RETFORD CIRCULAR ECONOMY PROJECT

TECHNICAL APPENDIX 13.5 ACCON AIR QUALITY ASSESSMENT

FEBRUARY 2023

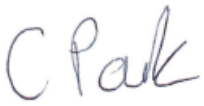
Report for:

Hive Aggregates

Retford Circular Economy Project

Air Quality Assessment

Status: Final **Date: 17.03.2023**

Author	 Henry Robins Air Quality Consultant
Reviewed by	 Christine Park Senior Environmental Consultant
Approved By	 Graham Parry Managing Director
Report For	**Hive Aggregates** **C/O Hive Energy** Woodington House East Wellow Hampshire SO51 6DQ
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1. INTRODUCTION

ACCON UK Limited (ACCON) has been commissioned by Arcus on behalf of Hive Aggregates to carry out an Air Quality Assessment for the proposed development at the Land at, and in the vicinity of, Lound Low Road, Retford, Nottinghamshire.

The 'Proposed Development' comprises the extraction and export of up to 300,000 tonnes per annum ('tpa') of pulverised fuel ('PFA') from former disposal lagoons at Lound (the 'Site') as part of a minerals planning application submitted to Nottinghamshire County Council ('NCC').

The proposed development is expected to be first operational during 2024, which for air quality purposes will be utilised as a worst-case scenario.

This assessment has been completed in order to determine whether the proposed development achieves compliance against the National Air Quality Objectives (NAQOs), along with National and Local Planning Policy. The assessment has been undertaken in accordance with the Department for Environment, Food and Rural Affairs' (DEFRA) current Technical Guidance on Local Air Quality Management (LAQM.TG22.)[1] and covers the effects of local air quality on the development.

The report assesses the overall pollutant concentrations of nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$) at nearby existing sensitive receptors. A glossary of terms is detailed in **Appendix 1** and the location of the site is shown in **Section 3.1**. **Appendix 4** identifies nearby sensitive receptor locations, modelled to assess the impacts of additional traffic emissions associated with the operation of the development.

The potential air quality impacts of the development have been assessed on the basis of the findings of detailed dispersion modelling using Breeze Roads GIS Pro Version 5.1.8, which has been undertaken in the context of relevant NAQOs, emission limit values and relevant guidance.

[1] DEFRA, Local Air Quality Management Technical Guidance 2022.

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
Brighton Office Tel: 01273 573 814

2. AIR POLLUTION POLICY CONTEXT

2.1. Legislation

2.1.1. Air Quality Strategy and Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 requires the Secretary of State to publish an air quality strategy and local authorities to review and assess the quality of air within their boundaries.[2] The latter has become known as Local Air Quality Management (LAQM), which commenced in 1997, an instrument by which the Government's air quality objectives are to be achieved over a determined period of time.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1) provides the policy framework for local air quality management and assessment in the UK. It sets out air quality standards and objectives for key air pollutants which are designed to improve air quality and protect human health and the environment from the effects of pollution. For the purpose of the strategy, th terms are defined below:

- **standards** are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive subgroups or on ecosystems
- **objectives** are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale.

The air quality standards and objectives are outlined in **Appendix 2**.

As part of this LAQM role, Local Authorities are required to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. Where a local authority identifies areas of non-compliance with the Air Quality Objectives[3] of pollutants of concern, and there is relevant public exposure, there remains a statutory need to declare the geographic extent of non-compliance as an Air Quality Management Area (AQMA) and to draw up an action plan detailing appropriate measures and policies that can be introduced in order to work towards achieving the objective(s).

The objectives for use by Local Authorities are prescribed within the Air Quality (England) Regulations 2000[4], and the Air Quality (England) (Amendment) Regulations 2002[5]. The AQOs for pollutants

[2] In 1997, the United Kingdom National Air Quality Strategy (NAQS) was published in response to the Environment Act of 1995, setting out a framework of standards and objectives for the air pollutants of most concern (SO_2, PM_{10}, NOx, CO, lead, benzene, 1,3-butadiene and tropospheric ozone), to be achieved by local authorities through a system of Local Air Quality Management (LAQM) by 2005. The aim of the strategy was to reduce the air pollutant impact on human health by reducing airborne concentrations. A review of the NAQS led to the publication of Air Quality Strategy for England, Scotland, Wales and Northern Ireland in January 2000, whilst in July 2007 was further reviewed with various amendments to the Air Quality Objectives for local authorities.
[3] Defra, 2022, Local Air Quality Management Technical Guidance (TG22)
[4] The Stationary Office (2000) Statutory Instrument 2000, The Air Quality (England) Regulations 2000, London
[5] The Stationary Office (2002) Statutory Instrument 2002, The Air Quality (England) (Amendment) Regulations 2002, London

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

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Brighton Office Tel: 01273 573 814

included within the Air Quality Strategy and assessed as part of the scope of this report are summarised in **Table 2.1**. The objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. It should be noted that Local Authorities in England have a flexible role in working towards reducing emissions and concentrations of $PM_{2.5}$.

Table 2.1: UK Air Quality Objectives for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Objectives	Averaging Period
Nitrogen dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24-hour mean
	40µg/m^3	Annual mean
Particulate Matter ($PM_{2.5}$)*	Work towards reducing emissions/ concentrations of fine particulate matter ($PM_{2.5}$)	Annual mean

*The $PM_{2.5}$ objective, which is to be met by 2020, is not in (Air Quality England) Regulations and there is no requirement for local authorities to assess it, although they are encouraged to do so.

The AQS objectives apply at locations where members of the public are likely to be regularly present and exposed over the averaging period of the objective. **Table 2.2** identifies examples of where the annual mean objectives should apply as provided in LAQM.TG22[6], and include: building facades of residential properties[7], schools, hospitals, etc. The annual mean objectives are not relevant for the building facades of offices or other places of work where members of the public do not have regular access, kerbsides or gardens. The 24-hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1-hour mean objective also applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1-hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

[6] Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.
[7] Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London.

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

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Brighton Office Tel: 01273 573 814

Table 2.2 Examples of where AQS should be applied

Averaging Period	AQS Should Apply	AQS Should Not Apply
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of: • Residential properties* • Schools • Hospitals • Care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. • Hotels, unless people live there as their permanent residence. • Residential gardens • Kerbside sites or any other location where public exposure is expected to be short term.
24-hour and 8-hour mean	All locations where the annual mean objective would apply. • Hotels • Residential gardens	Kerbside sites or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. • Kerbside sites (e.g. pavements of busy shopping streets) • Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might spend one hour or more. • Any outdoor locations where members of the public might spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

*Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local adjustment should always be applied.

2.2. Clean Air Strategy

The Clean Air Strategy 2019[8] was released in January 2019 and supersedes the policies featured in The National Air Quality Strategy. The strategy mainly deals with how to improve air quality in England but also discusses air quality policy in the devolved administrations. In comparison with the previous strategies it has a more joined-up approach, incorporating transport, domestic, industrial and agricultural emission reduction policies with a combined focus on both ambient and indoor air quality. The plan also has an emphasis on the proposal to use Clean Air Zones (CAZs) and the ULEZ (in London) to quickly bring highly polluted urban centres below the legal limits. Some of the key

[8] DEFRA, 2019, The Clean Air Strategy 2019

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
Brighton Office Tel: 01273 573 814

policies in the plan are a renewed consideration of under-used Smoke Control Areas due to the growth of highly polluting domestic wood burning stoves, new best practices being incorporated into the agricultural sector to reduce ammonia emissions (and their associated secondary particulates) and with a policy to prohibit the sale of new petrol and diesel cars by 2040. However, air quality objective limits outlined in the document are largely unchanged from the previous strategy.

2.3. The Environment Act 2021

The Environment Act 2021 establishes a legally binding duty on government to bring forward at least two new air quality targets in secondary legislation by 31 October 2022. This duty sits within the environmental targets framework outlined in the Environment Act (Part 1).

