out fee under Rule 7 upon determining that a target unit has failed to meet its target; or

13.1.3 decides to vary or not to vary the target for a target unit,

the Operator may appeal to the Tribunal against the decision.

13.2 In respect of an Operator which enters into an agreement after 1st April 2013, the Operator may appeal to the Tribunal against the target that has been set for the target unit by the Administrator.

13.3 For the purposes of Rule 13.2, the date on which notice of the decision is deemed to have been sent to the Operator is the later of the date the agreement is entered into or the date the Administrator sends notice to the Operator of the target for the target unit.

13.4 The grounds on which an Operator may appeal under Rule 13.1 and 13.2 are:

13.4.1 that the decision was based on an error of fact;

13.4.2 that the decision was wrong in law;

13.4.3 that the decision was unreasonable;

13.4.4 any other reason.

13.5 The bringing of an appeal suspends the effect of the decision pending final determination by the Tribunal of the appeal or its withdrawal.

13.6 On determining an appeal under these Rules the Tribunal must either:

13.6.1 affirm the decision;

13.6.2 quash the decision; or

13.6.3 vary the decision.

14. RECORDS AND INFORMATION

14.1 A Sector Association and an Operator must retain records of all information required to be supplied to the Administrator under these Rules.

14.2 In particular, an Operator must retain:

14.2.1 sufficient records to allow the Administrator to verify whether a target unit has met its target, including sufficient records to allow the accurate verification of throughput and annual consumption of energy of a target unit; and

14.2.2 records of energy saving actions and measures implemented during each target period.

14.3 A Sector Association and an Operator must make all records which it is required to retain under these Rules available for inspection by the Administrator or a person appointed by the Administrator and must provide copies of such records in response to a request by the date specified in the request.

14.4 All records required to be retained under these Rules must be retained throughout the duration of an agreement and for a period of four years following the termination of an agreement.

15. PUBLICATION AND DISCLOSURE OF INFORMATION

15.1 The Administrator must publish such information as required under the Regulations.

15.2 In respect of the disclosure of information other than disclosure of information required to be published under the Regulations, information supplied by a Sector Association or an Operator to the Administrator or the Secretary of State, to any agent of the Administrator or the Secretary of State, or to any person appointed by the Administrator or Secretary of State to carry out an independent audit, may be disclosed without the consent of the Sector Association or Operator, where such disclosure is:

15.2.1 by the Administrator to the Secretary of State, for any purpose connected with the functions of the Secretary of State;

15.2.2 by the Secretary of State to the Administrator, for any purpose connected with the functions of the Administrator;

15.2.3 to a relevant authority, for any purpose connected with the functions of the relevant authority;

15.2.4 to any person appointed by the Administrator or the Secretary of State to carry out an independent audit;

15.2.5 to an adjudicator appointed under these Rules;

15.2.6 to any person appointed by the Administrator or the Secretary of State to act as agent, consultant, adviser or contractor to the Administrator or the Secretary of State, in connection with the functions of the Administrator of the Secretary of State;

15.2.7 necessary for the purpose of or in connection with any legal proceedings, including the obtaining of legal advice;

15.2.8 required to comply with any Act of Parliament or subordinate legislation made under an Act of Parliament, including requests made under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004; or

15.2.9 required to meet any obligation to the European Union.

15.3 A relevant authority referred to in this Rule means:

15.3.1 either House of Parliament including any committee of either or both Houses;

15.3.2 any Government department;

15.3.3 the European Commission;

15.3.4 the Committee on Climate Change;

15.3.5 the Commissioners of Her Majesty’s Revenue and Customs;

15.3.6 a person or body prescribed by or appointed under Part I of the Environmental Protection Act 1990 or regulations made under section 2 of the Pollution Prevention and Control Act 1999 or any corresponding legislation for Northern Ireland;

15.3.7 any regulator appointed under section 54 of the Competition Act 1998; or

15.3.8 any other public body, regulatory agency or government advisory body, where in the absolute discretion of the Administrator or the Secretary of State, as appropriate, the Administrator or Secretary of State considers that it would be obliged to disclose such information in response to a request for information under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004, if such a request were made.

16. COLLECTION OF CHARGES

16.1 A Sector Association may request the consent of the Administrator to collect charges due from Operators to the Administrator in respect of facilities under the charging scheme.

16.2 If a Sector Association wishes to collect charges due from an Operator to the Administrator under the charging scheme, the Sector Association may serve a notice in writing on the Administrator by the last working day in February in the calendar year in which the charges fall due.

16.3 A notice served under Rule 16.2 must specify the facilities in respect of which the Sector Association intends to collect charges, being not fewer than 50% of the facilities covered by an umbrella agreement.

16.4 Following receipt of the notice, the Administrator must:

16.4.1 consent to the Sector Association collecting charges; or

16.4.2 refuse consent to the Sector Association collecting charges, giving reasons for the decision.

16.5 If the Administrator consents to the Sector Association collecting charges the Sector Association must:

16.5.1 itemise charges separately in any invoices that it issues in respect of charges;

16.5.2 collect and remit all charges collected to the Administrator without deduction or set off by the last working day in September in each year;

16.5.3 prepare an annual report to the Administrator by the last working day in October in the year in which it has collected charges setting out which Operators it has collected charges from and which Operators have failed to pay charges due to the Sector Association.

16.6 A Sector Association must not actively pursue any outstanding charges after the last working day in September in any year in which they fall due. If a Sector Association receives charges after this date the Sector Association must accept the payment and remit this to the Environment Agency along with information identifying the Operator making the payment.

16.7 If a Sector Association fails to comply with any of its obligations under this Rule the Administrator may serve a notice on the Sector Association that consent to the Sector Association continuing to collect charges is withdrawn at the expiry of 20 working days from the date of the notice.

17. SERVICE OF NOTICES

17.1 Any notice served under these Rules must be in writing and may be served by sending it by post or electronically.

17.2 The address for the service of all notices on the Administrator is:

Postal: Environment Agency
Lutra House
Dodd Way, Off Seedlee Road
Walton Summit, Bamber Bridge,
Preston, Lancs
PR5 8BX

Electronic: CCA-operations@environment-agency.gov.uk

17.3 The address for the service of all notices on the Sector Association is the address of the person set out in Schedule 2 to the umbrella agreement.

17.4 The address for the service of all notices on the Operator is the address of the responsible person.

SCHEDULE 2

THE OPERATOR

Operator name: ADM Erith Ltd
Company registration number:
Registered office address:
Church Manorway
Erith
Kent
DA8 1DL

Notices served under this Agreement will be sent to the Responsible Person:
Vadym Fushtey

The address for service of all notices under this Agreement is:

Electronically:
vadim.fushtey@adm.com

Copies of notices served under this Agreement will be sent electronically to the administrative contact:
Andrew Oakes
Andrew.Oakes@adm.com

SCHEDULE 3

THE SECTOR ASSOCIATION

FDF Climate Change Levy Agreement Ltd

Whose address for service of all notices under this Agreement is
By post:
6th Floor, 10 Bloomsbury Way, London, WC1A 2SL, England

Sector Contact:
Emma Piercy

Electronically:
Emma.Piercy@fdf.org.uk

THE UMBRELLA AGREEMENT

The Agreement dated 18 December 2020 made between the Administrator and the Sector Association.

SCHEDULE 4

ACTIVITIES UNDERTAKEN BY A FACILITY FALLING WITHIN THE SECTOR

A facility belongs to the food and drink sector if it is a facility which treats and processes materials intended for the production of food products. For this purpose 'food' includes drink, articles and substances of no nutritional value which are used for human consumption and articles and substances used as ingredients in the preparation of food. At an installation or site where refined salt for use in food products or supplements is prepared or processed from minerals.

SCHEDULE 5

FACILITIES TO WHICH THIS AGREEMENT APPLIES

Facility Identifier	Site and address	EUETS ID
FDF1/F00023	ADM Erith Ltd Church Manorway, Erith, Kent, DA8 1DL, England	

SCHEDULE 6

TARGET UNIT TARGETS

Target Unit Identifier	Target Period	Target Type	Throughput Unit	Baseline Throughput	Primary Consumption Unit	Baseline	Numerical target	(Percentage reduction from base year)
FDF1/T00017	TP1 (1 Jan 2013 to 31 Dec 2014)	Relative	Tonnes	16,560.435	kWh	2,886,000.000	149.637	(14.135%)
	TP2 (1 Jan 2015 to 31 Dec 2016)	Relative	Tonnes	16,560.435	kWh	2,886,000.000	147.430	(15.402%)
	TP3 (1 Jan 2017 to 31 Dec 2018)	Relative	Tonnes	16,560.435	kWh	2,886,000.000	145.223	(16.668%)
	TP4 (1 Jan 2019 to 31 Dec 2020)	Relative	Tonnes	16,560.435	kWh	2,886,000.000	143.016	(17.935%)
	TP5 (1 Jan 2021 to 31 Dec 2022)	tbc	tbc	tbc	tbc	tbc	tbc	tbc

ADM Erith (UK)

Odour Management Plan 2021

18 June 2021

Project No.: 0584457

The business of sustainability

ERM

Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
Document title	ADM Erith (UK)
Document subtitle	Odour Management Plan 2021
Project No.	0584457
Date	18 June 2021
Version	Final Version
Author	Yves Verlinden, Chris Hazell-Marshall
Client Name	ADM Erith Ltd

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft for client review	1	Yves Verlinden	Chris Hazell Marshall	David Pollok	14/06/21	
Final Version	1	Yves Verlinden	Chris Hazell Marshall	David Pollok	17/06/21	

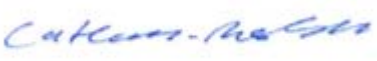
Signature Page

18 June 2021

ADM Erith (UK)

Odour Management Plan 2021

Yves Verlinden
Principal Consultant



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CONTENTS

APPENDIX F SCHEDULE B - ODOUR MANAGEMENT - DAILY CHECKS (AS PER CURRENT VERSION OF ADM PROCEDURES)

List of Tables

List of Figures

Acronyms and Abbreviations

Name	Description
DAF	Dissolved Air Flotation
DTDC	Desolventizer/Toaster/Dryer/Cooler
EA	Environment Agency
EMS	Environmental Management System
EOL	Edible Oils Limited
FIDOR	Frequency of detection, Intensity as perceived, Duration of exposure, Offensiveness and Receptor sensitivity.
MOS	Mineral Oil System
OAS	Odour Abatement System
OMP	Odour Management Plan
RBD	Refined, Bleached and Deodorised
TO	Thermal Oxidiser
TO&S	Thermal Oxidiser with Scrubber

1. INTRODUCTION

This Odour Management Plan (OMP) has been prepared by Environmental Resources Management Limited (ERM) as part of a permit variation application on behalf of ADM Erith Limited relating to its Erith site ("the Site") and forms part of the overall Site Environmental Management Plan.

This OMP has been written in accordance with the Environment Agency H4 Odour Management guidance[1] (H4) and is intended to address the key potential odour sources within the boundary of the Site.

The site principally comprises a rapeseed edible oil production and processing facility. The facility also produces rape meal as a by-product of the edible oil process, which is sold for use in animal feed, and stores a relatively small quantity of sunflower oil.

The process has a characteristic vegetable odour which is detectable at certain points within and at the site boundary and sometimes beyond. Thermal and solvent treatment of the feedstock also liberates reduced sulphur compounds from naturally-occurring glucosinolates found in rapeseed.

Within ADM's most recent Environmental Permit, issued on 21st December 2005, the following condition on odour is stated:

> *"2.2.6.1 The Operator shall use BAT so as to prevent or where that is not practicable to reduce odorous emissions from the Permitted Installation, in particular by:*
>
> - *limiting the use of odorous materials*
> - *restricting odorous activities*
> - *controlling the storage conditions of odorous materials*
> - *controlling processing parameters to minimise the generation of odour*
> - *optimising the performance of abatement systems*
> - *timely monitoring, inspection and maintenance*
> - *employing, where appropriate, an approved odour management plan*
>
> *…provided always that the techniques used by the Operator shall be no less effective than those described in the Application, where relevant."*

The 2005 permit also included an Improvement Condition ("IP5") as follows:

> *"The Operator shall develop and maintain an odour management plan, summarising the actions to be taken to minimise odour under both normal and abnormal operating conditions with regard to the requirements set out in the Agency Guidance Note IPPC S6.10 Section 2.2.6, Dec. 2002. This plan shall assess the measures that are in place to prevent or reduce odour. Upon completion of the odour management plan a summary of the document shall be submitted to the Agency in writing and shall include time scales for any remedial action required."*

The Agency Guidance Note IPPC S6.10 (2002) is no longer in use in England. A new version was published in 2011, but it includes very little guidance on odour management. The Environment Agency consolidated cross-sector guidance on odour management and control into Horizontal Guidance Note H4 in March 2011 [1]. H4 is the Environment Agency's preferred contemporary guidance on the development and review of odour management plans for English installations.

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296737/geho0411btqm-e-e.pdf

In 2015 and 2018 there were a number of odour events at the Erith facility. These events were partially due to issues with the biofilters and in summer of 2018 coincided with an extended and uncharacteristic weather pattern of high pressure and very low wind speed towards the South West of the site. This resulted in the poor dispersion of odour emitted from the site. These events have been viewed by the Environment Agency (EA) as evidence of the need to review the existing Odour Management Plan[2].

This document has been written to replace the previous ADM Erith Odour Management Plan and is intended to comply with the latest relevant guidance.

[2] ADM Erith, 2006. Odour Management Planning at the ADM Erith Installation. Prepared by Golder Associates, August 2006.

2. OBJECTIVES

The EA summarises its expectations for an OMP in Appendix 4 of the H4 guidance. The Appendix states that:

"OMPs should be designed to:

- *employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution;*
- *prevent unacceptable odour pollution at all times;*
- *reduce the risk of odour releasing incident or accidents by anticipating them and planning accordingly.*

All OMPs will need to consider sources, releases and impacts, and use these to identify cost-effective opportunities for odour management."

In order to satisfactorily identify primary odour control measures, the scope of ADM's revised OMP includes the following areas from H4:

- Risk of Odour Impacts from Site Activities
  - Inventory of odorous source materials, including descriptions and quantities of solid, liquid and gaseous material.
  - Review of odorous releases on-site, in terms of release characteristics.
  - Consideration of the potential impact of odorous releases – classify the sensitivity of the surrounding area in terms of land-use and receptors.
- Review of Odour Management Controls
  - Review existing documentation relating to the management and physical operating procedures for known odorous activities/locations on-site and review for adequacy. This also includes the review of existing plans outlining the procedures for actions to be taken when odour complaints are received.
- Odour Monitoring Measures
  - Review of existing monitoring measures on-site and recommendation for improvements or new measures to adequately monitor odour.
- Odour Incident Reporting
  - Review of existing ADM documentation relating to the procedures for odour incident reporting and propose new measures to improve the effectiveness.

The following sections of this OMP address these requirements in turn.

3. SITE DESCRIPTION

3.1 Location

To the north of the site is a Tesco distribution centre, with a pond to the north-west of the site boundary, which is understood to have been constructed at the same time as the distribution centre in 2012.

To the south and west of the site are industrial properties and residential properties. The River Thames lies directly adjacent to the east. The nearest residential area is approximately 400m to the south/southwest of the site boundaries, this is unchanged from the original permit application.

3.2 Site Overview

The Site is approximately 6.5 hectares in area, the majority of which comprises buildings and industrial infrastructure, including several buildings used for the manufacturing, processing and preparation of edible oil products.

The Site Layout is presented in **Figure 3.1**.

3.3 Site Activities

3.3.1 General

The site operates continuously throughout the year unless maintenance or process changes are required. Planned summer shutdowns lasting a few weeks are the norm.

The Erith Oil Works installation processes rapeseed to produce rapemeal for feedstuffs and edible rape oils. The site also unloads sunflower oil from ships into storage tanks for transfer (without processing) to the adjacent Edible Oils Limited (EOL) site.