The proposed air quality targets are:

- *Annual Mean Concentration Target ('concentration target') - a maximum concentration of 10µg/m^3 to be met across England by 2040*
- *Population Exposure Reduction Target ('exposure target') - a 35% reduction in population exposure by 2040 (compared to a base year of 2018).*

The amendments to the Environment Act 1995 made through the Bill will:

- *Strengthen the local air quality management (LAQM) framework to enable greater cooperation at local level and broaden the range of organisations that play a role in improving local air quality. Responsibility for tackling local air pollution will now be shared with designated relevant public authorities, all tiers of local government and neighbouring authorities.*
- *Increase transparency and accountability by requiring the Secretary of State to regularly review the Air Quality Strategy at least every 5 years, and to publish an annual statement to Parliament on progress towards achieving air quality standards and objectives.*

The amendments to the Clean Air Act 1993 made through the Bill will help local authorities reduce pollution from domestic burning, which contributed 38% of $PM_{2.5}$ emissions in 2019. Specifically, the amendments will:

- *Replace the criminal offence of emitting smoke from a chimney in a smoke control area with a civil penalty regime, which allows for the removal of the statutory defences that currently hinder enforcement. This will enable quicker, simpler and more proportionate enforcement at a local level against the emissions of smoke within a smoke control area (SCA).*
- *Give local authorities powers to address pollution from solid fuel burning on inland waterway vessels (for example, canal boats) in smoke control areas.*
- *Strengthen the offences in relation to the sale and acquisition of certain solid fuels for use in smoke control areas, by removing the limit on the fine for delivering unapproved solid fuels to a building in a smoke control area, and requiring retailers of solid fuels to notify customers*

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
Brighton Office Tel: 01273 573 814

that that it is illegal to buy unapproved fuel for use in a smoke control area unless burning in an approved appliance.

- *Amendments to the Environmental Protection Act 1990 allow local authorities to take more substantive action against those who repeatedly emit smoke and endanger human health by extending the system of statutory nuisance to private dwellings in SCAs. Smoke from chimneys that causes a nuisance could result in a local authority issuing an abatement notice. Breaching such a notice is a criminal offence and could result in the payment of fine, as is already the case outside SCAs.*

The National Planning Policy Framework (NPPF) was first published on 27th March 2012 and updated on 24th July 2018, 19th February 2019, and 20th July 2021. The policy sets out the government's planning policies for England and how these are expected to be applied.

The NPPF[9] "sets out the Government's planning policies for England and how these should be applied and provides a framework within which locally-prepared plans for housing and other development can be produced." It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out below:

Section 9 - Promoting sustainable transport:

Paragraph 105

"The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making..."

Section 15 - Conserving and enhancing the natural environment:

Paragraph 174 Bullet point 'e':

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

Paragraph 186:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality

[9] Ministry of Housing, Communities and Local Government, 2019, National Planning Policy Framework

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
Brighton Office Tel: 01273 573 814

Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

The NPPF is accompanied by relevant planning practice guidance (PPG)[10], a web-based resource which brings together planning guidance on various topics into one place. Specific guidance in respect to air quality is provided where the guiding principles on how planning can take account of the impact of new development on air quality is included. The PPG states that:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity."

The PPG sets out the information that has to be considered when deciding whether an air quality assessment may be required for a planning application, stating that:

Where air quality is a relevant consideration the local planning authority may need to establish:

- *the 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.*

It also provides guidance on options for mitigating air quality impacts, and makes clear that:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met."

Examples of mitigation include:

[10] GOV.UK. (2014). Air quality. [online] Available at: https://www.gov.uk/guidance/air-quality--3 [Accessed 07 October 2020].

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
Brighton Office Tel: 01273 573 814

- *maintaining adequate separation distances between sources of air pollution and receptors;*
- *using green infrastructure, in particular trees, where this can create a barrier or maintain separation between sources of pollution and receptors;*
- *appropriate means of filtration and ventilation;*
- *including infrastructure to promote modes of transport with a low impact on air quality (such as electric vehicle charging points);*
- *controlling dust and emissions from construction, operation and demolition; and*
- *contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.*

2.4. Local Planning Policy

2.4.1. Nottinghamshire - Minerals Local Plan – 2021 - 2036

Over the plan period to 2036 minerals will continue to be used as efficiently as possible across Nottinghamshire. Minerals are a valuable natural resource and should be worked and used in a sustainable manner and where possible reused to minimise waste.

2.4.2. Local Planning Policy - Bassetlaw Local Plan 2020-2037

Improving Air Quality

10.1.5 Bassetlaw does not have any Air Quality Management Areas or Clean Air Zones. National policy therefore requires development to 'sustain and contribute towards compliance with relevant limit values or national objectives for pollutants'. For example, DEFRA monitoring indicates that the level of nitrogen dioxide in the air around Harworth and Bircotes, Blyth and the A1M has reduced since 2001 as a result of a new traffic management scheme delivered through new development and by improvements to the A1 through the District. This Local Plan will strive to ensure air quality remains at an acceptable quality on individual sites, cumulatively across the District, and also elsewhere.

10.1.6 On that basis, proposals will be expected to minimise and mitigate air pollution and to contribute towards the achievement of relevant air quality objectives. Where relevant, an Air Quality Assessment may be required in support of development; this should be produced in accordance with the latest Environmental Protection UK guidance.

2.5. Relevant Guidance

2.5.1. Local Air Quality Management Technical Guidance (TG22)

DEFRA's Technical Guidance LAQM (TG22)[11] provides guidance in respect of the local air quality; whilst this primarily addresses LAQM activities, the guidance provides relevant methods concerning

[11] DEFRA, 2022, Local Air Quality Management Technical Guidance (TG22)

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
Brighton Office Tel: 01273 573 814

treatment and interpretation of data. The methodology in LAQM.TG22. directs air quality professionals to a number of tools published by DEFRA to predict and manage air quality. DEFRA regularly updates its Technical Guidance, with the latest LAQM Technical Guidance (TG22) published in August 2022.

2.5.2. Land-Use Planning & Development Control: Planning for Air Quality (IAQM, 2017)

This guidance[12] has been produced by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) to ensure that air quality is adequately considered in the land-use planning and development control process. The guidance, of itself, can have no formal or legal status and is not intended to replace other guidance that does have this status. The document was developed for professionals operating within the planning system. It provides them with a means of reaching sound decisions, having regard to the air quality implications of development proposals. It also is anticipated that developers will be better able to understand what will make a proposal more likely to succeed. The guidance is particularly applicable to assessing the impacts of traffic and energy centre emissions and provides advice how to describe air quality impacts and their significance.

[12] Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London.

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

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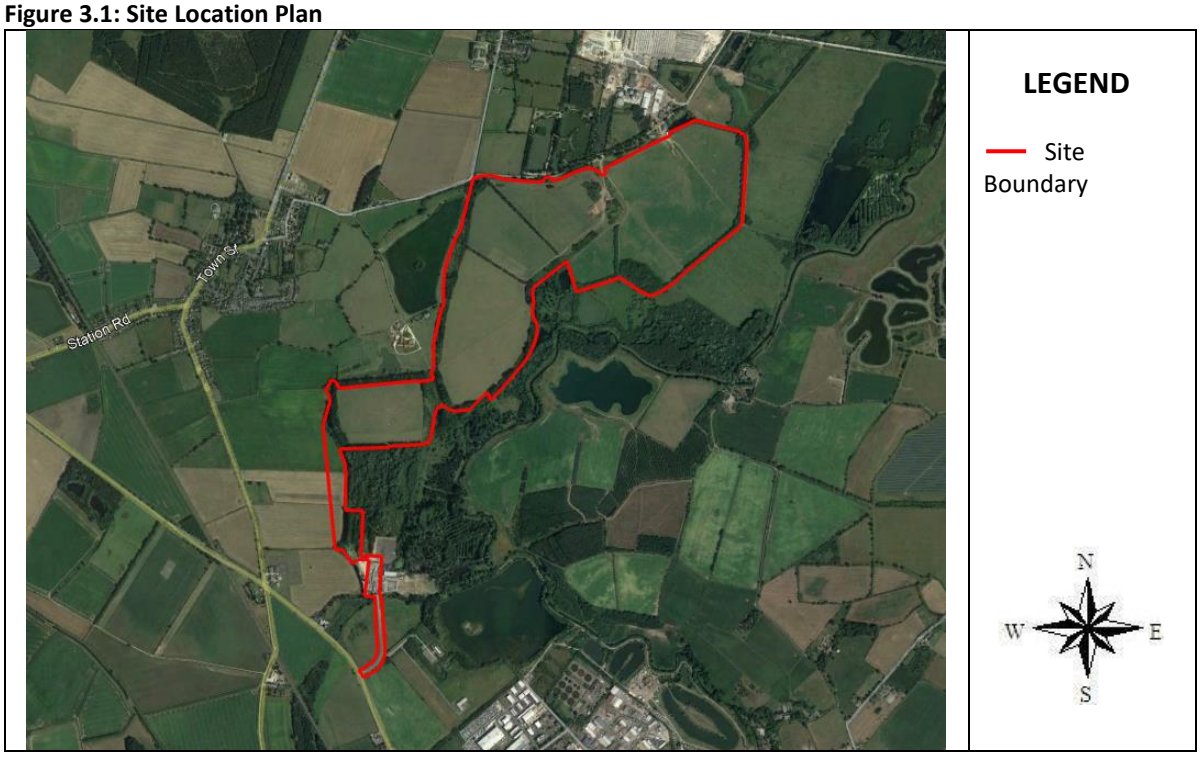
3. SITE DESCRIPTION AND BASELINE CONDITIONS

3.1. Site Description

The Site is located approximately 500m south of the village of Lound and 400m southeast of the village of Sutton-cum-Lound. Retford is located approximately 1.5km south of the Site. The Site is located at the approximate National Grid Reference (NGR): x468900, y384150. The Site is located within the administrative area of Bassetlaw District Council (BDC) in a relatively isolated location within a predominantly flat, low-lying rural agricultural setting. The location and the red line boundary of the site are detailed below in **Figure 3.1**.

Figure 3.1: Site Location Plan



3.2. Air Quality Review and Assessment

As previously indicated, Local Authorities have been required to carry out a review of local air quality within their boundaries to assess areas that may fail to achieve the limit values. Where these objectives are unlikely to be achieved, local authorities must designate these areas as AQMA's and prepare a written action plan to achieve the AQS's.

The review of air quality takes on several prescribed stages, of which each stage is reported. BDC Air Quality Annual Status Report 2020[13] provides the most recent available air quality monitoring results for BDC (2019). Whilst, an Annual Status Report has been published for 2021, the monitoring results were affected by the pandemic and therefore the data has not been relied upon. Details of the

[13] 2020 Air Quality Annual Status Report (ASR) for Bassetlaw District Council.

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
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monitoring data used for pollutant concentration model verification purposes are provided in **Section 3.3.**

3.3. Local Air Quality Monitoring

BDC monitors local air quality through an automatic monitor and diffusion tube monitoring network. The monitoring sites chosen for verification of the air quality modelling were the diffusion tube as there was publicly available traffic data for these sites.

The 2019 annual mean NO_2 concentrations for the monitoring sites are identified in **Table 3.1.** The annual mean NO_2 NAQO was not exceeded at any of the monitoring sites.

Table 3.1: Local Monitoring Data Suitable for Model Verification

Monitor Site	Grid Reference		2019 Annual Mean NO_2 (µg/m^3)	2019 Data Capture (%)
	X	Y		
25 London Road Junction, Retford	470759	380698	24.7	92
26 Hospital Road, Retford	470095	381292	30.1	100
27 Arlington Way / Grove Street, Retford	470793	381106	28.7	100

3.4. Background Concentration of Air Pollutants

Background concentrations of air pollutants for the modelling were obtained from the DEFRA pollutant concentration maps[14]. **Table 3.2** identifies the background pollutant concentrations at the proposed site at the associated 1km x 1km grid squares. All of the estimated background concentrations for the annual mean NO_2 and PM_{10} used in the assessment are significantly below the annual mean objective limit of 40µg/m^3 in 2019 and 2024.

Table 3.2: Background Concentrations of Pollutants

Location and Year	NO_x µg/m^3	NO_2 µg/m^3	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3
Verification 2019 470500, 380500	15.99	11.92	14.36	8.84
Verification 2019 470500, 381500	15.16	11.39	13.91	8.63
Site and ecological receptors - 2024 468500, 383500	9.75	7.57	14.91	8.01
Site 2024 468500, 384500	10.12	7.83	14.82	8.51
Site 2024 469500, 385500	9.79	7.59	14.19	8.30
Site 2024 470500, 384500	8.63	6.75	15.18	8.07
Site 2024 470500, 385500	8.56	6.70	14.29	7.88
Existing receptors ER1 & ER2 - 2024 465500, 388500	10.79	8.31	15.26	8.30

[14] DEFRA, *Background Mapping Data for Local Authorities- 2019* [online] Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2019

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
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Location and Year	NO_x µg/m³	NO_2 µg/m³	PM_{10} µg/m³	$PM_{2.5}$ µg/m³
Existing receptors – ER3 to ER8 - 2024 465500, 387500	9.51	7.41	14.70	7.98
Existing receptors – ER9 to ER11 - 2024 465500, 386500	9.31	7.26	15.07	8.03
Existing receptors – ER12 to ER16 - 2024 466500, 384500	9.53	7.42	14.18	7.83
Existing receptors – ER17 and ER18 - 2024 469500, 382500	10.70	8.26	13.55	7.82
Existing receptors – ER19 and ER22 - 2024 469500, 381500	11.38	8.75	13.03	7.75

Note: In 2024 the ratio between PM_{10} and $PM_{2.5}$ at the Existing Sensitive Receptors is 0.53 - 0.59.

Email: enquiry@accon-uk.com ●www.accon-uk.com
Unit B, Fronds Park, Frouds Lane, Aldermaston, Reading, RG7 4LH

Reading Office Tel: 0118 971 0000 Fax: 0118 971 2272
Brighton Office Tel: 01273 573 814

4. METHODOLOGY AND ASSESSMENT CRITERIA

4.1. Methodology

In the UK, DEFRA provides guidance on the most appropriate methods to estimate pollutant concentrations for use in Local Air Quality Management (LAQM). DEFRA regularly updates its Technical Guidance, with the latest LAQM Technical Guidance (TG22) published in August 2022. The methodology in LAQM.TG22, directs air quality professionals to a number of tools published by DEFRA to predict and manage air quality. For example, it is necessary to use the updated NO_x to NO_2 calculator to derive NO_2 concentrations from the NO_x outputs from Breeze Roads modelling. This is because NO_2 concentrations within the model are predicted using the CALINE4 NO_x to NO_2 conversion methodology, which should not be used within the model as current evidence shows that the proportion of primary NO_2 in vehicle exhausts has increased since the model was developed, which would affect the relationship between NO_x and NO_2 at roadside locations.

In order to determine the extent to which air quality issues will affect the development of the site, the study has considered the following:

- Any air quality measurements carried out in the area near the proposed development; and
- The most recent Air Quality Review and Assessment Reports from BDC.

4.2. Breeze Roads Modelling of Pollutant Concentrations

Dispersion modelling has been undertaken using Breeze Roads to determine air quality concentrations across the site. Breeze Roads is an air dispersion modelling software suite that predicts air quality impacts of carbon monoxide (CO), nitrogen dioxide, particulate matter (PM), and other inert pollutant concentrations from moving and idling motor vehicles at or alongside roadways and roadway intersections.

Breeze Roads can be used in conjunction with the MOBILE5, EMFAC emission models or other emissions data, to demonstrate compliance with the UK's National Air Quality Strategy. Breeze Roads predicts air pollutant concentrations near highways and arterial streets due to emissions from motor vehicles operating under free-flow conditions and idling vehicles. In addition, 1-hour and running 8-hour averages of CO or 24-hour and annual block averages of PM_{10} can be calculated.

4.3. Model Set-up Parameters

The most recent Emissions Factor Toolkit (EFT, version 11.0, November 2021) issued by DEFRA was used to derive emissions rates (in grams per kilometre) for vehicle movements along roads incorporated into the model.

Briefly, the changes between v10.1 and 11.0 are as follows:

- EFT 11.0 allows users to define Input Years up to 2050.
    - 2031 - 2050 outputs are limited to England (not London) only.

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- Emissions outputs for the years 2031-2050 are provided in support of climate assessments and appraisals only. Where emissions are to be used after 2030 to inform air quality assessments, the appropriate caveats around the limitations of the analysis must be included to accompany the assessment.

It is noted that the default fleet projections in EFT v11.0 are based on fleet growth assumptions which were current before the Covid-19 outbreak in the UK. In consequence, default fleet outputs from the tool do not reflect short- or longer-term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

Meteorological data from Doncaster Sheffield Airport (2019) has been utilised for the dispersion modelling, which is considered representative of the site area and its environs, and the wind rose is shown in **Appendix 3**.