3.3.2 Raw material intake, storage and preparation

All seed coming onto the site by road is received via a registered weighbridge, sampled and checked for quality before unloading to one of two pits and transferred to storage silos via conveyors. Some seed is received from ships via a river jetty. This is unloaded from the vessels by a manually controlled vacuum unloader which sucks seed from the ship and raises it to the conveyor system which transfers the seed to silos. ADM Erith also unload unrefined rape oil occasionally when the Extraction Plant is not running (e.g. during long summer shut). The plant has twelve concrete seed silos, twelve concrete meal silos and one talc silo located near the extraction plant and a Mitchell Silo near the Thames. These silos are aspirated through seven vents (emission points A16 and A22-27).

The seed is transferred from storage silos via enclosed conveyors and elevators to the seed preparation plant. Seeds are screened to remove stalks, chaff and non-vegetable matter. Air from this process is vented to air via air emission point A8 after passing through a fabric filter to control the emissions of particles. The seeds are then conditioned by warming to increase their plasticity. The warmed seed is then flaked to crush and shear the seeds converting them to thin flakes, in which the oil is more accessible. Air from this flaking process is vented from air emission point A9 after passing through fabric filters to control the emissions of particles. The flaked seed is fed continuously to a steam heated tubular rotary conditioner which reduces the moisture content in preparation for pressing.

The heated flakes pass into several screw-presses, which apply mechanical pressure to the flakes forcing out approximately 65% of the available oil. The residual seed cake is transferred to a solvent extractor.

3.3.3 Extraction (distillation and desolventising)

The solvent extractor enables counter-current washing of the remaining oil in the seed cake with the solvent (hexane), to extract more oil from the flakes into the solvent. Once the oil has been removed from the flakes with pressing and solvent extraction has taken place the remaining solids are called meal.

Separation of the oil and hexane is achieved using conventional distillation methods. The oil-solvent mixture (miscella) is separated by evaporation and steam stripping which is carried out in stages. The extracted crude oil is pumped to storage tanks waiting further processing in the refinery. Hexane is recovered and reused.

The plant has twelve meal silos with a total capacity of 12,000 tonnes. The meal is loaded onto trucks and/or ships. Trucks are loaded via two enclosed meal loading bays with the ships being loaded at the jetty.

The meal-containing solvent is desolventised by steam in a vessel called the DTDC (Desolventizer/Toaster/Dryer/Cooler) to remove the solvent from the meal. Hexane is recovered and reused. The meal is dried, cooled and stored, before sale as animal feed.

3.3.4 Refining of oil

The refining process is completed in four stages:

(1) Degumming is a process used to remove oily phosphorus, the crude oil is treated with phosphoric acid and water. The oil is then passed through a centrifuge to remove the unwanted compounds. These compounds known as gums are transferred to the solvent extraction plant where they are added to the rapeseed meal in the DTDC. The free fatty acids remain in the degummed oil.

(2) Neutralisation removes the phosphorous and free fatty acids which naturally occur in the oil. It is treated with phosphoric acid and then a caustic solution. The oil is then passed through a centrifuge to remove the unwanted compounds. These compounds known as soap stock are transferred to the solvent extraction plant where they are added to the rapeseed meal in the DTDC (Desolventizer/Toaster/Dryer/Cooler).

(3) Bleaching removes unwanted contaminants and colour from the oil. Bleaching Earth is added to the degummed or neutralized oil which absorbs the unwanted contaminants. The oil earth mixture is then filtered via bleach filters. The filtered oil is transferred to the deodorization process and the used bleaching earth is pumped to the extraction process.

(4) Deodorising is the final step in the refining process and removes odour, taste and other unwanted compounds. If degummed oil is the feedstock, the deodoriser would also remove the free fatty acids. Steam is used to strip the unwanted compounds from the feed oil. This steam distillation is carried out at high temperature and low vacuum to protect the oil from oxidization. The finished product (Refined, Bleached and Deodorised – i.e. RBD oil) is transferred to holding tanks where the quality is checked before being transferred to storage tanks for dispatch. The stripped compounds are cooled to form distillate which is transferred to a storage tank and shipped as a by-product.

The refinery has ten large storage tanks with a total capacity of around 13,350 tonnes and ten process tanks with a total capacity of around 1,800 tonnes.

3.4 Sensitive Receptors

Potential odour receptors around the facility comprise a mix of predominantly low sensitivity industrial units immediately surrounding the site, and residential properties located approximately 400 metres away to the south, south-west, which are considered to be high sensitivity.

Table 3.1 outlines identified sensitive receptors. These have been split into receptors where members of the public are likely to be present, and those that are commercial or industrial properties, as the latter are generally less sensitive to odours. These receptors are also represented on **Figure 3.2**. The focus of this management plan is primarily on residential areas, particularly the residential properties located on Lower Road, Willis Road, Glendale Road and Battle Road.

Table 3.1: Sensitive Receptors

Sensitive Receptor Number	Receptor	Approximate distance from Site (m)	Direction from Site
Residential Area (public)			
1	Residences - Lower Rd (east)	415	South
2	Residences - Willis Road	420	Southwest
3	Residences - Glendale Road	410	Southwest
4	Residences - Battle Road (north)	500	South
Other sensitive (public) receptors, schools, leisure and retail			
5	Carousel Cafe Belvedere	470	North
6	Bulbanks Medical Centre	360	Southwest
7	St John Church, Erith	520	South
Commercial/Industrial (employment)			
8	Erith Tesco	0	North
9	Ocado CFC4	130	Northwest
10	Edible Oils	0	South
11	Ocado GMDC	270	South
12	Sharvatt Woolwich Ltd - Timber Merchants	350	West

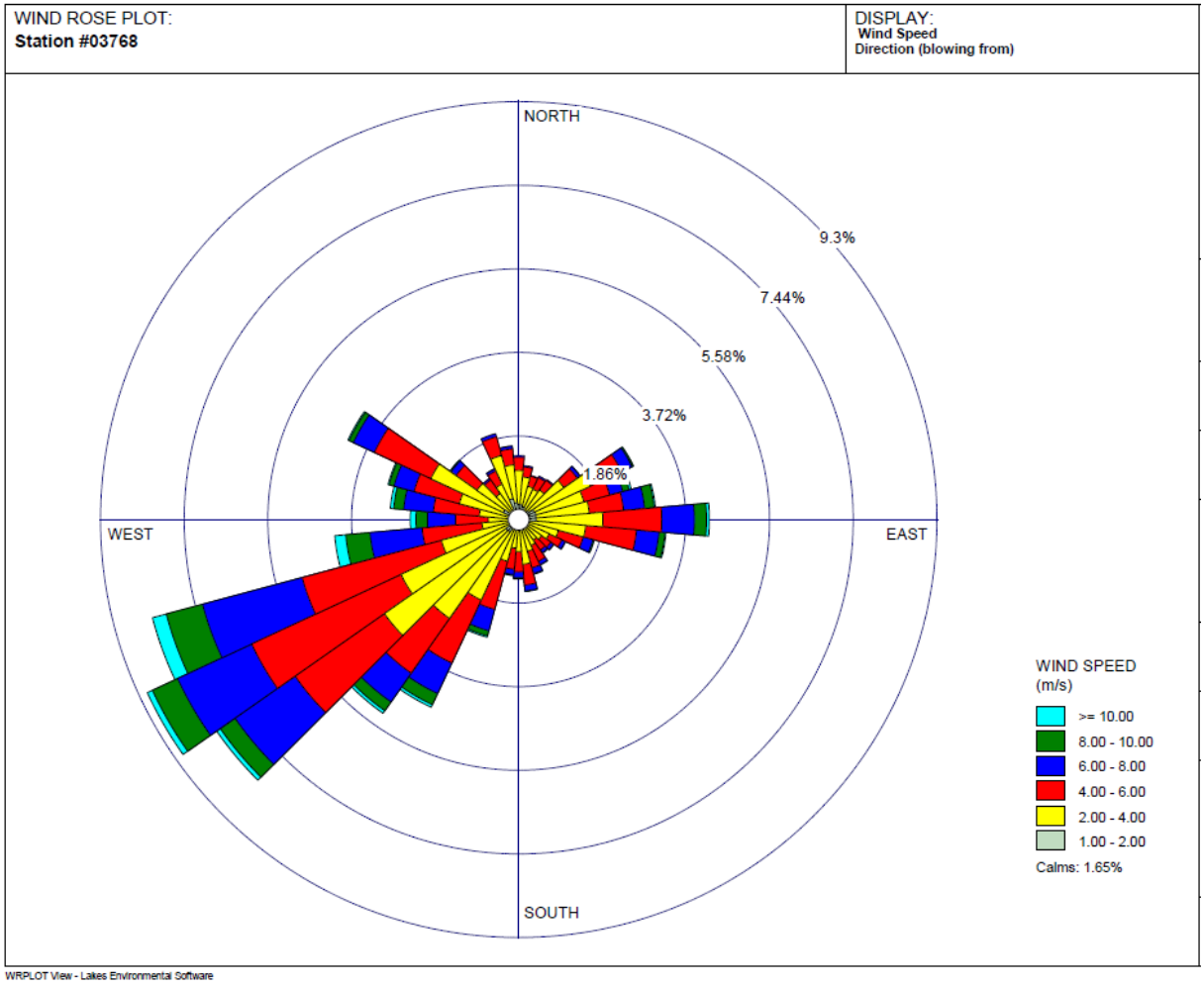
Figure 3.1: Site Layout Plan

Figure 3.2: Site Context - Sensitive Receptors

3.5 Wind Direction

A wind rose from London City Airport for the years 2016-2020 inclusive is illustrated in **Figure 3.3**. London City Airport is considered to be the closest, most applicable meteorological site to the Erith facility. This clearly shows the prevailing wind direction at the site from the five years of data to be from the south-west, which would direct any odour emissions over the River Thames towards the Rainham Landfill site to the east. A smaller proportion of the annual wind direction however does feature from the east/north-east, which may affect the residential properties to the west and south-west.

Figure 3.3: Wind Rose from London City Airport (2016-2020)



4. ODOUR RISK ASSESSMENT

4.1 Odorous Releases On-Site

Emissions testing has identified numerous compounds within the exhaust streams, including a number of potentially odorous sulphur compounds including hydrogen sulphide and dimethyl sulphide amongst others. These are or will be emitted mainly through the following primary, controlled odour emission point sources (see **Figure 4.1**):

- Emission point A10 - Odour abatement system exhaust
- Emission point A28 – New thermal oxidiser with scrubber (replacing old thermal oxidiser, emission point A13 in Q4 of 2021)
- Emission point A14 - DTDC (rapemeal dryer, toaster, deodoriser and cooler) which exhaust through a biofilter.

In addition to the point sources listed above, in the event the exhaust from the MOS bypasses the thermal oxidiser/scrubber system (A28, more details provided in **Section 4.4**), and is instead routed to emission point A14, increased amounts of H_2S are released.

4.2 Sources of Odour On-Site

Due to the nature of the operations at the site, fugitive sources of odour are naturally present to varying degrees at different stages of the process. An inventory of potentially odorous substances brought to or produced on-site is summarised in **Table 4.1** below.

The strongest continual source of odour on-site is the MOS. Continuous odours are also associated with the rapemeal extraction process (Desolventizer/Toaster/Dryer/Cooler (DTDC)).

Some intermittent odours are associated with on-site wastewater, generally when the treatment works periodically extracts the solids from the split box, or if the sludge dewatering system is over-loaded and not functioning properly. These emissions are limited to about one hour and occur <10 times per year.

Slight odours also arise on-site due to the storage of refined and crude rapeseed oil, with intermittent odours particularly occurring when the covering nitrogen blanket in the silos is displaced during loading and unloading.

Figure 4.1: Emission Points

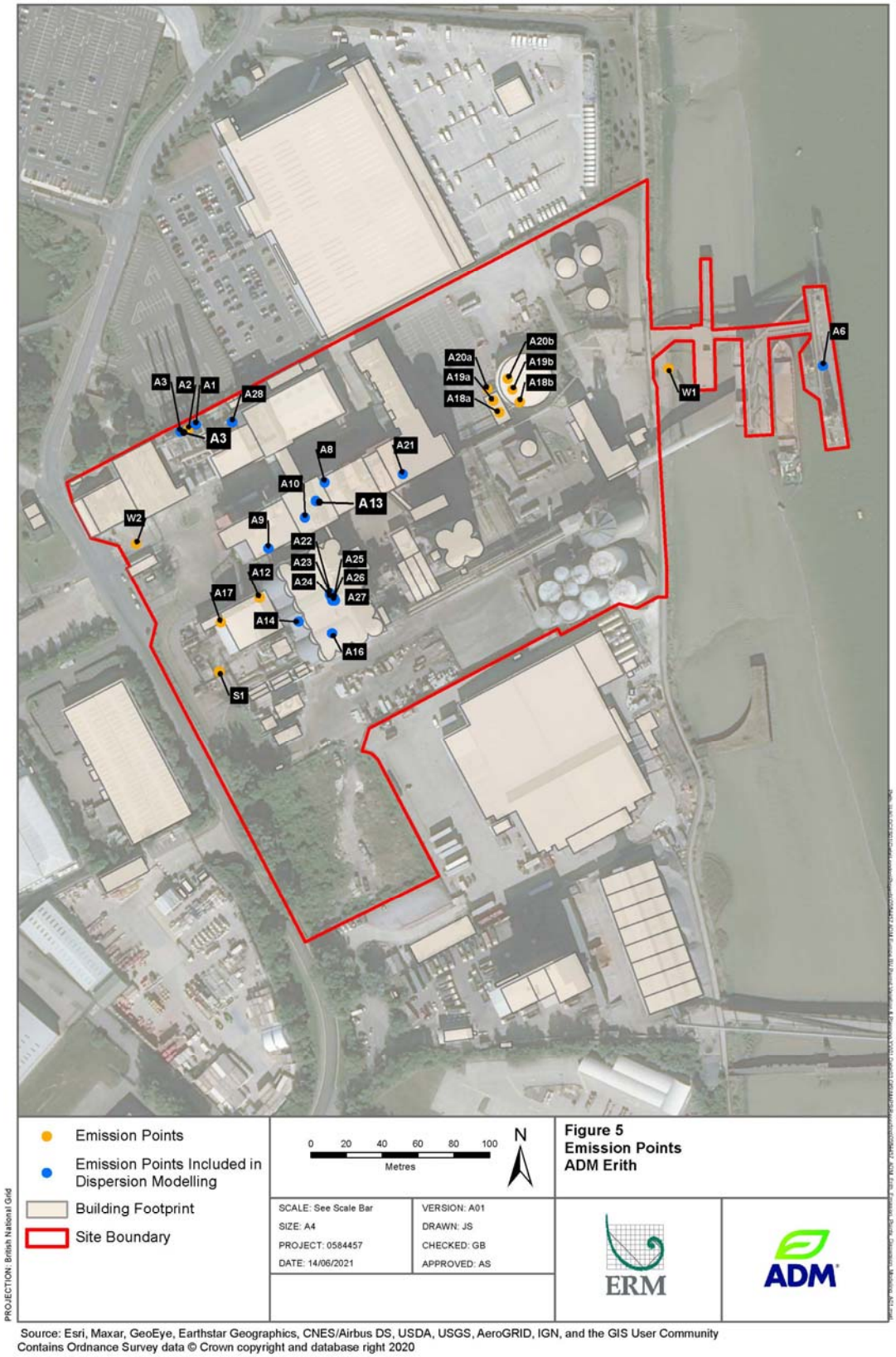


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Table 4.1: Inventory of Odour Sources On-site