4.4. Assessment Criteria

A detailed assessment was considered appropriate for this proposed development with model results being verified against local monitoring data. This was undertaken using the detailed dispersion model Breeze Roads.

For the purposes of this assessment, the limit values assigned to individual pollutants as set out in the Air Quality Standards Regulations 2010 form the basis of the air quality assessment. The limit values are based on an assessment of the effects of each pollutant on public health. Therefore, they are a good indicator in assessing whether, under normal circumstances, the air quality in the vicinity of a development is likely to be detrimental to human health.

4.5. Operation Phase

The main pollutants of concern are generally considered to be NO_2 and PM_{10} for road traffic. The Breeze Roads methodology has been used for this assessment to predict the air quality impacts of any additional traffic generated from the development on surrounding sensitive receptors.

For the assessment, the following scenarios were considered:

- 2019 Model Verification;
- 2024 Baseline without Development;
- 2024 Baseline plus Operational Traffic; and
- 2024 Baseline plus Construction Traffic.

4.5.1. Traffic Data

The Breeze Roads prediction model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the number of heavy-duty vehicles (HDVs), the distance of the road centreline from the receptors and vehicle speeds. The traffic information is detailed in **Table 4.1** and **Table 4.2** below for the verification and assessment scenarios.

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Table 4.1 identifies the traffic data for 2019 which was utilised for the verification. Traffic flow and vehicle split data were obtained from the DfT (2019). Vehicle speeds were based on speed estimations and were subsequently adjusted where it was deemed, they were not sufficiently accurate, e.g. at junctions, crossings, etc.

Table 4.1: 2019 Traffic Flow Data for Verification

Road Section	AADT	HDV%
A638 – Arlington Way, Retford	14,512	1.5
A620 – Hospital Road, Retford	15,857	2.9
A638 - North Way, Retford	16,829	2.6
Amcott Way, Retford	20,001	2.4

Note: This is a non-exhaustive summary of the road sections modelled and includes the sections that are likely to contribute the greatest emissions to the existing sensitive receptors.

Table 4.2 identifies the estimated AADT traffic flows for roads near to the proposed development site, with the proposed development fully operational. This data was provided by the transport consultants, Arcus Consultancy Services Limited.

According to the traffic consultant, the proposed mineral development will generate approximately 136 vehicle movements per day (71% HDV), and in the construction phase will result in an additional 50 vehicles movements per day (40% HDV). The proposed development flows have been applied to all the roads as a worst-case scenario.

Three scenarios were produced by Arcus which are identified below:

- 2024 Baseline
- 2024 Baseline plus Operational Traffic
- 2024 Baseline plus Construction Traffic.

Table 4.2: 2024 Opening Year Traffic Flow Data

Road	AADT Baseline No Development	HDV%	AADT Baseline plus Operational Traffic	HDV%	AADT Baseline plus Construction traffic	HDV%
A638, between Scooby and Ranskill	5,526	4.8%	5,662	6.4%	5,576	5.1%
A638, near Torworth	5,388	6.2%	5,524	7.7%	5,438	6.5%
A638, South of Barnby Moor	9,052	4.7%	9,188	5.7%	9,102	4.9%
A638, Retford	16,081	2.0%	16,217	2.6%	-	-

Note: This is a non-exhaustive summary of the road sections modelled and includes the sections that are most likely to contribute the greatest emissions to the existing sensitve receptors.

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4.6. Model Verification

Model validation undertaken by the software developer will not have been carried out in the vicinity of the site being considered in this assessment. As a result, it is necessary to perform a comparison of the modelled results with local monitoring data at suitable locations where data is available. This verification process aims to minimise model uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results. The verification was carried out in accordance with LAQM.TG22. Suitable monitoring data for the purpose of verification is available for concentrations of NO_2 at the monitoring positions detailed in **Section 3.3**.

When the monitored and modelled results are compared as recommended in LAQM.TG22 the road NO_X adjustment factor is **4.1963** (as identified in **Table 4.3**). This factor was applied to all modelled NO_x results prior to calculating modelled NO_2 using the NO_x to NO_2 calculator. In the absence of appropriate PM_{10} monitoring within close proximity to the site, the NO_x adjustment factor has also been applied to the PM_{10} modelled concentrations, in accordance with the guidance provided in LAQM.TG22.

Table 4.3: NO_2 Annual Mean Verification for 2019

Monitoring Position	Monitored		Modelled		% Difference (NO_x Roads) Before Adjustment	% Difference (NO_2 Total) After Adjustment	Road NO_X Factor
	Road NO_2 µg/m³	Road NO_X[15] µg/m³	Road NO_2 µg/m³	Road NO_X µg/m³			
25 London Road Junction, Retford	12.78	24.40	3.43	6.30	-74.19	4.09	**4.1963**
26 Hospital Road, Retford	18.71	36.58	3.44	6.30	-82.78	4.02	
27 Arlington Way / Grove Street, Retford	17.31	33.63	3.44	6.30	-81.27	-9.30	

[15] Obtained from NO_x to NO_2 Calculator Spreadsheet available from www.laqm.Defra.gov.uk

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5. IMPACTS AND CONSTRAINTS OF AIR QUALITY

5.1. Air Quality Impact of Development Traffic - Acceptability Criteria

It is common in the UK to use the Environmental Protection UK's (EPUK) Guidance[16] on Air Quality Assessments for Planning Applications to assess the impact of a development. This advises that an air quality assessment will be required where the development is anticipated to give rise to significant changes in air quality. There will also be a need to assess air quality implications of a development where a significant change in relevant exposure is anticipated. A full air quality assessment should normally be undertaken where proposals give rise to significant changes in traffic flows, typically a change in annual average daily traffic (AADT) of 100 LDV flows in or adjacent to an AQMA or 500 LDV flows elsewhere. Other changes caused by a development such as a major new junction, significant road realignment or a substantial increase in HDV traffic may also warrant a full impact assessment.

5.2. Air Quality Impacts

In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) updated their guidance on "Land-Use Planning and Development Control: Planning for Air Quality". The guidance provides a methodology for determining the impacts of increased pollutant concentrations at sensitive receptor locations resulting from emission sources such as the generation of traffic from development sites.

To characterise the impacts of the proposed development on local air quality, predictions of air pollutant concentrations have been made using the Breeze Roads dispersion model.

Table 5.1: Impacts of Pollutant Concentrations as a result of the Development

Long-Term Average Concentration in Assessment Year	% Change in Concentration relative to the Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
The AQAL is the Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level'				

5.3. Air Quality Impact of Development Traffic - Assessment

The 'Proposed Development' comprises the extraction and export of up to 300,000 tonnes per annum ('tpa') of pulverised fuel ('PFA') from former disposal lagoons at Lound (the 'Site') as part of a minerals planning application submitted to Nottinghamshire County Council ('NCC').

[16] Environmental Protection UK and IAQM (2017, v1.2) – Land-Use Planning and Development Control: Planning for Air Quality

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The development when operational will result in an additional 136 vehicle movements per day (71% HDV), and in the construction phase will result in an additional 50 vehicles movements per day (40% HDV), as detailed in **Table 4.2**.

The existing sensitive receptor locations are identified in **Appendix 4.5** and the modelled predicted NO_2 and particulate matter pollutant concentrations at these existing receptors are identified in **Tables 5.2**, **5.3**, **5.4** and **5.5**.

The ecological receptor locations can be identified in **Appendix 4** and the modelled predicted NO_x and particulate matter pollution concentrations can be identified In **Tables 5.6** and **5.7.**

5.4. Predicted Air Quality Constraints on the Development

As the proposed development does not include any residential development, a constraints assessment is not required.

5.5. Pollutant Concentrations - Impacts

5.5.1. Annual Mean NO_2 Concentrations – Human Receptors

Tables 5.2 and **5.3** identify the modelled NO_2 concentrations at representative existing sensitive receptors for the worst-case scenarios for which there will be no exceedances of the AQO. All impacts are classified based on the criteria found in **Table 5.1**.

All of the receptors have pollutant concentrations which are "75% or less of the AQAL" and therefore all the modelled changes in pollutant concentrations are classified as **negligible**.