Potential Odour Source	Odour Description	Odour Intensity*	Odour Release Pattern	Additional Comments
External Sources				
Ship loading	n/a	Unknown, but expected to be low	24 hours	To be confirmed during walkover survey during loading. May impact users of Thames riverside and marine amenities.
Grain Silos	n/a	0	n/a	Not aspirated – no odour observed.
Distillate tanks	Vegetable-type odour	2	Monthly	Filled slowly until a tanker is required to remove the contents
Wastewater Treatment Works	Putrescible waste	1-3	1-2 hour peak when clearing out solids	Generally no odour, but when emptied periodic short-term odour.
Refined (rapeseed) oil tank	Vegetable-type odour characteristic of rapeseed	2	Intermittent	Periodic release of odour when covering nitrogen blanket is temporarily displaced during unloading
Crude (rapeseed) oil tank	Vegetable-type odour characteristic of rapeseed	2	Continuous	As above
Rapemeal bay loading	n/a	0	Intermittent	Not considered to be odorous.
Spent bleaching clay storage	Faint decomposing matter	Spent bleaching clay storage	Faint decomposing matter	Faint odour due to uncovered waster material in skips. Plans to cover all skips
Waste vegetable oil & solvent hoppers		0	Continuous	No detectable odour – only very faint when hoppers filled/emptied
Storm-water sump	Sulphur	1	Continuous	Very faint odour by gatehouse. Expected to peak during dry, warm weather
Sludge dewatering	Putrescible waste	4	Intermittent	Audit observed excessive water during malfunctioning process resulting in strong odour. Located close to the Church Manorway public footpath
Dissolved Air Flotation (DAF) Unit	Decomposing suspended solids/oils	2	Continuous	Faint odour detected from this open-air source next to Church Manorway boundary. Regular maintenance is essential to prevent offsite impacts
Rapemeal extraction (DTDC)	Solvent / cooking cereal	3	Continuous through fugitive process releases	Cyclones and knockout pots, with exhaust vented to A14 bypass if biofilter down. Large quantities of hexane used but removed to ppm levels through condensation and mineral oil absorption. Some hexane slippage will occur in exhaust however

Potential Odour Source	Odour Description	Odour Intensity*	Odour Release Pattern	Additional Comments
Biofilters (x6)	Faint decomposing organic matter	2	There should not be odour unless containment fails	Normally no odour, unless a biofilter roof fails, releasing odorous water vapour
		Internal Sources		
Seed hoppers	Vegetable-type odour characteristic of the rapeseed oil production process.	2	Continuous	
Shaker floor	Vegetable-type odour, however more pronounced than seed hoppers	3	Continuous	
Mineral Oil System	Vegetable-type odour	5	Continuous	Very strong, although not offensive odour emanated from the whole process
Extraction vessels	Putrescible waste	3	Continuous	The open meal vessels are vented to the odour abatement system (wet scrubber), but some odour can still be present in the building.
Deodoriser	Putrescible waste	3	Continuous	Flashes off residue under vacuum with distillate residue after neutralisation & bleaching
Neutralisation & Bleaching	Very strong putrescible waste	5	Continuous	Unwanted fatty acids in oil reacted with phosphoric acid and then a caustic solution to form “soap stock” after passing through a centrifuge. Bleaching Earth added to absorb the unwanted contaminants. Very strong odour through open adjacent external shutters

* Odour Intensity Scale: 0 – No odour; 1 – Very faint odour; 2 – Faint odour; 3 – Distinct odour; 4 – Strong odour; 5 – Very strong odour; 6 – Extremely strong odour (Ref: German Standard VDI 3882, Part 14)

4.3 Odour Characterisation

Since a lower intensity of a less pleasant odour may cause similar nuisance to a higher intensity of a more pleasant one, the EA, in its H4 guidance, has set out three criteria for different hedonic tones as a threshold for potential nuisance. The hedonic tone indicates how pleasant or otherwise the odour may be.

Based on **Sections 4.1** and **4.2**, emissions of H_2S will be the primary focus of this OMP, and the most stringent hedonic tone will be used, which relates to the least pleasant odours.

4.4 Dispersion Modelling

Within the framework of the Permit Variation Application, dispersion modelling[1] of H_2S emissions from the Site has been performed to predict potential impacts to human health but also to predict potential risk of odour nuisance. Three scenarios were modelled:

Scenario 1) Current normal operations, with following H_2S point emission sources:

- scrubber of odour abatement system (OAS) emitting through A10;
- MOS exhaust treated by existing thermal oxidiser, emitting through A13;
- biofilter of DTDC emitting through A14;

Scenario 2) Future normal operations, with following H_2S point emission sources:

- scrubber of odour abatement system (OAS) emitting through A10;
- MOS exhaust treated by new thermal oxidiser/scrubber emitting through A28;
- biofilter of DTDC emitting through A14;

Scenario 3) Bypass events. The difference between future and current bypass lies with duration and frequency of the events which are expected to decrease considerably. The nature of emissions (immediate mass flow, flow parameters and emission points), and consequently the dispersion modelling input, are however identical with regards to H_2S. Future frequency and duration of events has been estimated by ADM based on knowledge of current MOS operational performance and the design of the new TO&S. This scenario involves following H_2S point emission sources:

- scrubber of odour abatement system (OAS) emitting through A10;
- MOS exhaust bypassed to A14 without treatment;
- biofilter of DTDC emitting through A14.

These scenarios assume the least favourable dispersion conditions based on five years of weather data (2016-2020) and is therefore conservative. The model is used to estimate potential maximum concentrations in Odour Units per cubic metre (OU/m^3) and the number of hours per year during which the odour assessment criterion may potentially be exceeded. The Odour Unit concentration represents the intensity of a perceived odour and is not related to how pleasant or otherwise the odour may be.

[1] Appendix A in 'ADM Erith Environmental Permit, Substantial Variation Application: Supporting Information Document

As per H4 Guidance, the assessment criterion for odour is based on the 98th percentile of hourly average concentrations of odour modelled over a year at the site/installation boundary (i.e. a maximum of 175 exceedance hours allowed per year). The criteria are:

- 1.5 odour units (OU) for most offensive odours;
- 3 odour units for moderately offensive odours;
- 6 odour units for less offensive odours.

In this case, the most stringent criterion was used, which relates to the least pleasant odours. This most stringent value was chosen to represent potential emissions of H_2S which are generally accepted as having an offensive odour. A concentration of one 'odour unit' per cubic metre (OU/m^3) is defined as the odour detection threshold which for H_2S according to WHO[1], falls between 0.2 and 2µg/m^3. For information, the identification threshold falls between 0.6 and 6µg/m^3. For the purposes of this AQIA, one OU/m^3 has been defined as 1.1µg/m^3 for H_2S, i.e. the mean of the WHO range for the odour detection threshold.

The modelling results (see **Figure 4.2** to **Figure 4.5** and **Table 4.2**) indicate the following for:

- current normal operations (scenario 1):
  - the odour criterion is predicted to be exceeded >175 hours (>2%) per year (i.e. greater than the maximum allowed under H4 Guidance) in the current situation with a maximum of 2,495 (28%) predicted exceedances per year at the point of maximum impact. The area where >175 yearly exceedances are predicted includes the largely industrial immediate area, and the adjacent Thames River to the east, but also extends to residential receptors to the west (Lower Road, Culing Road, Beltwood Road, Bullbanks Road, Mayfield Road). The maximum predicted number of exceedances at the specifically modelled human receptors for this situation is 251 (2.9%) per year. Based on this the current risk of odour nuisance is considered high;
- future normal situation (scenario 2):
  - the number of exceedance hours is predicted to decrease to a maximum of 263 exceedances (3.0%) per year at the point of maximum impact, which is situated over a small area over the northeast corner off the site and the River Thames, where the number of sensitive receptors should in practice be few. The maximum predicted number of exceedances at the specifically modelled residential receptors is reduced significantly to 38 (0.43%) per year. Based on this the future risk for odour nuisance is considered low;
- bypass event (scenario 3):
  - the number of bypass events following installation of the new TO&S are expected to decrease to a maximum of five events annually with an average duration of one hour as compared to a maximum recorded annual total of 48 hours (2016) and average recorded of 110 minutes per event for the current situation. As this is below the 175 hours allowable, the H4 guidance odour benchmark cannot be exceeded. Taking into account the maximum recorded and expected future bypass hours, the model predicts that the maximum percentage of time during a year in which the odour criterion (1.65µg/m^3) will potentially be exceeded due to bypass emissions is only 0.26% in the current situation and will further decrease to 0.027% in the future situation. Nevertheless, there is a small risk of causing occasional odour nuisance at nearby residential receptors during a bypass event. This risk will be further assessed using the FIDOR method (see **Section 4.5**).

In terms of transient receptors, members of the public may be present along the Thames Path / Thames Cycle Route which is located between the eastern boundary of the facility and the River Thames, together with a public footpath being situated on the boundary of Church Manorway to the west of facility.

[1] https://www.euro.who.int/__data/assets/pdf_file/0019/123076/AQG2ndEd_6_6Hydrogensulfide.PDF

Whilst it is acknowledged that these boundary locations also have the potential to be affected by odour from the site, given the short length of time members of the public are expected to be in these areas, potential odour impacts in these locations are not considered to be significant or of material consideration.

From the above, the risk of causing odour nuisance at nearby residential receptors is predicted to be negligible during normal future operations. In case of a bypass event this risk will increase, however due to the very limited number of bypass hours, the risk for odour nuisance remains low.

Table 4.2: Predicted H_2S Odour Contribution

Parameter	Unit	AQS	Current – Normal Operations	Future – Normal Operations	Current – Bypass Events	Future – Bypass Events
Maximum Operational hours	h/yr	-	8760	8760	Maximum observed: 48	Maximum expected: 5
Maximum Anywhere offsite						
Odour criterion exceedance	h/yr (%)	175 (2%)	2495 (28%)	263 (3.0%)	Maximum observed: 22.7 (0.26%)	Maximum expected: 2.37 (0.027%)
Maximum affected residential receptor						
Odour criterion exceedance	h/yr (%)	175 (2%)	251 (2.9%)	38 (0.43%)	Maximum observed: 8.10 (0.092%)	Maximum expected: 0.84 (0.0096%)

Figure 4.2: Predicted H_2S Odour Criterion Exceedance Hours – Scenario 1 (Current Normal)

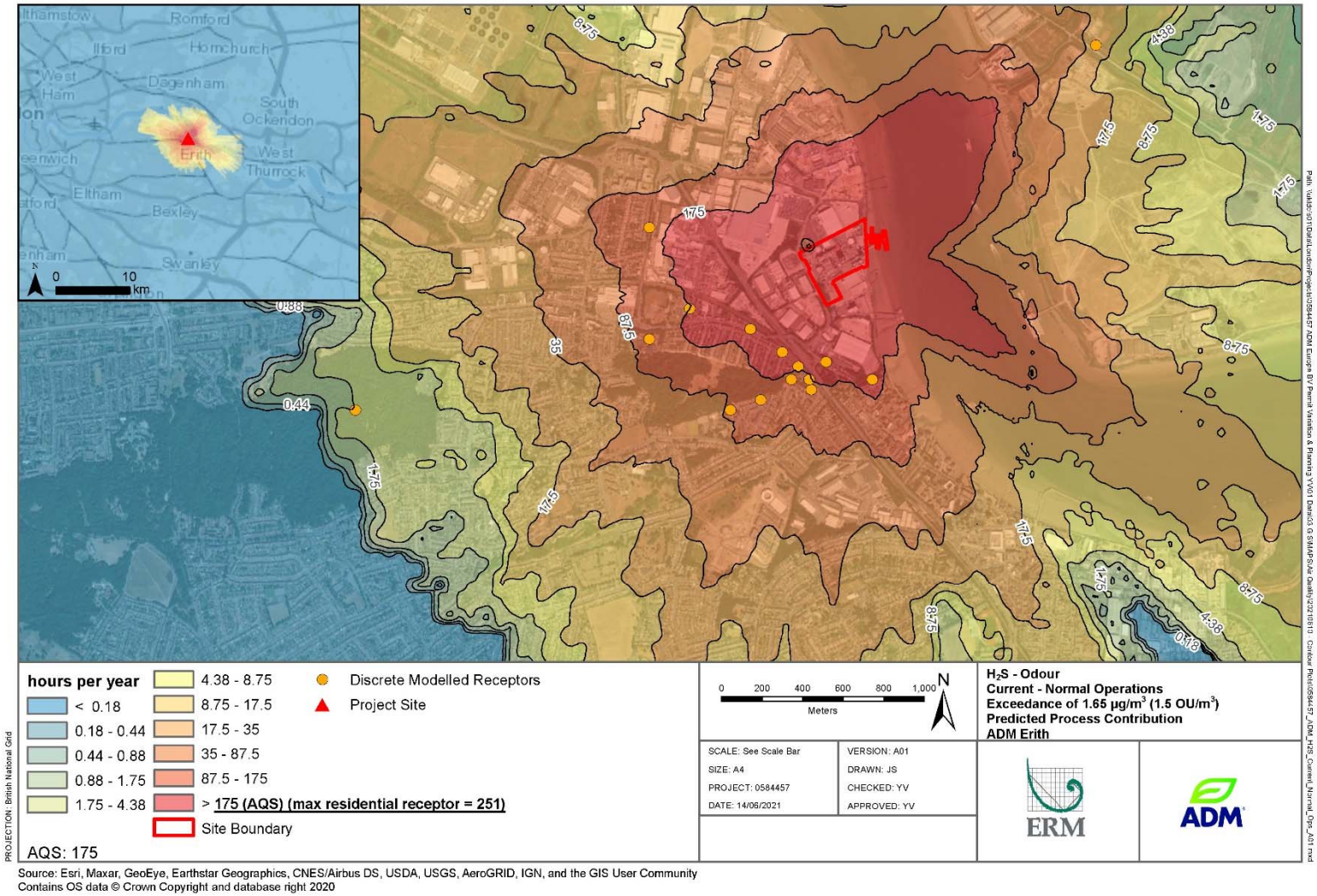

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Figure 4.3: Predicted H_2S Odour Criterion Exceedance Hours – Scenario 2 (Future Normal)

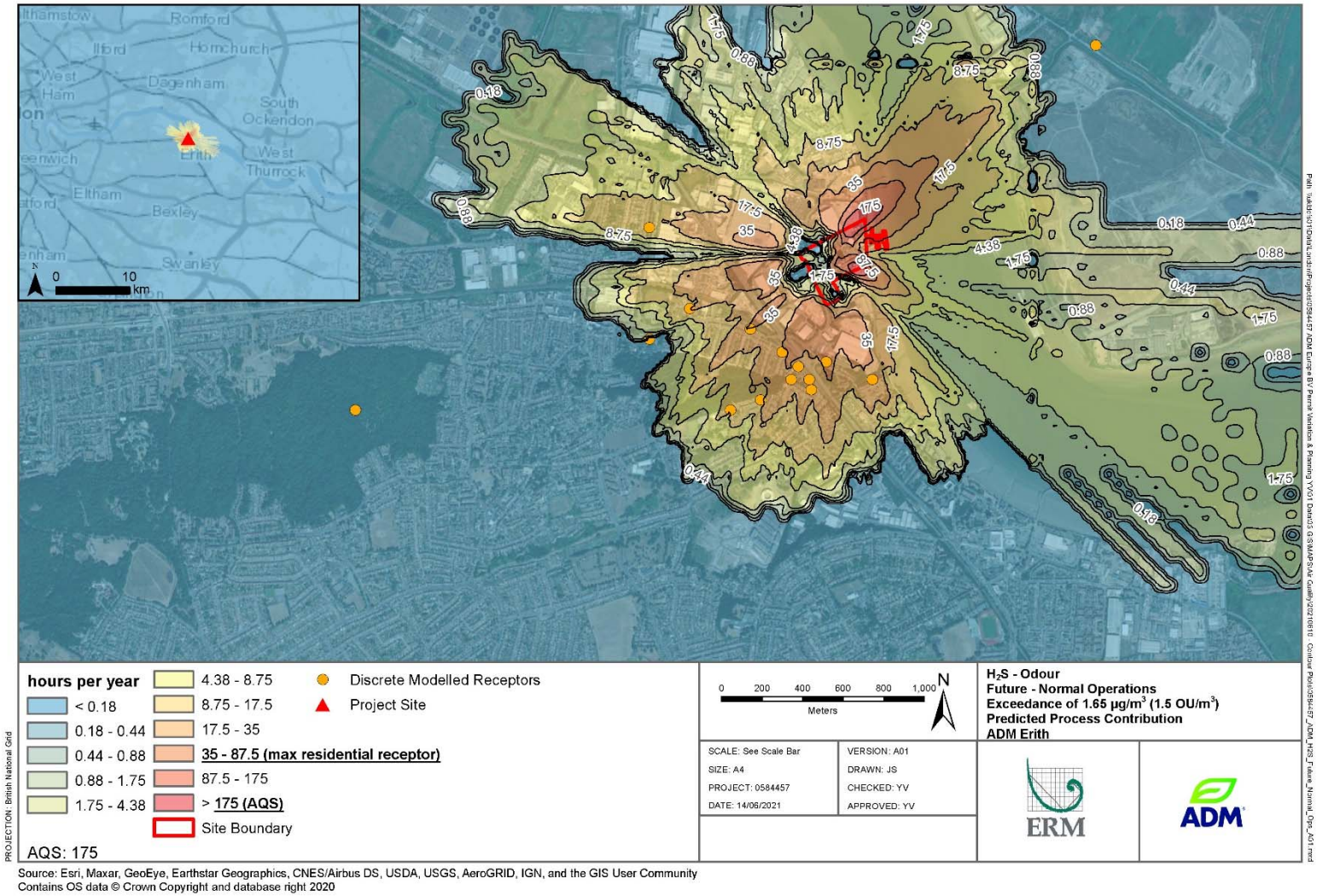

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Figure 4.4: Predicted H_2S Odour Criterion Exceedance Hours – Scenario 3 (Current Bypass)