All of the pollutant concentrations will remain significantly below the annual NO_2 AQO. In respect of the NO_2 1-hour AQO, there is only a risk that the NO_2 1-hour objective (200µg/m^3) could be exceeded at local sensitive receptors if the annual mean NO_2 concentration is greater than 60µg/m^3. Therefore, exceedances of NO_2 1-hour AQO would not be expected as the worst-case annual mean predicted concentration is 12.0µg/m^3 (ER20). The worst-case increase in annual mean NO_2 concentrations is predicted to be 0.5µg/m^3 (ER6), with the development completed and operational.

Table 5.2: Modelled 2024 NO_2 Concentrations - Baseline and Operational traffic - Existing Receptors

Receptor	Air Quality Objective (µg/m^3)	Baseline Without Development Total NO_2 (µg/m^3)	Baseline with Operational traffic Total NO_2 (µg/m^3)	Change in Concentration (µg/m^3)	% Change in Concentration relative to the Air Quality Assessment Level (AQAL)	Impact Descriptor
ER1	40	9.9	10.0	0.1	0.2%	Negligible
ER2		9.3	9.4	0.1	0.2%	Negligible
ER3		8.5	8.6	0.1	0.2%	Negligible
ER4		8.9	9.0	0.1	0.3%	Negligible

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Receptor	Air Quality Objective (µg/m³)	Baseline Without Development Total NO_2 (µg/m³)	Baseline with Operational traffic Total NO_2 (µg/m³)	Change in Concentration (µg/m³)	% Change in Concentration relative to the Air Quality Assessment Level (AQAL)	Impact Descriptor
ER5		9.4	9.6	0.2	0.4%	Negligible
ER6		10.4	10.9	0.5	1.1%	Negligible
ER7		9.6	9.8	0.2	0.3%	Negligible
ER8		9.0	9.0	0.0	0.2%	Negligible
ER9		8.6	8.7	0.1	0.1%	Negligible
ER10		8.3	8.3	0.0	0.1%	Negligible
ER11		8.2	8.3	0.1	0.1%	Negligible
ER12		8.7	8.8	0.1	0.1%	Negligible
ER13		8.6	8.6	0.0	0.1%	Negligible
ER14		8.7	8.8	0.1	0.1%	Negligible
ER15		8.7	8.8	0.1	0.1%	Negligible
ER16		8.0	8.0	0.0	0.0%	Negligible
ER17		10.8	10.8	0.1	0.2%	Negligible
ER18		9.2	9.2	0.0	0.1%	Negligible
ER19		11.4	11.5	0.1	0.3%	Negligible
ER20		11.8	12.0	0.2	0.7%	Negligible
ER21		9.7	9.7	0.0	0.1%	Negligible
ER22		10.6	10.6	0.0	0.2%	Negligible

Table 5.3 identifies the pollutant concentration in the construction phase, all of the pollutant concentrations will remain significantly below the annual NO_2 AQO. In respect of the NO_2 1-hour AQO, there is only a risk that the NO_2 1-hour objective (200µg/m³) could be exceeded at local sensitive receptors if the annual mean NO_2 concentration is greater than 60µg/m³. Therefore, exceedances of NO_2 1-hour AQO would not be expected as the worst-case annual mean predicted concentration is 11.8µg/m³ (ER20). The worst-case increase in annual mean NO_2 concentrations is predicted to be 0.5µg/m³ (ER6)

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Table 5.3: Modelled 2024 NO_2 Concentrations - Baseline and Construction traffic - Existing Receptors

Receptor	Air Quality Objective ($\mu g/m^3$)	Baseline Without Development Total NO_2 ($\mu g/m^3$)	Baseline with Construction Traffic Total NO_2 ($\mu g/m^3$)	Change in Concentration ($\mu g/m^3$)	% Change in Concentration relative to the Air Quality Assessment Level (AQAL)	Impact Descriptor
ER1	40	9.9	9.9	0.0	0.1%	Negligible
ER2		9.3	9.4	0.1	0.0%	Negligible
ER3		8.5	8.6	0.1	0.1%	Negligible
ER4		8.9	8.9	0.0	0.1%	Negligible
ER5		9.4	9.5	0.1	0.1%	Negligible
ER6		10.4	10.5	0.1	0.2%	Negligible
ER7		9.6	9.7	0.1	0.1%	Negligible
ER8		9.0	9.0	0.0	0.0%	Negligible
ER9		8.6	8.6	0.0	0.0%	Negligible
ER10		8.3	8.3	0.0	0.1%	Negligible
ER11		8.2	8.3	0.1	0.0%	Negligible
ER12		8.7	8.8	0.1	0.0%	Negligible
ER13		8.6	8.6	0.0	0.0%	Negligible
ER14		8.7	8.7	0.0	0.0%	Negligible
ER15		8.7	8.8	0.1	0.0%	Negligible
ER16		8.0	8.0	0.0	0.0%	Negligible
ER17		10.8	10.8	0.0	0.0%	Negligible
ER18		9.2	9.2	0.0	0.0%	Negligible
ER19		11.4	11.4	0.0	0.1%	Negligible
ER20		11.8	11.8	0.0	0.1%	Negligible
ER21		9.7	9.7	0.0	0.0%	Negligible
ER22		10.6	10.6	0.0	0.0%	Negligible

5.5.2. Annual Mean Particulate Matter Concentrations – Human Receptors

Tables 5.4 and **5.5** identify the modelled PM_{10} and $PM_{2.5}$ concentrations for the Baseline, Baseline plus Operational Traffic and Baseline plus construction traffic at existing receptor locations.

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The highest predicted annual mean PM_{10} concentration with the development is 15.6µg/m^3 (ER1). There is a maximum increase of 0.1µg/m^3 (ER1, ER7 and ER9), with the development completed and operational predicted change in PM_{10}, as a result of the proposed development.

The highest predicted annual mean $PM_{2.5}$ concentration with the development is 8.5µg/m^3 (ER1). There is a maximum increase of 0.1µg/m^3 (ER7), with the development completed and operational predicted change in $PM_{2.5}$, as a result of the proposed development.

In the construction phase the highest predicted annual mean PM_{10} and $PM_{2.5}$ concentrations are 15.6µg/m^3 and 8.5µg/m^3 respectively. There is predicted to be a maximum 0.1µg/m^3 increase in both PM_{10} and $PM_{2.5}$ pollutant concentrations during the construction phase.

Table 5.4: Modelled 2024 PM_{10} Concentrations – Existing Receptors

Receptor	Total PM_{10} Without Development µg/m^3 (Days >50 µg/m^3)	Total PM_{10} With Development µg/m^3 (Days >50 µg/m^3) [17]	Change in PM_{10} (µg/m^3)	Total PM_{10} Baseline plus Construction traffic µg/m^3 (Days >50 µg/m^3) [18]	Change in PM_{10} (µg/m^3)
ER1	15.6 (0)	15.6 (0)	0.0	15.6 (0)	0.0
ER2	15.5 (0)	15.5 (0)	0.0	15.5 (0)	0.0
ER3	14.9 (0)	14.9 (0)	0.0	14.9 (0)	0.0
ER4	15.1 (0)	15.2 (0)	0.1	15.2 (0)	0.1
ER5	15.2 (0)	15.2 (0)	0.0	15.2 (0)	0.0
ER6	15.2 (0)	15.2 (0)	0.0	15.2 (0)	0.0
ER7	15.3 (0)	15.4 (0)	0.1	15.4 (0)	0.1
ER8	15.2 (0)	15.2 (0)	0.0	15.2 (0)	0.0
ER9	15.2 (0)	15.3 (0)	0.1	15.3 (0)	0.1
ER10	15.2 (0)	15.2 (0)	0.0	15.2 (0)	0.0
ER11	15.2 (0)	15.2 (0)	0.0	15.2 (0)	0.0
ER12	14.5 (0)	14.5 (0)	0.0	14.5 (0)	0.0
ER13	14.5 (0)	14.5 (0)	0.0	14.5 (0)	0.0
ER14	14.5 (0)	14.5 (0)	0.0	14.5 (0)	0.0
ER15	14.5 (0)	14.5 (0)	0.0	14.5 (0)	0.0
ER16	14.3 (0)	14.3 (0)	0.0	14.3 (0)	0.0
ER17	14.1 (0)	14.1 (0)	0.0	14.1 (0)	0.0

[17] Not to be exceeded more than 35 times a year
[18] Not to be exceeded more than 35 times a year

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Receptor	Total PM_{10} Without Development $\mu g/m^3$ (Days >50 $\mu g/m^3$)	Total PM_{10} With Development $\mu g/m^3$ (Days >50 $\mu g/m^3$) [17]	Change in PM_{10} ($\mu g/m^3$)	Total PM_{10} Baseline plus Construction traffic $\mu g/m^3$ (Days >50 $\mu g/m^3$) [18]	Change in PM_{10} ($\mu g/m^3$)
ER18	13.8 (0)	13.8 (0)	0.0	13.8 (0)	0.0
ER19	13.6 (0)	13.6 (0)	0.0	13.6 (0)	0.0
ER20	13.4 (0)	13.4 (0)	0.0	13.4 (0)	0.0
ER21	13.2 (0)	13.2 (0)	0.0	13.2 (0)	0.0
ER22	13.4 (0)	13.4 (0)	0.0	13.4 (0)	0.0

Table 5.5: Modelled 2024 $PM_{2.5}$ Concentrations – Existing Receptors

Receptor	Total $PM_{2.5}$ Without Development $\mu g/m^3$	Total $PM_{2.5}$ With Development $\mu g/m^3$	Change in $PM_{2.5}$ ($\mu g/m^3$)	Total $PM_{2.5}$ Baseline plus Construction traffic $\mu g/m^3$	Change in $PM_{2.5}$ ($\mu g/m^3$)
ER1	8.5	8.5	0.0	8.5	0.0
ER2	8.4	8.4	0.0	8.4	0.0
ER3	8.1	8.1	0.0	8.1	0.0
ER4	8.2	8.2	0.0	8.2	0.0
ER5	8.3	8.3	0.0	8.3	0.0
ER6	8.3	8.3	0.0	8.3	0.0
ER7	8.3	8.4	0.1	8.4	0.1
ER8	8.3	8.3	0.0	8.3	0.0
ER9	8.1	8.1	0.0	8.1	0.0
ER10	8.1	8.1	0.0	8.1	0.0
ER11	8.1	8.1	0.0	8.1	0.0
ER12	8.0	8.0	0.0	8.0	0.0
ER13	8.0	8.0	0.0	8.0	0.0
ER14	8.0	8.0	0.0	8.0	0.0
ER15	8.0	8.0	0.0	8.0	0.0
ER16	7.9	7.9	0.0	7.9	0.0
ER17	8.1	8.1	0.0	8.1	0.0
ER18	7.9	7.9	0.0	7.9	0.0
ER19	8.1	8.1	0.0	8.1	0.0
ER20	7.9	7.9	0.0	7.9	0.0

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Receptor	Total $PM_{2.5}$ Without Development µg/m³	Total $PM_{2.5}$ With Development µg/m³	Change in $PM_{2.5}$ (µg/m³)	Total $PM_{2.5}$ Baseline plus Construction traffic µg/m³	Change in $PM_{2.5}$ (µg/m³)
ER21	7.9	7.9	0.0	7.9	0.0
ER22	8.0	8.0	0.0	8.0	0.0

5.5.3. Annual Mean Concentrations – Ecological Receptors

There are eleven SSSI's located within 10km of the site, which are

- Barrow Hills Sandpit
- Castle Hill Wood
- Chesterfield Canal
- Clarborough Tunnel
- Clumber Park
- Gamston & Eaton Woods & Roadside Verges
- Mattersey Hill Marsh
- River Idle Washlands
- Scrooby Top Quarry
- Sutton and Lound Gravel Pits
- Treswell Wood

The only ones with the potential to be impacted by the proposed development are Sutton and Lound Gravel Pits. What is listed for extensive areas of open water lagoons that support a variety of breeding, wintering and passage birds. Also supports a nationally important population of wintering gadwall. Adjacent to the lagoons lies areas of open grassland, acidic scrub and willow dominated woodland. The site is one of the most important localities for passage and overwintering wildfowl in the East Midlands.

Tables 5.6 and **5.7** identify the modelled NO_x concentrations both with and without the development completed and fully operational and also in the construction phase at ecological receptor locations. The ecological receptor locations are identified in **Appendix 4.5** as transect locations across the SSSI.

The highest predicted annual mean NO_x concentration with the development are 10.6µg/m³. There is a maximum 0.1µg/m³ predicted change in NO_x, with the development completed and operational, as a result of the proposed development.

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In the construction phase of the project the highest predicted annual mean NO_x concentration with the development is 10.6µg/m^3. There is a negligible predicted increase of 0.1µg/m^3 in NO_x concentrations.

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Table 5.6: Modelled 2024 NO_x, Concentrations – Ecological Receptors

Ecological Receptor	NO_X						
	Baseline Without Development Total NO_x ($\mu g/m^3$)	Baseline plus Operational Traffic Total NO_x ($\mu g/m^3$)	Change in Concentration ($\mu g/m^3$)	% Change in Concentration relative to the Air Quality Assessment Level (AQAL)	Baseline plus Construction Traffic Total NO_x ($\mu g/m^3$)	Change in Concentration ($\mu g/m^3$)	% Change in Concentration relative to the Air Quality Assessment Level (AQAL)
ECO 1	10.3	10.4	0.1	0.4%	10.4	0.1	0.4%
ECO 2	10.2	10.3	0.1	0.2%	10.3	0.1	0.2%
ECO 3	10.2	10.3	0.1	0.2%	10.3	0.1	0.2%
ECO 4	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 5	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 6	10.1	10.2	0.1	0.1%	10.2	0.1	0.1%
ECO 7	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 8	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 9	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 10	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 11	10.0	10.1	0.1	0.1%	10.1	0.1	0.1%
ECO 12	10.0	10.1	0.1	0.1%	10.1	0.1	0.1%
ECO 13	10.0	10.0	0.0	0.0%	10.0	0.0	0.0%
ECO 14	10.0	10.0	0.0	0.0%	10.0	0.0	0.0%
ECO 15	10.4	10.6	0.1	0.5%	10.6	0.2	0.5%
ECO 16	10.3	10.4	0.1	0.3%	10.4	0.1	0.3%
ECO 17	10.3	10.3	0.0	0.2%	10.3	0.1	0.2%
ECO 18	10.2	10.3	0.1	0.1%	10.3	0.1	0.1%

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ECO 19	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 20	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 21	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 22	10.1	10.2	0.1	0.1%	10.2	0.1	0.1%
ECO 23	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 24	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 25	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 26	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 27	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 28	10.0	10.1	0.1	0.1%	10.1	0.1	0.1%
ECO 29	10.5	10.6	0.1	0.4%	10.6	0.1	0.4%
ECO 30	10.4	10.5	0.1	0.2%	10.5	0.1	0.2%
ECO 31	10.3	10.4	0.1	0.2%	10.4	0.1	0.2%
ECO 32	10.3	10.3	0.0	0.1%	10.3	0.0	0.1%
ECO 33	10.2	10.3	0.1	0.1%	10.3	0.1	0.1%
ECO 34	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 35	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 36	10.2	10.2	0.0	0.1%	10.2	0.0	0.1%
ECO 37	10.1	10.2	0.1	0.1%	10.2	0.1	0.1%
ECO 38	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 39	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 40	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 41	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%
ECO 42	10.1	10.1	0.0	0.1%	10.1	0.0	0.1%

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6. MITIGATION

6.1. Operation Phase

As identified by the impact assessment, there are no exceedances of the NAQO's for NO_z, NO_x, PM_{10} or $PM_{2.5}$ at any of the ecological or existing sensitive receptors.

There are negligible expected increases in NO_2, PM_{10} and $PM_{2.5}$ concentrations at the existing sensitive receptors with the proposed extraction site operational.

Of the existing receptors, the highest resultant annual mean NO_2 pollutant concentration is at ER20 with a concentration of 12.0µg/m^3, which has a negligible increase as a result of the development scheme. Of these existing receptors, the highest resultant PM_{10} pollutant concentration was at ER1 with a concentration of 15.6µg/m^3, which has a negligible increase as a result of the development scheme.

In the construction phase the highest resultant annual mean NO_2 and PM_{10} pollutant concentrations are 11.5µg/m^3 and 15.6µg/m^3 respectively, which has a negligible increase as a result of the construction of the development scheme.

Of the ecological receptors the highest resultant annual mean NO_x pollutant concentration is 10.6µg/m^3, there is predicted to be a negligible increase in NO_x pollutant concentration as a result of the proposed mineral extraction site.