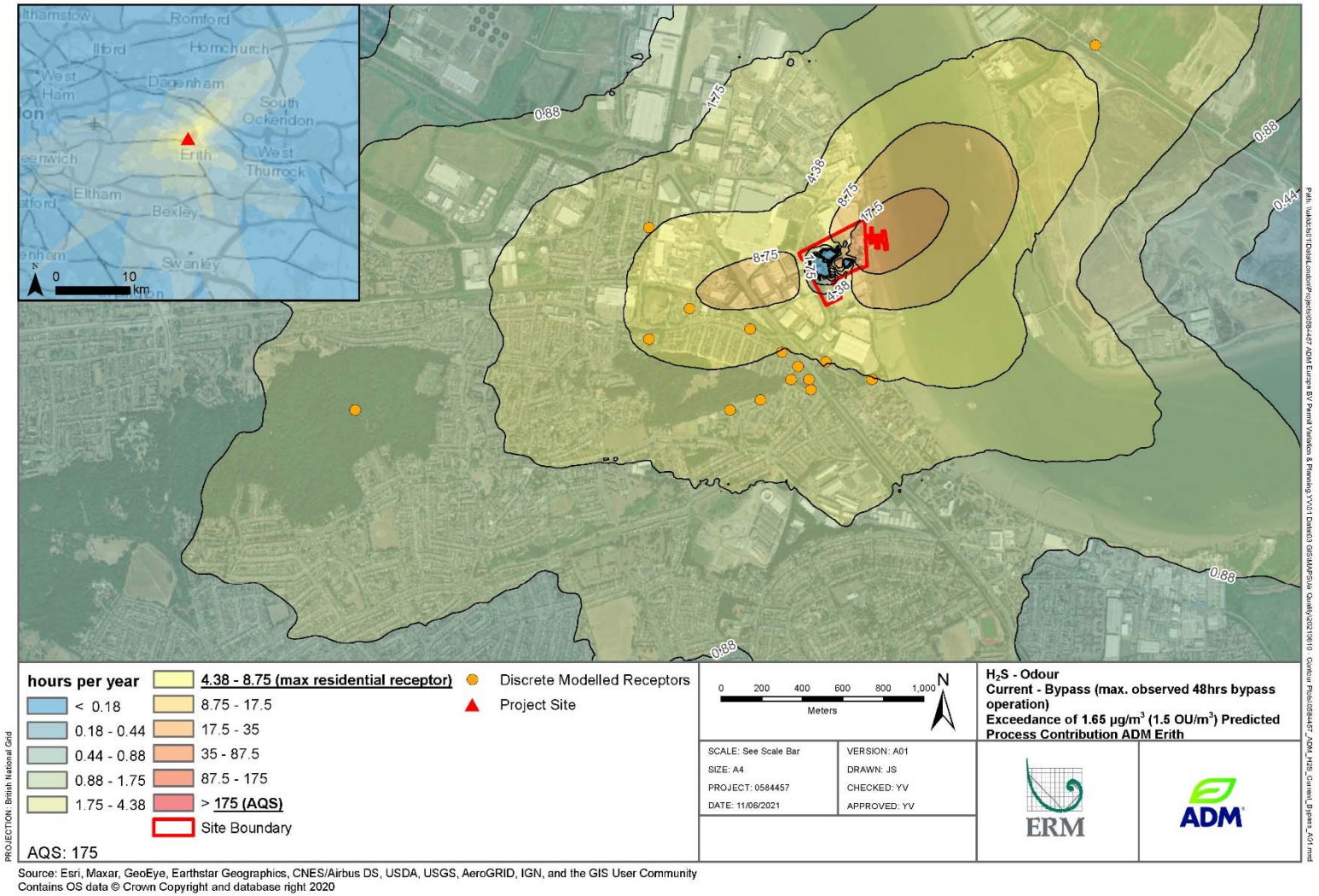

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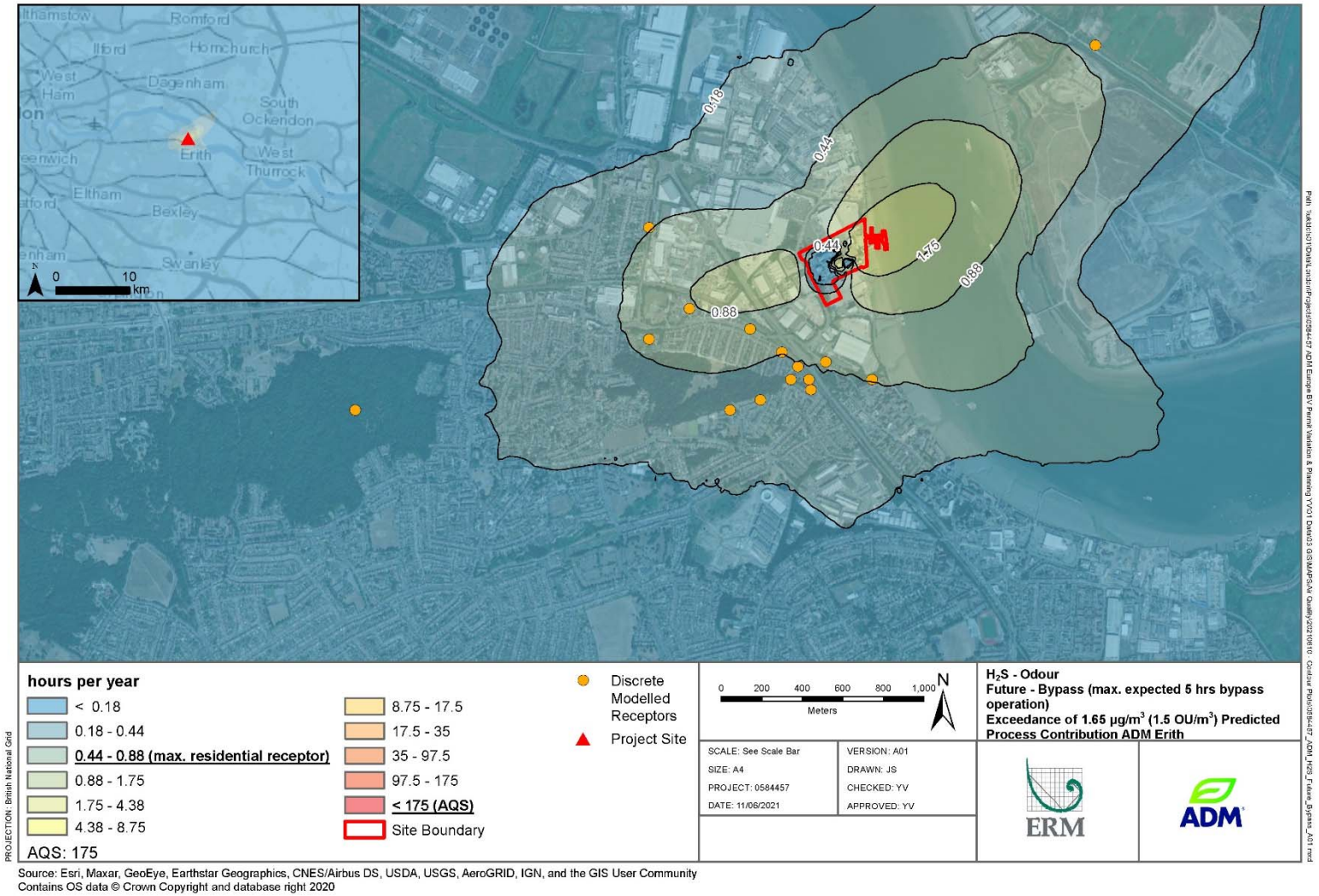
Figure 4.5: Predicted H_2S Odour Criterion Exceedance Hours – Scenario 3 (Future Bypass)



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
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4.5 FIDOR Assessment

As the expected future H_2S process contributions during a bypass event are predicted to exceed the adopted odour criterion (1.65µg/m^3), a FIDOR assessment has been performed specifically for this situation.

Whether or not odour emissions reasonably constitute a nuisance depends on a number of factors. There is no single method of reliably measuring or assessing odour pollution, and any conclusion is best based on a number of lines of evidence.

In order to allow the potential significance of odour impact (source or emission) from a site to be determined, the EA sets out in their H4 guidance the following aspects of odour, commonly referred to under the FIDOR acronym, to be of key consideration:

- **F**requency of detection: can be assessed from emissions and process control data, wind direction data, complaints and odour diaries;
- **I**ntensity as perceived: For new proposals the expected exposure arising from different options can be estimated through, for example modelling as per **Section 4.4**;
- **D**uration of exposure: can be assessed from emissions and process control data, wind direction data, complaints and odour diaries;
- **O**ffensiveness some odours are generally regarded as more unpleasant than others (see **Section 4.4**); and
- **R**eceptor sensitivity: Some receptors are more sensitive than others. Domestic residences, or a pub with a beer garden are more likely to be sensitive than an industrial complex or passers-by. Some individuals will be extremely tolerant of odours at high intensities while others will be unable to tolerate an odour as soon as they identify it. Evidence that, for example, only one person finds the odour unacceptable whereas most others, similarly exposed, find it acceptable in that context (e.g. in a rural village) would be relevant to the assessment of the degree of pollution.

The FIDOR method is qualitative and involves a degree of subjectivity. There is also some overlap between criteria, e.g. intensity relates to concentration, however offensiveness may also increase with concentration. The overall conclusion of low risk is driven by the low expected frequency and duration of future bypass events; just five hours per year.

On the basis of the site context, the sensitive receptors with the greatest risk of odour nuisance are to the west/southwest of the site. This represents the receptors which are upwind for the greatest proportion of the year, but also closest to the site boundary. Residential areas are the most sensitive to odour.

The FIDOR Assessment is presented in **Table 4.3**.

Table 4.3: FIDOR Risk Assessment (Future Bypass)

Sensitive Receptor	Frequency of detection	Intensity	Duration	Offensiveness	Receptor sensitivity	Risk
Residential areas (#1 - 4)	Very infrequent due to large separation distance, low occurrence of events, prevailing wind direction away from receptors	Medium	Short, on average events last for ~ one hour.	Medium	High	Low (due to low expected frequency)
Other non-residential public receptors (# 5 - 7)	Very infrequent due to large separation distance, low occurrence of events, prevailing wind direction away from receptors	Medium	Short, on average events last for ~ one hour.	Medium	Medium	Low (due to low expected frequency)
Commercial and industrial, non-public receptors (#8 - 11)	Infrequent due to low occurrence of events	High (closer to source)	Short, on average events last for ~ one hour.	High (closer to source)	Low	Low (due to low expected frequency)

5. ODOUR RISK CONCLUSION

The plant will generate some odour emissions during normal operations. There are occasional activities that lead to higher odour emissions, most noteworthy the bypass of the mineral-oil exhaust to A14. Following the installation of the new abatement system (new TO&S) on the MOS exhaust, the overall risk of future odour nuisance at nearby sensitive receptors is considered to be low, due to the expected low frequency and duration of bypass events, coupled with the location of the most proximal residential receptors up prevailing wind direction from the site.

The following sections set out how emissions of odour will be managed at ADM Erith.

6. PROCESS CONTROL MEASURES

6.1 Overview

ADM uses a number of processes to abate odour from the Erith Site. These relate to operations within the process buildings and effluent and waste activities located out of doors but within the site boundary. These processes are performed in accordance with prevailing versions of ADM procedures.

All procedures mentioned in this OMP are live documents subject to change in accordance with operational, regulatory or other internal or external factors. The reference numbers mentioned in this OMP are in accordance with the procedure at the current time.

Listed below are key currently prevailing operating procedures relevant to odour control:

1. ADM Erith Odour Management (ref 181084);
2. Odour complaints investigation (ref 28974, current version summarised in **Appendix A**);
3. Biofilter Odour Abatement (ref 28924);
4. Odour Abatement System (ref 14592);
5. Thermal Oxidiser odour and Emissions to Air Control (ref 181848);
6. DAF Operating Procedure (ref 14737);
7. Wastewater Evaporator System (ref 41271);
8. Final Effluent Control and Associated Sampling Requirements (ref 14409);
9. Immediate reporting of environmental incidents (ref 43565).

6.2 Odour Control Technology

ADM's principal odour abatement technology is listed below:

- Odorous gaseous streams:
  - Wet scrubber / odour abatement system (OAS) for the exhaust gases following the preparation of the seed, before release to atmosphere at emission point A10 (stack located on top of the prep building);
  - Biofilters (replaced 2019) to treat the extraction exhaust stream from the rapemeal DTDC process, before release to atmosphere at emission point A14;
  - Mineral-oil system exhaust gas (H_2S and hexane-rich) passed through thermal oxidiser/scrubber system to emission point A28. The exhaust may be vented to atmosphere via A14, bypassing the biofilter when TO/scrubber is off- line.
- Odorous liquid streams:
  - Wastewater Evaporator System (current ref 41271).
  - Dissolved Air Flotation (DAF) Unit (current ref 14737).

All of these odour abatement measures are or will be documented and incorporated into the ADM Erith site Environmental Management System (EMS). This section of the OMP can be considered as a framework document which signposts the relevant published procedures (current prevailing versions) for odour control. The specific techniques used to control odour are presented in more detail in the following sections.

6.3 Thermal Oxidiser

The site currently uses a thermal oxidiser (TO) to abate the waste gases from the mineral oil extraction system. The current TO is fuelled using a 630kW natural gas-fired burner (manufactured by Weishaupt) and combusted gases are emitted through air emission point A13 (see **Figure 4.1**).

The TO (air emission point A13) will continue to be in operation, with a target end date to be decommissioned during Q4 2021.

A new TO is planned to be installed in Q4 2021 and will incorporate a natural gas fired burner and integrated wet caustic scrubber. Combusted gases will be emitted through air emission point A28.

The new TO and scrubber system will abate emissions from the mineral oil system after the extraction process. During a combustion process the contaminants within the exhaust gas (H_2S, VOCs and SO_2) react with the oxygen, fully oxidising the species present. The exhaust gases will then be channelled through a caustic scrubber to remove acid gases. The scrubbing system consists of an evaporative quencher using re-circulated water to cool down hot gas from the TO.

Water that has not evaporated flows from the quencher into the packed bed absorber. The gas passes through the first stage packed bed to remove the majority of SO_2 in the gas stream. The scrubbing water is collected in the sump and is re-circulated back to the top of the first stage packed bed and to the quencher. A sodium hydroxide solution with a concentration of 15% is metered into the scrubber recirculation line to neutralize acid gases in the gas stream. The addition rate of sodium hydroxide is controlled by the pH of the liquid in the absorber sump.