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7. CONCLUSIONS

The air pollutant concentration modelling has identified that there will be negligible increases in nitrogen dioxide and particulate matter concentrations at ecological and existing sensitive receptors as a result of the extraction site. There are no sensitive ecological or human receptor locations which will exceed the AQO, both during the construction phase and as a result of the proposed extraction site.

Accordingly, air quality impacts of the proposed extraction site are considered to be acceptable, and mitigation is not required.

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APPENDICES

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Appendix 1: Glossary of Terms

AADT	Annual Average Daily Traffic
AAHT	Annual Average Hourly Traffic
AQMA	Air Quality Management Area -An area that a local authority has designated for action, based upon predicted exceedances of Air Quality Objectives.
AQS/ NAQOs	Air Quality Standard/ National Air Quality Objectives - The concentrations of pollutants in the atmosphere, which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive sub groups.
AURN	Automatic Urban and Rural Network Air Quality Monitoring Site.
Calendar Year	The average of the concentrations measured for each pollutant for one year. In the case of the AQS this is for a calendar year.
Concentration	The amount of a (polluting) substance in a volume (of air), typically expressed as a mass of pollutant per unit volume of air (for example, micrograms per cubic metre, µg/m^3) or a volume of gaseous pollutant per unit volume of air (parts per million, ppm).
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emissions Factor Toolkit
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Objective.
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
LAQM	Local Air Quality Management
Nitrogen Oxides	Nitric oxide (NO) is mainly derived from road transport emissions and other combustion processes such as the electricity supply industry. NO is not considered to be harmful to health. However, once released to the atmosphere, NO is usually very rapidly oxidised to nitrogen dioxide (NO_2), which is harmful to health. NO_2 and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO_x).
PM_{10}/$PM_{2.5}$	Fine Particles are composed of a wide range of materials arising from a variety of sources including combustion sources (mainly road traffic), and coarse particles, suspended soils and dust from construction work. Particles are measured in a number of different size fractions according to their mean aerodynamic diameter. Most monitoring is currently focused on PM_{10} (less than 10 microns in aero-dynamic diameter), but the finer fractions such as $PM_{2.5}$ (less than 2.5 microns in aero-dynamic diameter) is becoming of increasing interest in terms of health effects.
TEMPro	TEMPro is software produced by the DfT to calculate the expected growth of traffic by year on roads throughout the country. The factor varies depending on the region and type of road.
µg/m^3	Micrograms per cubic metre of air - A measure of concentration in terms of mass per unit volume. A concentration of 1µg/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollution.

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Appendix 2: Air Quality Standards

Pollutant	Averaging Period	Limit Value	Margin of Tolerance
Benzene	Calendar Year	5µg/m^3	
Carbon Monoxide	Maximum daily running 8 Hour Mean	10mg/m^3	
Lead	Calendar Year	0.5µg/m^3	100%
Nitrogen Dioxide	One Hour	200µg/m^3 Not to be exceeded more than 18 times per year	
	Calendar Year	40µg/m^3	
Particulates (PM_{10})	One day	50µg/m^3 Not to be exceeded more than 35 times per year	50%
	Calendar Year	40µg/m^3	20%
Particulates ($PM_{2.5}$)	Calendar Year	25µg/m^3	20%
Sulphur Dioxide	One Hour	350µg/m^3 Not to be exceeded more than 24 times per calendar year	150µg/m^3
	One Day	150µg/m^3 Not to be exceeded more than 3 times per calendar year	
Nitrogen Oxides	Calendar Year	30µg/m^3	

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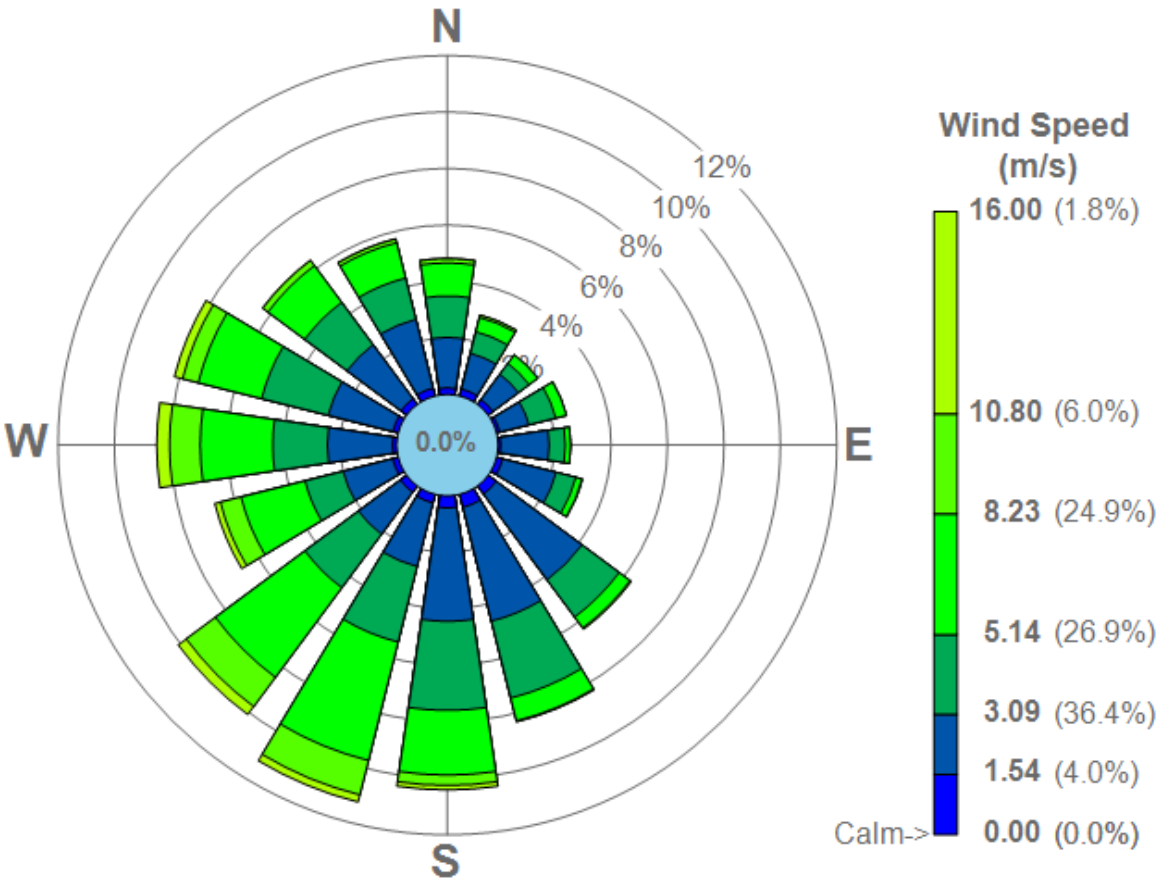
Appendix 3: 2019 Doncaster Sheffield Airport Wind Rose



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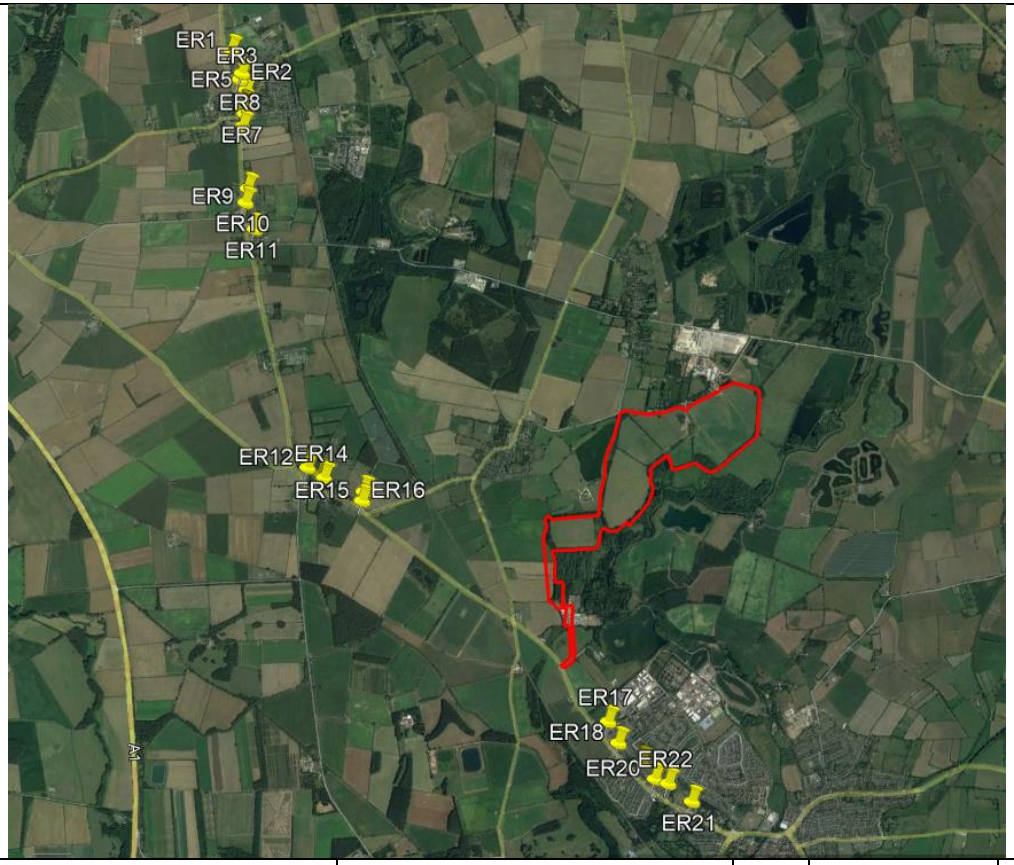
Appendix 4: Proposed Development - Representative Existing Sensitive Receptor Locations