After the first stage, the gas passes through a second stage packed bed. The second stage acts as a polishing step to achieve a low outlet SO_2 concentration. A dilute solution of plant-supplied sodium hydroxide is metered into the second stage re-circulation line and is controlled based on the pH in the 2nd stage sump.

A blowdown stream is taken from the re-circulation line to purge the system of absorption products. A blowdown waste-water will be discharged into the site's water treatment plant, where it is mixed with all other waste streams on site. Form the water treatment plant the water is discharged into the Thames Water sewer. Clean softened water is added to the system to make up for blowdown and evaporative losses.

After passing through the packed bed the exhaust gases passes through a mist eliminator at the top of the scrubber vessel. The entrainment separator collects any water droplets that were entrained in the gas stream during scrubbing. The gas then passes through an interconnect duct and stack before being discharged into the atmosphere.

6.4 Biofilter

New biobeds were installed in 2019 to replace the former biobeds (discharging to A14), and were operational by November 2019. Air from the four lower stages of the DTDC passes through one of four cyclones to remove particulates. The warm vapours from the first lower stage (which contains over 99% of the odour and hydrogen sulphide emitted from the DTDC) is processed through the biobeds and then vented through A14. The remaining decks (containing less than 0.7 the odour and hydrogen sulphide) are vented directly from A14.

6.5 Odour Abatement System / Wet Scrubber

The odour abatement system (OAS) is installed to treat the odorous air streams generated following initial preparation. The system comprises of a cooler, scrubber and catalyst tank, and uses an alkaline sodium hypochlorite to oxidise the odorous components.

Continuous process monitoring is installed within the OAS equipment to notify of any process upsets. Relevant ADM personnel are also trained in the maintenance of the unit and a range of spare parts are always kept on-site.

The Odour Abatement System (current ref 14592) document sets out the protocol to ensure correct operation of this control.

The document, together with the ADM Odour Complaints Investigation Procedure (current ref 28974, current version summarised in **Appendix A**) outlines the parameters continuously monitored at ADM Erith, such as temperature, pH, levels of oxidisation solution and freshwater, and the exhaust gas flow-rate, together with the manual periodic checks required by relevant trained personnel and a trouble shooting guide in the event of unit problems.

6.6 Wastewater Evaporator System & Effluent Control

The wastewater evaporator system separates the used industrial water from the clean water, allowing the recycled water to be reused in the process, minimising wastewater and waste management costs. The system is also used to produce low-pressure steam used in the DTDC.

Putrescible solids collect at the bottom of the split-box, which when tankered out periodically can be odorous for a limited time and close to the source.

The method to correctly shut-down and start up the system satisfactorily is set out in the procedure Wastewater Evaporator System (current ref 41271). Key considerations for correct operation, relating to the control of odour, include:

- ensuring there is sufficient flow of water to the surge tank and the pump valves are open to the evaporator; and
- checking the surge tank is correctly overflowing through the swan neck, which demonstrates that the pump feed lines are clear of fines. If the lines are blocked, this has to be cleared immediately.

The document Wastewater Evaporator System (current ref 41271) also sets out the ADM Erith personnel responsible for maintenance; as per prevailing version of this procedure, these are the Extraction Operator and Shift Superintendent. Furthermore, Final Effluent Control and Associated Sampling Requirements (current ref 14409) sets out the procedures for monitoring of the final effluent to sewer, highlighting daily visual inspections of surface water conditions, the monthly flow meter calibrations and the composition sampling and analysis, together with the critical trade effluent discharge parameters and limits.

6.7 Dissolved Air Flotation (DAF) Unit

The DAF removes suspended solids, oils and other contaminants in wastewater stream via the use of air flotation. Air is dissolved in the water, mixed with the waste stream and released from solution whilst in contact with the contaminants. The air bubbles formed attach to the solids or oil, increase their buoyancy and float the material to the surface.

The unit is located close to the ADM site boundary with Church Manorway, adjacent to the public footpath.

The DAF Operating Procedure (current ref 14737) sets out the duties of the extraction operator and shift supervisor, including monitoring the following parameters:

- Flow and recycle stream;
- DAF Inlet pH;
- DAF Outlet pH;
- Coagulant dosing;
- Polymer dosing;
- Final effluent pH.

In addition to the DAF Operating Procedure, there is a specific monitoring and control protocol which includes a trouble shooting matrix for correcting potential problems such as high/low supply pH, no float, no flocs (solids) etc.; together with the chain of command in terms of responsibility for corrective action.

7. ODOUR MINIMISATION MEASURES

7.1 Overview

ADM Erith acknowledges that a fundamental aspect of odour minimisation is to ensure that all personnel responsible for, or having roles relevant to, odorous activities at the facility are trained in how best to minimise odour for that particular task. To this end all site personnel are made aware of the potential impact of odorous emissions being perceived at nearby sensitive receptors.

Typical odour minimisation measures which are the responsibility of all personnel include:

- ensuring that all odorous material or odorous stages are undertaken in enclosed areas or are prevented from escaping to outdoor air by being covered;
- regular cleaning of hard surfaces, drains etc.;
- avoiding build-up of dirt;
- covering the skips;
- routine maintenance of equipment (e.g. cleaning of filters).

Schedule A (see **Appendix E**) to this report sets out a Development Plan for the Erith site, highlighting the key items, activities or processes which are currently considered to be critical to the overall management of odour on-site.

Schedule B (see **Appendix F**) to this report also sets out the routine weekly checks (as per current procedures) which will be carried out to help minimise the potential for odorous releases off-site. These routine checks are based upon the potential odours which are considered to be continuous, as a result of the processes at ADM.

The odorous process areas at the site, together with the current controls are set out in the following sections.

7.2 Odour Minimisation Controls during Preparation and Refining

The preparation, refining and processing stages, particularly the soap-stock separation (aqueous mixture of soap and phosphatides) stage can be very odorous. Unwanted fatty acids in oil are reacted with sodium hydroxide (NaOH) to form “soaps”, which are then fed back into meal due to their calorific value. Due to the continuous nature of the process, ensuring the adjacent roller shutters are closed at all times is therefore the principal control to prevent odours escaping to the environment and potentially off-site.

Other potentially odorous include minor fugitive emissions from the refinery vessels, together with the deodoriser / neutraliser. Again, due to the continuous nature of the process, closing all external doors is the principal control.

The open vessels in the prep area are controlled via ventilation to the OAS (odour abatement system - wet scrubber). This has been installed to keep workplace air at an acceptable standard of odour concentration for worker welfare, but there is a corresponding benefit in controlling emissions which may leave the built environment as fugitive odour emissions.

7.3 Controls during Dewatering

There is a new sludge dewatering press installed since 2019. The system is a screw and bowl system and uses a coagulant polymer dosed pro rate to the throughput. Since the new system has been installed the dryness of the sludge has improved considerably, thereby eliminating the risk of odour emissions almost completely.

7.4 Controls during Waste Collection

There are no solid wastes that should generate a strong odour when managed as per ADM Erith's site procedures. All waste products are placed in skips/containers, with no dumping of any form of waste on the hard-standing.

DAF sludge does have the potential to be odorous and is generated close to the site boundary, however, the waste is removed from this location multiple times per week (therefore only small quantities of this waste are stored in this area). Furthermore, given recent improvements to the process, the DAF Sludge is far dryer than was historically the case, with much less odour generating potential. The DAF sludge is removed to the Waste Yard and is stored in a larger skip and is taken away for waste disposal multiple times per month.

The procedure Waste management (current ref 52400) documents the controls for the transfer of waste, waste management, segregation and recycling and outlines how all of the wastes generated on-site are correctly identified and recovered or disposed of in accordance with the Environmental Protection (Duty of Care) Regulations 1991, ADM IPPC Permit Condition 2.6 and the Waste Regulations (England & Wales) 2011. These procedures serve to minimise fugitive odour emissions from stored wastes.

7.5 Controls during Wastewater Treatment

The periodic clearing out of the waste water treatment facility has the potential to result in short-term odour episodes. Tankering away the sludge is a transient but essential process. Enclosed tanks/ gulpers designed specifically for the purpose are used to remove sludge from the wastewater treatment plant and leave the Site as promptly as possible.

8. ODOUR MONITORING MEASURES

8.1 Overview

The principal ADM procedure to address potential odour impacts is the ADM Erith Odour Management Procedure (current ref 181084). The measures set out in this OMP summarise the contents of the current version of this procedure and include certain additional measures.

8.2 Weekly Monitoring Procedure

Monitoring for odour ('sniff-test') will be carried out around the site at various fixed locations and at differing times of day and shift (i.e. morning, afternoon, evening, night-time). Odour observation records will be completed for each visit and held for quality assurance purposes.

The 'sniff-test' is the most appropriate for regular surveys, however the extent of the test and the chosen test locations are likely to vary based on the specific purpose of the test. Seasonal variation also occurs in the monitoring programme, with increased monitoring near receptors during the warmer months, to reflect when occupiers/residents are likely to have windows open. Examples of different monitoring purposes include:

- assessing off-site or boundary impacts under unfavourable meteorological conditions / north-westerly winds;
- assessing the validity of a complaint;
- assessing a particular odorous source or activity; or
- simply conducting a general site-walk over to confirm odour is acceptable.

An odour monitoring form is provided in **Appendix B** (taken from H4 guidance), which sets out the items and parameters that should be noted and observations to make. As well as the FIDOR parameters discussed in **Section 4.5**, the form also requires meteorological conditions to be recorded to assist with remedial action, odour source identification and responses to any complaints even if received well after the fact.

When performing the site odour surveys, the following suggestions are also made in H4 to ensure robust data collection:

- on occasion, two people simultaneously but independently carrying out the sniff-tests will improve data collection, particularly if responding to a reported odour complaint or checking off-site impacts;
- the odour surveys should be undertaken by staff who have had minimal exposure to potential odour on-site and are not de-sensitised to the site odour i.e. use of office-based staff or ensure surveys are undertaken at the start of an individual's shift to minimise the chance of odour habituation;
- it is advised to have a certain redundancy of staff that can undertake the surveys;
- the staff should be free from cold-like symptoms (including sinusitis/ sore throat) as these may restrict the ability to observe odours;
- it is advised that staff avoid strong scented food or drinks (including coffee) for a minimum of 30 minutes, and avoid wearing strong scented toiletries as well as the use of car air-fresheners, if driving to survey locations off-site;
- up-wind and down-wind 'sniff' tests should always be undertaken to help identify the source of odours (and those from off-site); and
- note any external activities that could be odour sources, or could contribute towards odours from on-site or be a confounding factor.

The above recommendations are followed by the ADM testers as far as is reasonably practicable. The frequency of testing is reviewed should concerns or complaints be received.

8.3 Source Monitoring

Third-party stack emissions testing at emission points A10 (scrubber OAS), A14 (biofilter) and A13 Extraction via thermal oxidiser periodically takes place. Once the new thermal oxidiser/scrubber system is operational, emission testing will continue at emission point A28 instead of A13.

Periodically the inlets to the OAS scrubber and thermal oxidiser, and the inlet and outlet of the biofilters are also monitored.

9. ODOUR INCIDENT PROCEDURES

The ADM Odour Complaints Investigation Procedure (ref 28974, current version summarised in **Appendix A**) sets out the current procedure for actions and investigation in the event of odour and fugitive odour impacts.

If an odour complaint is received by ADM directly, through the Environment Agency or the London Borough of Bexley Council (LBB), the immediate course of action is to understand whether the alleged odour has come from the ADM site and attempt to identify the source to see how it could be stopped in future. A checklist is included in the current version of the ADM Erith Odour Assessment & Complaints Investigation Procedure and covers items such as a review of the weather conditions and operational status of emission sources (Odour Abatement System and Thermal Oxidiser in particular) in the hours before and after the alleged episode.

When ADM is notified of an alleged odour complaint, the complaint may have occurred several weeks or months prior to receiving notice, making an investigation into the incident very difficult.

ADM therefore encourages the local residents to contact the Environment Manager at ADM Erith directly at the time of any observed odour impacts, so that an investigation can be undertaken as quickly as possible (typically within an hour of the complaint) to identify the potential reason for the odour at the receptor and provide a solution. An odour complaint form is set out in the ADM Erith Odour Management procedure (current ref 181084) and the current version of this has been reproduced in **Appendix C** of this OMP for (subject to change as this is a live document).

Furthermore, an example of the current odour diary form (subject to change as this is a live document) is also set out in **Appendix D** and ADM invites neighbours located closest to the Erith facility to complete these regularly, to assist ADM in understanding and managing off- site odour impacts. These will be provided in the event of repeated complaints at any given receptor location.

Completed odour diaries will be submitted to and reviewed by the Environment Manager, with notification given to the Site Manager.

APPENDIX A ADM ODOUR COMPLAINTS INVESTIGATION PROCEDURE (SUMMARY OF CURRENT VERSION)

Odour Complaint Investigation Summary for Procedure 28974

- Precautions
- Required Complaint Information
- Complaint Investigation Procedure
- Environmental Considerations
- Required Training
- Document Control

Odour Complaint Report Form		
Date	Location	Grid Reference
Name and address of complainant:		
Tel No of complainant:		
Date and Time of complaint:		
Date time and duration of offending odour:		
Location of odour if not at above address:		
Weather conditions: (i.e. dry, rain, fog, snow)		
Cloud cover :(%)		
Cloud height:(low, med, high)		
Wind strength:(Light, moderate, strong, gusting)		
Wind direction:		
Complainant's description of odour:		
Has complainant any other comments relating to the odour:		
Have there been any other complaints relating to this location:		
Any other relevant information:		
On site activities at the time the odour occurred:		
Operating conditions at the time the odour occurred:		

APPENDIX B ODOUR MONITORING FORM (TAKEN FROM H4 GUIDANCE)

Odour report form			**Date**	
Time of test				
Location of test				
Weather conditions (dry, rain etc)				
Temperature (very warm mild etc or degrees if known)				
Wind strength (none, light etc) Use Beaufort scale if known				
Wind direction (eg from NE)				
Intensity (see below)				
Duration (of test)				
Constant or intermittent?				
What does it smell like?				
Receptor sensitivity				
Is the source evident?				
Any other comments or observations				

Sketch a plan of where the tests were taken and the potential source(s):

Intensity		**Receptor Sensitivity**
0 – No odour	4 – Strong odour	Low (eg footpath, road)
1 – Very faint odour	5 – Very strong odour	Medium (eg industrial or commercial building)
2 – Faint odour	6 – Extremely strong odour	High (eg housing, pub/hotel etc)
3 – Distinct odour	Ref: German Standard VDI 3882, Part 14	

APPENDIX C ODOUR COMPLAINT FORM (CURRENT VERSION)

ODOUR COMPLAINT FORM			
Time and date of complaint:	Name and address of complainant:		
Telephone number of			
Date of odour:			
Time of odour:			
Location of odour (if not at address above)			
Weather conditions (dry, rain etc)			
Temperature (very warm mild etc or degrees if known)			
Wind strength (none, light etc) Use Beaufort scale if known			
Wind direction (eg from NE)			
Description of the odour:			
What does it smell like?			
Intensity (see below):			
Duration:			
Constant or intermittent?			
Any other comments about odour?			
Have there been other similar complaints?			
Any other relevant information			
Does ADM accept that odour complaint is potentially attributed to site activities?			
Activities on-site at the time of the complaint?			
Operating conditions at the time of the complaint?			
Actions taken:			
Form completed by:	Date:	Signed:	

Intensity
0 – No odour; 1 – Very faint odour; 2 – Faint odour; 3 – Distinct odour; 4 – Strong odour; 5 – Very strong odour; 6 – Extremely strong odour (Ref: German Standard VDI 3882, Part 14)

APPENDIX D EXAMPLE ODOUR DIARY FORM (CURRENT VERSION)

ODOUR DIARY						**Sheet No:**
Name & Telephone number:		Address				
Date of odour:						
Time of odour:						
Location of odour (if not at address above)						
Weather conditions (dry, rain etc)						
Temperature (very warm mild etc or degrees if known)						
Wind strength (none, light etc)						
Wind direction (eg from NE)						
What does it smell like? How unpleasant is it? Do you consider this smell offensive?						
Intensity – How strong was it?: (see below):						
How long did it go on for (time)?						
Was it constant or intermittent?						
What do you believe the source/cause to be?						
Any actions taken or other comments?						