LEGEND

Existing Receptor Location and Number

Application Site Boundary

N
W
E
S

Client: Hive Aggregates		Proposed Development Overview of Nearby Existing Receptors		Design:	HR
				Drawn:	HR
Rev: A	Description: FINAL	Project: Retford Circular Economy Project		Checked:	CP
				Approved:	GP

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Appendix 4

Scale: On Map

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Appendix 4.1: - Representative Existing Sensitive Receptor Locations ER1 to ER8

LEGEND

Existing Receptor Location and Number

Application Site Boundary

N
W
E
S

Client: Hive Aggregates		Representative Existing Sensitive Receptor Locations ER1 to ER8		Design:	HR
				Drawn:	HR
Rev: A	Description: FINAL	Project: Retford Circular Economy Project		Checked:	CP
				Approved:	GP

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Appendix 4.1

Scale: On Map

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Appendix 4.2: - Representative Existing Sensitive Receptor Locations ER9 to ER11

LEGEND

Existing Receptor Location and Number

Application Site Boundary

N
W
E
S

Client: Hive Aggregates		Representative Existing Sensitive Receptor Locations ER9 to ER11		Design:	HR
				Drawn:	HR
Rev: A	Description: FINAL	Project: Retford Circular Economy Project		Checked:	CP
				Approved:	GP

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Appendix 4.2

Scale: On Map

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Appendix 4.3: - Representative Existing Sensitive Receptor Locations ER12 to ER16

LEGEND

Existing Receptor Location and Number

Application Site Boundary

N
W
E
S

Client: Hive Aggregates		Representative Existing Sensitive Receptor Locations ER12 to ER16		Design:	HR
				Drawn:	HR
Rev: A	Description: FINAL	Project: Retford Circular Economy Project		Checked:	CP
				Approved:	GP

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Appendix 4.3

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Appendix 4.4: - Representative Existing Sensitive Receptor Locations ER17 and ER22

LEGEND

Existing Receptor Location and Number

Application Site Boundary

N
W
E
S

Client: Hive Aggregates		Representative Existing Sensitive Receptor Locations ER17 and ER22		Design:	HR
				Drawn:	HR
Rev: A	Description: FINAL	Project: Retford Circular Economy Project		Checked:	CP
				Approved:	GP

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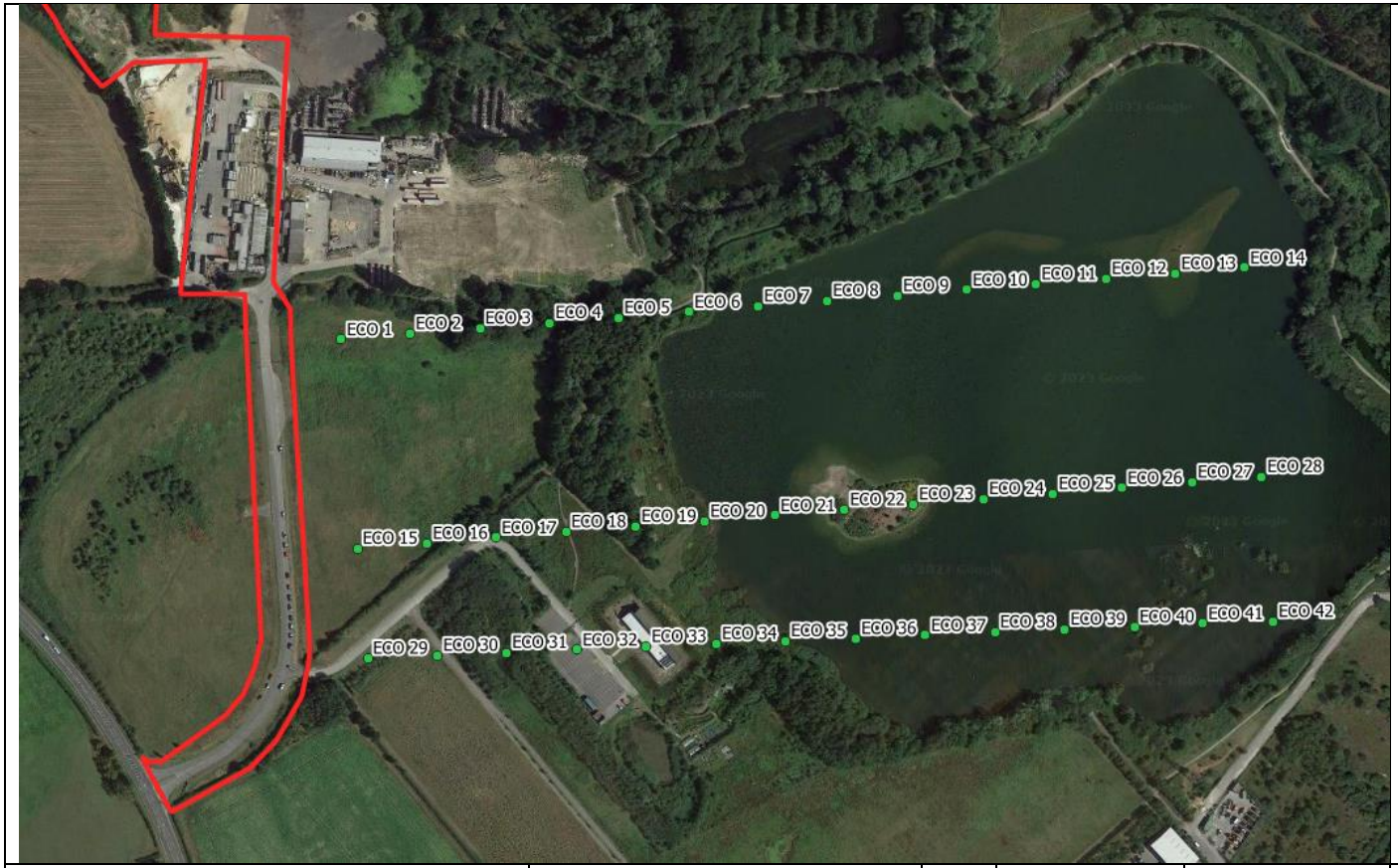
Appendix 4.5: - Representative Ecological Sensitive Receptor Locations



LEGEND

- Existing Receptor Location and Number
- Application Site Boundary

Client: Hive Aggregates		Representative Ecological Sensitive Receptor Locations		Design:	HR
				Drawn:	HR
Rev: A	Description: FINAL	Project: Retford Circular Economy Project		Checked:	CP
				Approved:	GP

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Brighton Office Tel: 01273 573 814

Email: enquiry@accon-uk.com

Reading Office:
Unit B, Fronds Park,
Frouds Lane, Aldermaston,
Reading, RG7 4LH
Tel: 0118 971 0000 Fax: 0118 971 2272

Brighton Office:
Citibase, 95 Ditchling Road,
Brighton, East Sussex, BN1 4ST
Tel: 01273 573 814

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