Intensity

0 – No odour; 1 – Very faint odour; 2 – Faint odour; 3 – Distinct odour; 4 – Strong odour;

5 – Very strong odour; 6 – Extremely strong odour (Ref: German Standard VDI 3882, Part 14)

APPENDIX E SCHEDULE A - ODOUR MANAGEMENT – CURRENT DEVELOPMENT PLAN

The ADM Erith Odour Management Plan and associated and referenced procedures are live documents which from time to time will be updated. The development items outlined below surrounding activities or processes which are considered to be critical to the overall management of odour on-site and require further control measures.

These measures consist of actions designed to minimise both ‘routine’ and ‘non-routine’ odour sources at ADM. ‘Routine’ odour sources are considered to be those inherently associated with the processes at ADM and are likely to occur continuously. ‘Non-routine’ odour sources are those which are considered to be preventable and occur due to equipment failure / process upsets.

These actions demonstrate ADM’s commitment towards minimising odour at the Erith facility and potential off-site odour impacts.

DEVELOPMENT ITEMS

By addressing the following priority action, the unnecessary release of ‘non-routine’ odour emissions will be greatly reduced and/or eliminated, largely by focussing on improvements in performance.

- Thermal oxidiser

  The on-going performance of the thermal oxidiser has been reviewed as a priority; due to the number of times it has been off-line in 2015. Its function is key for processing the hydrogen sulphide and hexane-rich mineral oil system exhaust which minimises odour. A new replacement thermal oxidiser with integrated wet caustic scrubber is due to be installed in Q4 2021. This will improve not only reduce H_2S emissions during normal operations but is also expected to reduce the duration and frequency of bypass events.

APPENDIX F SCHEDULE B - ODOUR MANAGEMENT - DAILY CHECKS (AS PER CURRENT VERSION OF ADM PROCEDURES)

This Schedule list the checks which need to be carried out on a daily basis to help minimise the potential for odorous releases off-site, as far as is reasonably practicable. These routine checks are based upon the potential odours which are considered to be continuous, as a result of the processes at ADM.

Many of the checks are simply visual however others may require a more detailed review and understanding of the process.

The checks listed below are indicative and are comprehensively referenced from the current version of the ADM Erith Odour Management Procedure (ref 181084, this is a live document subject to change in accordance with operational, regulatory or other internal or external factors).

Visual Checks:

- Ensure any spilled rapeseed is swept up and collected immediately.
- Ensure all roller doors / shutters are closed during loading / unloading.
- Ensure no waste material is left on the hard-standing.
- Ensure all external doors are closed to prevent odour egress from continuous process.

Equipment Checks:

- Confirm odour abatement system is operational and the associated ventilation in the prep area is functional:
  - Refer to unit details within:
    - Odour Abatement System (current ref 14592)
    - Biofilter Odour Abatement (current ref 28924)
    - Thermal Oxidiser odour and emissions to air control (current ref 181848)
    - the ADM Erith ADM Erith Odour Management (current ref 181084) and
    - Environmental Complaints procedure (current ref 49451)
- Confirm OAS is operational:
  - Check power is available to the unit
  - Check flow-rate is within range
  - Check oxidising solution flow rate/levels are within range
  - Check freshwater supply to OAS
- Confirm biofilter(s) are all operational:
  - Check integrity of each structure
  - Check flow-rate from DTDC
  - Check nozzle function and water vapour supply
  - Check quantity and quality of ‘husk’ filter material
  - Refer to Biofilter Operating Procedure
- Confirm thermal oxidiser is operational:
  - Check power is available to the unit
  - Check mineral exhaust flow-rate

- Check chamber temperature is within range

- Confirm storm-water sump isn't blocked and is functional:
  - Check the level of settled debris in sump is less than 50% of the outgoing pipe diameter
  - Remove excess debris if necessary. Do not allow settled sump waste to go into outgoing pipe
  - Check the cover is in-tact and the surrounding above-ground area is free from material that may leach into the system
- Confirm wastewater treatment facility isn't blocked and is functional: Refer to Wastewater Evaporator System Operating Procedures
  - Checking the surge tank is correctly overflowing through the swan neck
  - Check the temperature
  - Check the pH
- Confirm sludge de-watering is operating effectively:
  - Check effluent input flows rates
  - Check sludge capture rate and mechanism
- Confirm DAF unit is operating effectively:
  - Refer to DAF Operating Procedures
  - Check the effluent flow rates
  - Check the coagulation dosing
  - Check the inlet and outlet pH

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The business of sustainability

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The Water Industry Act 1991

CONSENT

to discharge trade effluent into a public sewer

T.E. Case No: TCRS1786

THAMES WATER UTILITIES LTD.

Water Industry Act 1991

CONSENT TO THE DISCHARGE OF TRADE EFFLUENT

WHEREAS

1. ADM Erith Ltd of
Church Manorway
Erith
Kent
DA8 1DL

is/are the occupier(s)/owner(s) (hereinafter called "the Applicant")of the trade premises known as

ADM Erith Ltd and situate at
Church Manorway
Erith
Kent
DA8 1DL

(hereinafter called "the Premises") and by notice dated Twenty Fifth day of July Two Thousand and Eight has/have made application to Thames Water Utilities Ltd. (hereinafter called "the Company") to consent to the discharge of trade effluent by him/her/them from "the Premises" into the Company's public foul water and/or combined sewers.

2. NOW THEREFORE in exercise of the powers conferred upon it in that behalf as a sewerage undertaker by the Water Industry Act 1991, the Company

HEREBY CONSENTS to the discharge of trade effluent from the Premises into the sewer(s) (as hereinafter defined) subject to the following conditions:

Nature and composition	1.	The nature and composition of the trade effluent (hereinafter called "the trade effluent") to be discharged under this consent is: Waste liquids arising from extraction, processing and refining of vegetable oils and bottling and packaging of refined vegetable oils.
Sewer(s) affected	2.	The sewer(s) into which the trade effluent may be discharged is/are the sewer(s) detailed below: Church Manorway No change shall be made in such point(s) of discharge without prior consent in writing of the Company.
Maximum quantity to be discharged	3.	The maximum quantity of the trade effluent which may be discharged on any one day of twenty-four hours determined from midnight to midnight shall not exceed 1200.000 m^3.
Maximum rate of discharge	4.	The maximum rate at which the trade effluent may be discharged shall not exceed 70.000 m^3 per hour.

Matter to be eliminated prior to discharge to the sewer(s)	5.	(a) There shall be eliminated from the trade effluent before it is discharged into the sewer(s) any matter, which, either alone or in combination with any matter with which it is likely to come into contact while passing through any sewers, would injure or obstruct any such sewers or cause injury to and/or damage to the health of any person lawfully present in such sewers, pumping stations or sewage treatment works or would make specially difficult or expensive the treatment or disposal of their contents and in particular but without prejudice to the generality of the foregoing words the following matters:- (i) Petroleum spirit (ii) Calcium carbide (iii) Thiourea and thiourea derivatives (iv) Non biodegradable detergents (b) The trade effluent shall not contain substances listed in Schedule 1 of the Trade Effluents (Prescribed Processes and Substances) Regulations 1989, as amended, at a concentration greater than background concentration as defined in such regulations. (c) The trade effluent shall not contain any of the substances listed in APPENDIX 1 at a concentration expressed in milligrams per litre greater than that stated. SEE APPENDIX 1
Temperature	6.	No trade effluent shall be discharged which has a temperature higher than 43.3 degrees Celsius (110 degrees Fahrenheit).
Acidity or alkalinity	7.	No trade effluent shall be discharged the pH value of which is less than 6.0 or greater than 11.0.
Condensing water	8.	No condensing water shall be discharged.
Changes in occupier or process	9.	The Applicant of the Premises shall forthwith give to the Company notice in writing of any changes or proposed changes in the company name, address, occupier, or processes of manufacture or the nature of the raw materials used or of any other circumstances which may alter the nature and composition or the volume of the trade effluent or may result in the permanent cessation of the discharge.
Commencement of Discharge	10.	The commencement date of this Consent will be the date the Company acknowledges satisfactory receipt of the Consent duly signed by or on behalf of the Applicant unless otherwise stated and the Applicant must not discharge the trade effluent before the commencement date.
Payment	11.	The Applicant of the Premises shall pay to the Company for the trade effluent discharged into the sewer (a) a sum calculated in accordance with the provisions contained in the Company's Charges Scheme together with (b) the amount of any additional expenses which the Company may from time to time incur with respect to the monitoring, analysis, reception, treatment and disposal of the trade effluent. All sums payable to the Company under this condition shall become due and

payable on demand.

Entry and samples

12. The Applicant of the Premises shall permit duly authorised representatives of the company to inspect, examine and test at all reasonable times any works and apparatus installed in connection with the trade effluent and to take samples of the trade effluent.

Inspection

13 (i) An inspection chamber or manhole shall be provided and maintained by the Applicant of the Premises in a suitable position defined in connection with each pipe through which the trade effluent being discharged and such inspection chamber or manhole shall be so constructed and maintained by the Applicant as to enable duly authorised representatives of the Company to take samples at any time of the matter passing into the sewer(s) from the Premises.

Measurement and determination of discharge

(ii) A notch gauge and continuous recorder or some other apparatus suitable and adequate for measuring and automatically recording the volume, nature, composition and rate of discharge of the trade effluent being discharged into the sewer(s) shall, if required by the Company be provided and maintained by the Applicant of the Premises to the satisfaction of the Company in connection with every pipe through which the trade effluent is being discharged.

Records

(iii) Records in such a form as the Company may require shall be kept of the volume, rate of discharge, nature and composition of the trade effluent discharged into the sewer(s) and shall be available at all reasonable times for inspection by duly authorised representatives of the Company and copies of such records shall be sent to the Company on demand.

(iv) If the notch gauge and continuous recorder or other apparatus aforesaid ceases to register or measure correctly then, unless otherwise agreed, the quantity of the trade effluent discharged into the sewer(s) during the period from the date on which the records of the volume of the trade effluent discharged into the sewer(s) were last accepted by the Company as being correct up to the date when the notch gauge and continuous recorder or other apparatus aforesaid again registers correctly shall, for the purpose of any payment to be made to the Company, be based on the average daily volume of the trade effluent discharged during the period of one month preceding the date on which the said records were last accepted as aforesaid or during the month immediately after the notch gauge and continuous recorder or other apparatus aforesaid has been corrected, whichever is the higher.

(v) The foregoing provisions of this condition shall be of no effect so long as there is available to the satisfaction of the Company some other method approved by the Company of sampling the trade effluent or of determining, measuring and recording the volume and rate of discharge and the nature and composition of the trade effluent discharged.

Vacation of Site

14. The Applicant(s) must notify the Company in writing at least 21 days in advance of the following events:

1. vacation of the Premises by the Applicant for any reason, whether permanent or temporary;
2. change of ownership or occupation of the Premises;
3. the Applicant's entry into liquidation whether voluntarily or compulsorily or bankruptcy, if an individual;
4. the presentation of a petition for the appointment of an administrator or a receiver or manager in respect of the Applicant's undertakings;

5. cessation of discharge of trade effluent from the Premises.

Signed

D. F. C. Wiltshire
Senior Consultant - Wastewater Quality
Duly authorised to sign on behalf of the company

Dated this 19th day of November 2008

Statement of Acceptance

I acknowledge the receipt of this document.

Signed By.....

Name(please print).....

Date.....

Position Held.....

NOTES:

(a) All communications should be sent to the following address

Senior Consultant - Trade Effluent
Thames Water Utilities Ltd
Crossness Sewage Treatment Works
Belvedere Road
Abbey Wood
London
SE2 9AQ

(b) Your attention is drawn to the right of appeal to the Director General of Water Services conferred by Section 122 of the Water Industry Act 1991 if you are aggrieved by any condition attached to this Consent.

(c) A standing charge for all sewerage services plus a domestic sewerage charge is payable in addition to charges for trade effluent flows.

(d) A copy of Thames Water Utilities Ltd Charges Scheme is obtainable from the Thames Water Customer Centre.

(e) If you discharge trade effluent in contravention of a condition of this Consent you will be guilty of a criminal offence and may be subject to prosecution.

APPENDIX 1

The trade effluent shall not contain any of the substances listed below at a concentration expressed in milligrams per litre greater than that stated:

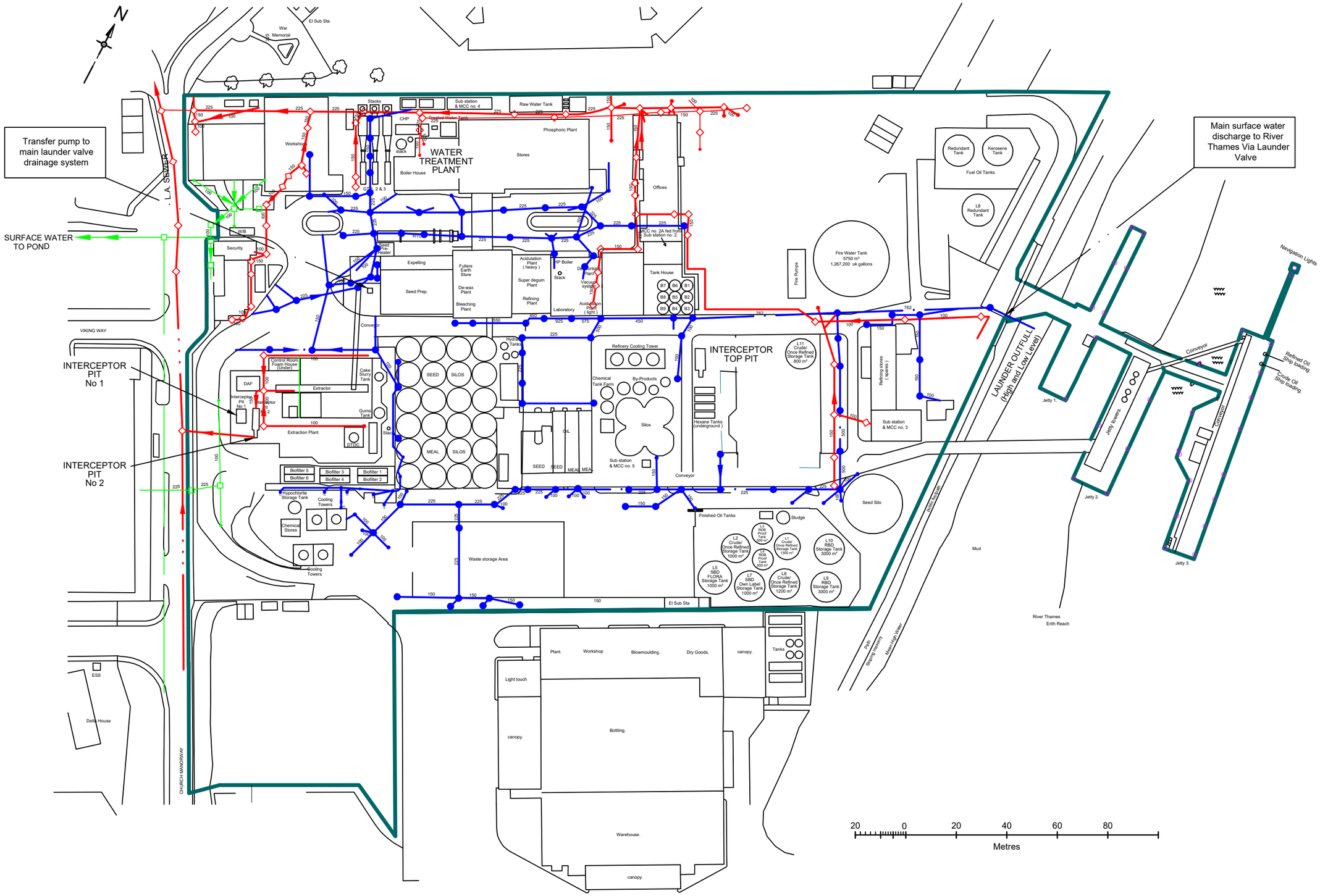
Settleable Solids	400
Chemical Oxygen Demand	3000
Saponifiable Oil or Grease	50
Unsaponifiable Oil or Grease	25
Sulphide	1
Ammoniacal Nitrogen	35
Sulphate	1800
Rapidly Settleable Solids	100
Phosphate (as P)	8
Mercury	0.001
4 Pentene Nitrile	25

THERE ARE NO FURTHER LIMITS IN THIS APPENDIX

Figure A5 - ADM Erith LTD Site Drainage

LEGEND

- LAUDER DRAIN OUTFALL TO RIVER THAMES
- FOUL DRAIN TO SEWER
- SURFACE WATER DISCHARGE TO POND



912-GEN-ENV-186

Section: 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier: **3D TRASAR™ 3DT134**
Substance type: CLP Mixture

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Use of the Substance/Mixture : COOLING WATER TREATMENT

Identified uses : Cooling Water Treatment

Recommended restrictions on use : Reserved for industrial and professional use.

1.3 Details of the supplier of the safety data sheet:

COMPANY IDENTIFICATION
NALCO EUROPE B.V.
Postbus 627
2300 AP Leiden, The Netherlands
TEL: 0031 71 5241100

LOCAL COMPANY IDENTIFICATION
Nalco Ltd.
P.O. BOX 11, WINNINGTON AVENUE
NORTHWICH, CHESHIRE, U.K. CW8 4DX
TEL: +44 (0)1606 74488

For Product Safety information please contact: msdseame@nalco.com

1.4 Emergency telephone number: +32-(0)3-575-5555 Trans-European

Date of Compilation/Revision: 07.03.2018
Version Number: 1.4

Section: 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Not a hazardous substance or mixture.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Not a hazardous substance or mixture.

Precautionary Statements : **Prevention:**
P264 Wash hands thoroughly after handling.
Storage:
P401 Store in accordance with local regulations.

2.3 Other hazards

None known.

Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Remarks : No hazardous ingredients

Section: 4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled : Get medical attention if symptoms occur.

In case of skin contact : Wash off with soap and plenty of water.
Get medical attention if symptoms occur.

In case of eye contact : Rinse with plenty of water.
Get medical attention if symptoms occur.

If swallowed : Rinse mouth.
Get medical attention if symptoms occur.

Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders.Use personal protective equipment as required.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

4.3 Indication of immediate medical attention and special treatment needed

Treatment : No specific measures identified.

Section: 5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Specific hazards during firefighting : Not flammable or combustible.

Hazardous combustion products : Decomposition products may include the following materials:
Carbon oxides
nitrogen oxides (NOx)
Sulphur oxides
Oxides of phosphorus

5.3 Advice for firefighters

Special protective equipment for firefighters	:	Use personal protective equipment.
Further information	:	Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

Section: 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel	:	Refer to protective measures listed in sections 7 and 8.
Advice for emergency responders	:	If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials.

6.2 Environmental precautions

Environmental precautions	:	No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Methods for cleaning up	:	Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Flush away traces with water. For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway.

6.4 Reference to other sections

See Section 1 for emergency contact information.
For personal protection see section 8.
See Section 13 for additional waste treatment information.

Section: 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Advice on safe handling	:	For personal protection see section 8. Wash hands after handling.
Hygiene measures	:	Wash hands before breaks and immediately after handling the product.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers	:	Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.
Suitable material	:	The following compatibility data is suggested based on similar product data and/or industry experience: Buna-N, Polyurethane, Polypropylene, Polyethylene, Plasite 7122, Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

Unsuitable material	:	The following compatibility data is suggested based on similar product data and/or industry experience: Brass, Stainless Steel 304, EPDM, Hypalon, Neoprene, Viton

7.3 Specific end use(s)

Specific use(s)	:	COOLING WATER TREATMENT

Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Individual protection measures

Hygiene measures	:	Wash hands before breaks and immediately after handling the product.
Eye/face protection (EN 166)	:	Safety glasses
Hand protection (EN 374)	:	Recommended preventive skin protection Gloves Nitrile rubber butyl-rubber Breakthrough time: 1 – 4 hours Minimum thickness for butyl-rubber 0.3 mm for nitrile rubber 0.2 mm or equivalent (please refer to the gloves manufacturer/distributor for advise). Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Skin and body protection (EN 14605)	:	Wear suitable protective clothing.
Respiratory protection (EN 143, 14387)	:	When respiratory risks cannot be avoided or sufficiently limited by technical means of collective protection or by measures, methods or procedures of work organization, consider the use of certified respiratory protection equipment meeting EU requirements (89/656/EEC, 89/686/EEC), or equivalent, with filter type:P

Environmental exposure controls

General advice	:	Consider the provision of containment around storage vessels.

Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	:	Liquid
Colour	:	yellow
Odour	:	odourless
Flash point	:	> 93.3 °C
pH	:	3.2, 100 %
Odour Threshold	:	no data available
Melting point/freezing point	:	FREEZING POINT: -3.6 °C
Initial boiling point and boiling range	:	no data available
Evaporation rate	:	no data available
Flammability (solid, gas)	:	no data available
Upper explosion limit	:	no data available
Lower explosion limit	:	no data available
Vapour pressure	:	no data available
Relative vapour density	:	no data available
Relative density	:	1.16 (20.0 °C)
Density	:	1.16 g/cm3
Solubility(ies)		
Water solubility	:	completely soluble
Solubility in other solvents	:	no data available
Partition coefficient: n-octanol/water	:	no data available
Auto-ignition temperature	:	no data available
Thermal decomposition	:	no data available
Viscosity		
Viscosity, dynamic	:	no data available
Viscosity, kinematic	:	19.6 mm2/s (20 °C)
Explosive properties	:	no data available
Oxidizing properties	:	no data available

9.2 Other information

no data available

Section: 10. STABILITY AND REACTIVITY

10.1 Reactivity

No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions : No dangerous reaction known under conditions of normal use.

10.4 Conditions to avoid

Conditions to avoid : Extremes of temperature

10.5 Incompatible materials

Materials to avoid : Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products : Decomposition products may include the following materials:
Carbon oxides
nitrogen oxides (NOx)
Sulphur oxides
Oxides of phosphorus

Section: 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Information on likely routes of exposure : Inhalation, Eye contact, Skin contact

Toxicity

Product

Acute oral toxicity	:	There is no data available for this product.
Acute inhalation toxicity	:	There is no data available for this product.
Skin corrosion/irritation	:	There is no data available for this product.
Serious eye damage/eye irritation	:	There is no data available for this product.
Respiratory or skin sensitisation	:	There is no data available for this product.
Carcinogenicity	:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
Reproductive effects	:	No toxicity to reproduction
Germ cell mutagenicity	:	Contains no ingredient listed as a mutagen
Teratogenicity	:	There is no data available for this product.
STOT - single exposure	:	Based on available data, the classification criteria are not met.
STOT - repeated exposure	:	There is no data available for this product.

Aspiration toxicity	:	No aspiration toxicity classification

Potential Health Effects

Eyes	:	Health injuries are not known or expected under normal use.
Skin	:	Health injuries are not known or expected under normal use.
Ingestion	:	Health injuries are not known or expected under normal use.
Inhalation	:	Health injuries are not known or expected under normal use.
Chronic Exposure	:	Health injuries are not known or expected under normal use.

Experience with human exposure

Eye contact	:	No symptoms known or expected.
Skin contact	:	No symptoms known or expected.
Ingestion	:	No symptoms known or expected.
Inhalation	:	No symptoms known or expected.
Further information	:	no data available

Section: 12. ECOLOGICAL INFORMATION

12.1 Ecotoxicity

Product

Environmental Effects	:	This product has no known ecotoxicological effects.
Toxicity to fish	:	96 h LC50 Rainbow Trout: 2,828 mg/l Test substance: Representative polymer tested in water with DOC 96 h LC50 Rainbow Trout: > 10,000 mg/l Test substance: Similar Product 96 h NOEC Rainbow Trout: 6,000 mg/l Test substance: Similar Product
Toxicity to daphnia and other aquatic invertebrates	:	48 h EC50 Daphnia magna: 760 mg/l 48 h LC50 Ceriodaphnia dubia: 1,227 mg/l Test substance: Similar Product 48 h LC50 Mysid Shrimp (Mysidopsis bahia): > 10,000 mg/l Test substance: Similar Product 48 h NOEC Ceriodaphnia dubia: 648 mg/l

Test substance: Similar Product

48 h NOEC Mysid Shrimp (Mysidopsis bahia): 6,000 mg/l
Test substance: Similar Product

Toxicity to algae : no data available

12.2 Persistence and degradability

Product

Biodegradability : The organic portion of this preparation is expected to be poorly biodegradable.

Biodegradation Assessment : The product may be degraded via abiotic processes.

TOTAL ORGANIC CARBON (TOC): 100,000 mg/l

Biological Oxygen Demand (BOD): 5 d 3,600 mg/l

Chemical Oxygen Demand (COD): 240,000 mg/l

12.3 Bioaccumulative potential

Product

Bioaccumulation : No bioaccumulation will occur. The large size of the polymer is incompatible with transport across the cellular membranes.

12.4 Mobility in soil

Product

The product is eliminated via abiotic process (adsorption on activated sludge) to a large amount from the aqueous phase.

12.5 Results of PBT and vPvB assessment

Product

Assessment : This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

NOEC on earthworm: > 1000 mg/l (representative polymer)AOX information: Product contains no organic halogens.Discharge in minor quantity into adapted biological units of sewage treatment plants is not expected to affect the efficiency of the activated sludge process.

Section: 13. DISPOSAL CONSIDERATIONS

Dispose of in accordance with the European Directives on waste and hazardous waste.Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.

13.1 Waste treatment methods

Product	:	Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.
Contaminated packaging	:	Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.
Guidance for Waste Code selection	:	Inorganic wastes containing not dangerous substances with concentration >= 0.1%. If this product is used in any further processes, the final user must redefine and assign the most appropriate European Waste Catalogue Code. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable European (EU Directive 2008/98/EC) and local regulations.

Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

Land transport (ADR/ADN/RID)

14.1 UN number:	Not applicable
14.2 UN proper shipping name:	PRODUCT IS NOT REGULATED DURING TRANSPORTATION
14.3 Transport hazard class(es):	Not applicable
14.4 Packing group:	Not applicable
14.5 Environmental hazards:	No
14.6 Special precautions for user:	Not applicable

Air transport (IATA)

14.1 UN number:	Not applicable
14.2 UN proper shipping name:	PRODUCT IS NOT REGULATED DURING TRANSPORTATION
14.3 Transport hazard class(es):	Not applicable
14.4 Packing group:	Not applicable
14.5 Environmental hazards:	No
14.6 Special precautions for user:	Not applicable

Sea transport (IMDG/IMO)

14.1 UN number:	Not applicable
14.2 UN proper shipping name:	PRODUCT IS NOT REGULATED DURING TRANSPORTATION
14.3 Transport hazard class(es):	Not applicable
14.4 Packing group:	Not applicable
14.5 Environmental hazards:	No
14.6 Special precautions for user:	Not applicable
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:	Not applicable

Section: 15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:

INTERNATIONAL REGULATIONS

NSF NON-FOOD COMPOUNDS REGISTRATION PROGRAM (former USDA List of Proprietary Substances & Non-Food Compounds):
NSF Registration number for this product is: 149776
This product is acceptable for treatment of cooling and retort water (G5) in and around food processing areas. This product is acceptable for treating boilers, steam lines, and/or cooling systems (G7) where neither the treated water nor the steam produced may contact edible products in and around food processing areas.

INTERNATIONAL CHEMICAL CONTROL LAWS

CANADA
The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

United States TSCA Inventory
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

NATIONAL REGULATIONS GERMANY

Water contaminating class (Germany)	:	WGK 1 Classification according VwVwS, Annex 4.

15.2 Chemical Safety Assessment:

No Chemical Safety Assessment has been carried out.

Section: 16. OTHER INFORMATION

Procedure used to derive the classification according to REGULATION (EC) No 1272/2008

Classification	Justification
Not a hazardous substance or mixture.	Calculation method

Full text of other abbreviations

ADN – European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR – European Agreement concerning the International Carriage of Dangerous Goods by Road; AICS – Australian Inventory of Chemical Substances; ASTM – American Society for the Testing of Materials; bw – Body weight; CLP – Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR – Carcinogen, Mutagen or Reproductive Toxicant; DIN – Standard of the German Institute for Standardisation; DSL – Domestic Substances List (Canada); ECHA – European Chemicals Agency; EC-Number – European Community number; ECx – Concentration associated with x% response; ELx – Loading rate associated with x% response; EmS – Emergency Schedule; ENCS – Existing and New Chemical Substances (Japan); ErCx – Concentration associated with x% growth rate response; GHS – Globally Harmonized System; GLP – Good Laboratory Practice; IARC – International Agency for Research on Cancer; IATA – International Air Transport Association; IBC – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 – Half maximal inhibitory concentration; ICAO – International Civil Aviation Organization; IECSC – Inventory of Existing Chemical Substances in China; IMDG – International Maritime Dangerous Goods; IMO – International Maritime Organization; ISHL – Industrial Safety and Health Law (Japan); ISO – International Organisation for Standardization; KECI – Korea Existing Chemicals Inventory; LC50 – Lethal Concentration to 50 % of a test population; LD50 – Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL – International

Convention for the Prevention of Pollution from Ships; n.o.s. – Not Otherwise Specified; NO(A)EC – No Observed (Adverse) Effect Concentration; NO(A)EL – No Observed (Adverse) Effect Level; NOELR – No Observable Effect Loading Rate; NZIoC – New Zealand Inventory of Chemicals; OECD – Organization for Economic Co-operation and Development; OPPTS – Office of Chemical Safety and Pollution Prevention; PBT – Persistent, Bioaccumulative and Toxic substance; PICCS – Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR – (Quantitative) Structure Activity Relationship; REACH – Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID – Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT – Self-Accelerating Decomposition Temperature; SDS – Safety Data Sheet; TCSI – Taiwan Chemical Substance Inventory; TRGS – Technical Rule for Hazardous Substances; TSCA – Toxic Substances Control Act (United States); UN – United Nations; vPvB – Very Persistent and Very Bioaccumulative

Further information

Sources of key data used to compile the Safety Data Sheet	:	IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer. The possible key literature references and data sources which may have been used in conjunction with the consideration of expert judgment to compile this Safety Data Sheet: European regulations/directives (including (EC) No. 1907/2006, (EC) No. 1272/2008), supplier data, inter-net, ESIS, IUCLID, ERIcards, Non European official regulatory data and other data sources.
Prepared By	:	Regulatory Affairs

Numbers quoted in the MSDS are given in the format: 1,000,000 = 1 million and 1,000 = 1 thousand. 0.1 = 1 tenth and 0.001 = 1 thousandth

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Annex: Exposure Scenarios

Exposure Scenario: Cooling Water Treatment

Life Cycle Stage	:	Industrial uses: Uses of substances as such or in preparations at industrial sites	
Sector of use	:	**SU4**	Manufacture of food products
		SU5	Manufacture of textiles, leather, fur
		SU6b	Manufacture of pulp, paper and paper products
		SU6a	Manufacture of wood and wood products
		SU7	Printing and reproduction of recorded media

SU8	Manufacture of bulk, large scale chemicals (including petroleum products)
SU9	Manufacture of fine chemicals
SU 10	Formulation [mixing] of preparations and/ or re-packaging (excluding alloys)
SU11	Manufacture of rubber products
SU12	Manufacture of plastics products, including compounding and conversion
SU13	Manufacture of other non-metallic mineral products, e.g. plasters, cement
SU14	Manufacture of basic metals, including alloys
SU15	Manufacture of fabricated metal products, except machinery and equipment
SU16	Manufacture of computer, electronic and optical products, electrical equipment
SU17	General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment
SU20	Health services
SU23	Electricity, steam, gas water supply and sewage treatment
SU24	Scientific research and development

Contributing scenario controlling environmental exposure for:

Environmental release category	:	**ERC4**	Industrial use of processing aids in processes and products, not becoming part of articles
Daily amount per site	:	1000 kg	
Type of Sewage Treatment Plant	:	none	

Contributing scenario controlling worker exposure for:

Process category	:	**PROC8a**	Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities
Exposure duration	:	15 min	
Operational conditions and risk management measures	:	Indoor	
		Local Exhaust Ventilation is not required	
General ventilation		Ventilation rate per hour: 1	
Skin Protection	:	Yes: See Section 8	
Respiratory Protection	:	No	

Contributing scenario controlling worker exposure for:

Process category	:	**PROC3**	Use in closed batch process (synthesis or formulation)
Exposure duration	:	60 min	
Operational conditions and risk management measures	:	Indoor	
		Local Exhaust Ventilation is not required	
General ventilation		Ventilation rate per hour:	1
Skin Protection	:	Yes: See Section 8	
Respiratory Protection	:	No	

Contributing scenario controlling worker exposure for:

Process category	:	**PROC15**	Use as laboratory reagent
Exposure duration	:	60 min	
Operational conditions and risk management measures	:	Indoor	
		Local Exhaust Ventilation is not required	
General ventilation		Ventilation rate per hour:	1
Skin Protection	:	Yes: See Section 8	
Respiratory Protection	:	No	

Contributing scenario controlling worker exposure for:

Process category	:	**PROC28**	Manual maintenance (cleaning and repair) of machinery
Exposure duration	:	240 min	
Operational conditions and risk management measures	:	Indoor	
		Local Exhaust Ventilation is not required	
General ventilation		Ventilation rate per hour:	1
Skin Protection	:	Yes: See Section 8	
Respiratory Protection	:	No	

Section: 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier: **NALCO® 2504**
Substance type: CLP Mixture

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Use of the Substance/Mixture : BIODISPERSANT

Recommended restrictions on use : Reserved for industrial and professional use.

1.3 Details of the supplier of the safety data sheet:

COMPANY IDENTIFICATION
NALCO EUROPE B.V.
Postbus 627
2300 AP Leiden, The Netherlands
TEL: 0031 71 5241100

LOCAL COMPANY IDENTIFICATION
Nalco Ltd.
P.O. BOX 11, WINNINGTON AVENUE
NORTHWICH, CHESHIRE, U.K. CW8 4DX
TEL: +44 (0)1606 74488

For Product Safety information please contact: msdseame@nalco.com

1.4 Emergency telephone number: +32-(0)3-575-5555 Trans-European

Date of Compilation/Revision: 28.03.2017
Version Number: 1.2

Section: 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Not a hazardous substance or mixture.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Not a hazardous substance or mixture.

Precautionary Statements :

Prevention:
P264 Wash hands thoroughly after handling.
Response:
P322 Specific measures: consult SDS Section 4.
Storage:
P401 Store in accordance with local regulations.

Special labelling of certain mixtures : Safety data sheet available on request.

2.3 Other hazards

None known.

Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

Chemical Name	CAS-No. EC-No. REACH No.	Classification (REGULATION (EC) No 1272/2008)	Concentration: [%]
Ethylene Oxide - Propylene Oxide Copolymer	9003-11-6	Acute toxicity Category 4; H332	30 - < 50

For the full text of the H-Statements mentioned in this Section, see Section 16.

Section: 4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled : Get medical attention if symptoms occur.

In case of skin contact : Wash off with soap and plenty of water.
Get medical attention if symptoms occur.

In case of eye contact : Rinse with plenty of water.
Get medical attention if symptoms occur.

If swallowed : Rinse mouth.
Get medical attention if symptoms occur.

Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders.Use personal protective equipment as required.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

4.3 Indication of immediate medical attention and special treatment needed

Treatment : No specific measures identified.

Section: 5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2 Special hazards arising from the substance or mixture

Specific hazards during firefighting : Not flammable or combustible.

Hazardous combustion products : Decomposition products may include the following materials:
Carbon oxides

nitrogen oxides (NOx)
Sulphur oxides
Oxides of phosphorus

5.3 Advice for firefighters

Special protective equipment for firefighters	:	Use personal protective equipment.
Further information	:	Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

Section: 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel	:	Ensure adequate ventilation. Refer to protective measures listed in sections 7 and 8.
Advice for emergency responders	:	If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials.

6.2 Environmental precautions

Environmental precautions	:	No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Methods for cleaning up	:	Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Flush away traces with water. For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway.

6.4 Reference to other sections

See Section 1 for emergency contact information.
For personal protection see section 8.
See Section 13 for additional waste treatment information.

Section: 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Advice on safe handling	:	For personal protection see section 8. Wash hands after handling.
Hygiene measures	:	Wash hands before breaks and immediately after handling the product.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers	:	Keep out of reach of children. Keep container tightly closed. Store in suitable labelled containers.

Suitable material	:	The following compatibility data is suggested based on similar product data and/or industry experience: Carbon steel, Teflon, Polypropylene, Polyethylene, Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

7.3 Specific end uses

Specific use(s)	:	BIODISPERSANT

Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Individual protection measures

Hygiene measures	:	Wash hands before breaks and immediately after handling the product.
Eye/face protection (EN 166)	:	Safety glasses
Hand protection (EN 374)	:	Recommended preventive skin protection Gloves Nitrile rubber butyl-rubber Breakthrough time: 1 – 4 hours Minimum thickness for butyl-rubber 0.3 mm for nitrile rubber 0.2 mm or equivalent (please refer to the gloves manufacturer/distributor for advise). Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Skin and body protection (EN 14605)	:	Wear suitable protective clothing.
Respiratory protection (EN 143, 14387)	:	When respiratory risks cannot be avoided or sufficiently limited by technical means of collective protection or by measures, methods or procedures of work organization, consider the use of certified respiratory protection equipment meeting EU requirements (89/656/EEC, 89/686/EEC), or equivalent, with filter type:A-P

Environmental exposure controls

General advice	:	Consider the provision of containment around storage vessels.

Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	:	Liquid
Colour	:	clear
Odour	:	slight
Flash point	:	241.1 °C Method: ASTM D 92, Cleveland open cup
pH	:	3.5, 100 % Method: ASTM E 70
Odour Threshold	:	no data available
Melting point/freezing point	:	FREEZING POINT: -2.7 °C
Initial boiling point and boiling range	:	no data available
Evaporation rate	:	no data available
Flammability (solid, gas)	:	no data available
Upper explosion limit	:	no data available
Lower explosion limit	:	no data available
Vapour pressure	:	similar to water
Relative vapour density	:	no data available
Relative density	:	1.03 (15.6 °C)
Solubility(ies)		
Water solubility	:	completely soluble
Solubility in other solvents	:	no data available
Partition coefficient: n-octanol/water	:	no data available
Auto-ignition temperature	:	no data available
Thermal decomposition temperature	:	no data available
Viscosity		
Viscosity, dynamic	:	15.5 mPa.s (15.6 °C) Method: ASTM D 2983
Viscosity, kinematic	:	no data available
Explosive properties	:	no data available
Oxidizing properties	:	no data available

9.2 Other information

no data available

Section: 10. STABILITY AND REACTIVITY

10.1 Reactivity

No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions : No dangerous reaction known under conditions of normal use.

10.4 Conditions to avoid

Conditions to avoid : Extremes of temperature

10.5 Incompatible materials

Materials to avoid : Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products : Decomposition products may include the following materials:
Carbon oxides
nitrogen oxides (NOx)
Sulphur oxides
Oxides of phosphorus

Section: 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Information on likely routes of exposure : Inhalation, Eye contact, Skin contact

Toxicity

Product

Acute oral toxicity : LD50 rat: > 5,000 mg/kg
Test substance: Similar Product

Acute inhalation toxicity : Acute toxicity estimate : > 20 mg/l
Exposure time: 4 h

Acute dermal toxicity : LD50 rabbit: > 3,000 mg/kg
Test substance: Similar Product

Skin corrosion/irritation : Species: Rabbit
Result: < 0.5
Method: Draize Test
Test substance:Similar Product

Serious eye damage/eye irritation : Species: rabbit
Result: < 15
Method: Draize Test
Test substance: Similar Product

Respiratory or skin : There is no data available for this product.

sensitization

Carcinogenicity	:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
Reproductive effects	:	No toxicity to reproduction
Germ cell mutagenicity	:	Contains no ingredient listed as a mutagen
Teratogenicity	:	There is no data available for this product.
STOT - single exposure	:	Based on available data, the classification criteria are not met.
STOT - repeated exposure	:	There is no data available for this product.
Aspiration toxicity	:	No aspiration toxicity classification

Components

Acute inhalation toxicity	:	Ethylene Oxide - Propylene Oxide Copolymer LD50 rat: 1 mg/l Exposure time: 4 h

Potential Health Effects

Eyes	:	Health injuries are not known or expected under normal use.
Skin	:	Health injuries are not known or expected under normal use.
Ingestion	:	Health injuries are not known or expected under normal use.
Inhalation	:	Health injuries are not known or expected under normal use.
Chronic Exposure	:	Health injuries are not known or expected under normal use.

Experience with human exposure

Eye contact	:	No symptoms known or expected.
Skin contact	:	No symptoms known or expected.
Ingestion	:	No symptoms known or expected.
Inhalation	:	No symptoms known or expected.
Further information	:	no data available

Section: 12. ECOLOGICAL INFORMATION

12.1 Ecotoxicity

Product

Environmental Effects	:	This product has no known ecotoxicological effects.
Toxicity to fish	:	96 hrs LC50 Lepomis macrochirus (Bluegill sunfish): > 1,000 mg/l Test substance: Product 96 hrs LC50 Oncorhynchus mykiss (rainbow trout): > 1,000 mg/l Test substance: Product
Toxicity to daphnia and other aquatic invertebrates	:	48 hrs LC50: > 100 mg/l Test substance: Active Substance
Toxicity to algae	:	72 hrs LC50: > 100 mg/l Test substance: Active Substance

Components

Toxicity to fish	:	Ethylene Oxide - Propylene Oxide Copolymer 96 h LC50 Fish: > 100 mg/l

12.2 Persistence and degradability

Product

Biodegradability	:	The organic portion of this preparation is expected to be readily biodegradable.

Components

Biodegradability	:	Ethylene Oxide - Propylene Oxide Copolymer Result: Readily biodegradable.

12.3 Bioaccumulative potential

Product

Bioaccumulation	:	This preparation or material is not expected to bioaccumulate.

12.4 Mobility in soil

Product

This substance is water soluble and is expected to remain primarily in water.

12.5 Results of PBT and vPvB assessment

Product

Assessment	:	This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

No adverse effects expected.

Section: 13. DISPOSAL CONSIDERATIONS

Dispose of in accordance with the European Directives on waste and hazardous waste.Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.

13.1 Waste treatment methods

Product	:	Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.
Contaminated packaging	:	Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.
Guidance for Waste Code selection	:	Organic wastes containing dangerous substances. If this product is used in any further processes, the final user must redefine and assign the most appropriate European Waste Catalogue Code. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable European (EU Directive 2008/98/EC) and local regulations.

Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

Land transport (ADR/ADN/RID)

14.1 UN number:	Not applicable.
14.2 UN proper shipping name:	PRODUCT IS NOT REGULATED DURING TRANSPORTATION
14.3 Transport hazard class(es):	Not applicable.
14.4 Packing group:	Not applicable.
14.5 Environmental hazards:	No
14.6 Special precautions for user:	Not applicable.

Air transport (IATA)

14.1 UN number:	Not applicable.
14.2 UN proper shipping name:	PRODUCT IS NOT REGULATED DURING TRANSPORTATION
14.3 Transport hazard class(es):	Not applicable.
14.4 Packing group:	Not applicable.
14.5 Environmental hazards:	No
14.6 Special precautions for user:	Not applicable.

Sea transport (IMDG/IMO)

14.1 UN number:	Not applicable.
14.2 UN proper shipping name:	PRODUCT IS NOT REGULATED DURING TRANSPORTATION
14.3 Transport hazard class(es):	Not applicable.
14.4 Packing group:	Not applicable.

14.5 Environmental hazards:	No
14.6 Special precautions for user:	Not applicable.
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:	Not applicable.

Section: 15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture **:**

INTERNATIONAL REGULATIONS

NSF NON-FOOD COMPOUNDS REGISTRATION PROGRAM (former USDA List of Proprietary Substances & Non-Food Compounds):
NSF Registration number for this product is: 141492
This product is acceptable for treating boilers, steam lines, and/or cooling systems (G7) where neither the treated water nor the steam produced may contact edible products in and around food processing areas.

INTERNATIONAL CHEMICAL CONTROL LAWS

The surfactant(s) contained in this preparation complies(comply) with the biodegradability criteria as laid down in Regulation (EC) No.648/2004 on detergents.

CANADA
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

United States TSCA Inventory
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

NATIONAL REGULATIONS GERMANY

Water contaminating class (Germany)	:	WGK 1 Classification according VwVwS, Annex 4.

15.2 Chemical Safety Assessment:

No Chemical Safety Assessment has been carried out.

Section: 16. OTHER INFORMATION

Procedure used to derive the classification according to REGULATION (EC) No 1272/2008

Classification	Justification
Not a hazardous substance or mixture.	Calculation method

Full text of H-Statements

H332	Harmful if inhaled.

Full text of other abbreviations

ADN – European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR – European Agreement concerning the International Carriage of Dangerous Goods by

Road; AICS – Australian Inventory of Chemical Substances; ASTM – American Society for the Testing of Materials; bw – Body weight; CLP – Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR – Carcinogen, Mutagen or Reproductive Toxicant; DIN – Standard of the German Institute for Standardisation; DSL – Domestic Substances List (Canada); ECHA – European Chemicals Agency; EC-Number – European Community number; ECx – Concentration associated with x% response; ELx – Loading rate associated with x% response; EmS – Emergency Schedule; ENCS – Existing and New Chemical Substances (Japan); ErCx – Concentration associated with x% growth rate response; GHS – Globally Harmonized System; GLP – Good Laboratory Practice; IARC – International Agency for Research on Cancer; IATA – International Air Transport Association; IBC – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 – Half maximal inhibitory concentration; ICAO – International Civil Aviation Organization; IECSC – Inventory of Existing Chemical Substances in China; IMDG – International Maritime Dangerous Goods; IMO – International Maritime Organization; ISHL – Industrial Safety and Health Law (Japan); ISO – International Organisation for Standardization; KECI – Korea Existing Chemicals Inventory; LC50 – Lethal Concentration to 50 % of a test population; LD50 – Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL – International Convention for the Prevention of Pollution from Ships; n.o.s. – Not Otherwise Specified; NO(A)EC – No Observed (Adverse) Effect Concentration; NO(A)EL – No Observed (Adverse) Effect Level; NOELR – No Observable Effect Loading Rate; NZIoC – New Zealand Inventory of Chemicals; OECD – Organization for Economic Co-operation and Development; OPPTS – Office of Chemical Safety and Pollution Prevention; PBT – Persistent, Bioaccumulative and Toxic substance; PICCS – Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR – (Quantitative) Structure Activity Relationship; REACH – Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID – Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT – Self-Accelerating Decomposition Temperature; SDS – Safety Data Sheet; TCSI – Taiwan Chemical Substance Inventory; TRGS – Technical Rule for Hazardous Substances; TSCA – Toxic Substances Control Act (United States); UN – United Nations; vPvB – Very Persistent and Very Bioaccumulative

Further information

Sources of key data used to compile the Safety Data Sheet	:	IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer. The possible key literature references and data sources which may have been used in conjunction with the consideration of expert judgment to compile this Safety Data Sheet: European regulations/directives (including (EC) No. 1907/2006, (EC) No. 1272/2008), supplier data, inter-net, ESIS, IUCLID, ERIcards, Non European official regulatory data and other data sources.
Prepared By	:	Regulatory Affairs

Numbers quoted in the MSDS are given in the format: 1,000,000 = 1 million and 1,000 = 1 thousand. 0.1 = 1 tenth and 0.001 = 1 thousandth

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.