



Agricultural Anaerobic Digestion Plant - Air Quality Assessment

Section 73 Application to vary Planning Permission NY/2024/0200/FUL
for an Agricultural Anaerobic Digestion Facility – Land East of A162,
Home Farm, Bond Ings, Sherburn in Elmet, LS25 6FW

Halstow Energy Limited

SHF.0174.006.AQ.R.001.P01



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| Reference | SHF.0174.006.AQ.R.001.P01 |
| For: | Halstow Energy Limited |
| Status: | Final Draft |
| Date: | January 2026 |
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Non-Technical Summary

- i. Enzygo Limited was commissioned by Halstow Energy Limited to undertake an updated Air Quality Assessment to support of the application for the construction and operation of an Agricultural Anaerobic Digestion (AD) Plant on agricultural land to Land East of A162, Low Farm, South Milford, Sherburn in Elmet, LS25 6FW.
- ii. The site benefits from extant planning permission for the Development of an Agricultural Anaerobic Digestion Facility. Since the grant of planning permission, the technology provider has changed resulting in changes in layout and emissions characteristics.
- iii. The air quality assessment for the consented scheme concluded that all impacts on human and ecological sensitive receptors would be not significant.
- iv. An updated Air Quality Assessment is required to assess revised impacts at sensitive locations in the vicinity of the site.
- v. Channelled emissions from the proposals will also be subject controls and, where applicable, emission limits as part of the operator's Environmental Permit.
- vi. The results of the dispersion modelling indicate predicted concentrations of all pollutants were below the relevant environmental quality standards at all locations within the assessment extents. Impacts on concentrations at human and ecological sensitive receptor locations were predicted to remain as not significant.
- vii. Impacts on ammonia concentrations and nitrogen and acid deposition rates were predicted to remain as not significant at all assessed sensitive ecological receptor locations.
- viii. This assessment includes the proposals on the site to control ammonia emissions to an acceptable level. In addition, it should also be considered that a proportion of the development's contributions will already be accounted for in background levels and loads as they are predominantly derived from manures and other feedstocks. Robust emissions assumptions have been used in this assessment and presents the maximum concentrations using 5 years of meteorological data.
- ix. Overall, impacts were similar to the previous assessment. As such, given the assessment and proposed control measures, all impacts on human and ecological receptors from the proposed development are considered to remain not significant.

1.0 Introduction

1.1 Background

1.1.1 Enzygo Limited was commissioned by Halstow Energy Limited to undertake an updated Air Quality Assessment in respect to a revised Agricultural Anaerobic Digestion (AD) Facility on agricultural land east of A162, Low Farm, South Milford, Sherburn in Elmet, LS25 6FW.

1.1.2 The site benefits from extant planning permission. Application NY/2024/0200/FUL was granted full planning permission, with 25 conditions, on 31 July 2025 for the:

“Development of an Agricultural Anaerobic Digestion (AD) Facility and associated plant and equipment and soft landscaping at Agricultural land to the east of the A612, Home Farm, Bond Ings, Sherburn in Elmet, LS25 6FW.”

1.1.3 Since the grant of planning permission, the technology provider has changed. This has resulted in a need to amend some of the approved technological elements of the anaerobic digestion (AD) process and associated equipment and their layout. This will require amendments to the details approved under condition 2 (approved details) of the permission. The northern part of the development remains unchanged, including the landscaping and planting, site entrance and access, weighbridge, drainage basin, digestate lagoon and silage clamps (footprint remains the same although now 2 clamps rather than 3).

1.1.4 As a result of the technological amendments other elements of the plant have been reviewed to make the development more efficient in terms of use of the land and operationally more pragmatic. Primarily this relates to the layout of the car parking and the office and welfare and feedstock reception buildings but also reductions in the height of the buildings. The feedstock building has also been separated into two buildings to separate the feedstock storage from the digestate separator operations, without any increase in building footprint.

1.1.5 The following S73 air quality impact assessment is being undertaken as a review the original air quality assessment, referenced CRM.0174.001.AQ.002.R1, considering revisions to the site layout, plant/equipment revisions and updated meteorological and emissions data.

1.1.6 The original assessment concluded that emissions generated by the consented AD facility, at all receptors would be not significant.

1.1.7 The main changes relate to the digestion tanks and building sizing and layouts with some changes to the type of processing plant employed. There are now 3 digestors rather than 4 with 2 having domed rooves and 1 with a reduced height flat roof. Also the removal of nitrogen stripping and replacing the CHP engines with natural gas generators.

1.1.8 As such, an updated Air Quality Assessment was required to assess impacts at sensitive locations in the vicinity of the site.

1.1.9 The proposed AD plant will accept approximately 65,000 tonnes per annum (tpa) of feedstock. The proposed development would generate biogas which will upgraded to biomethane then connected via pipeline to be injected into the national grid directly from the site.

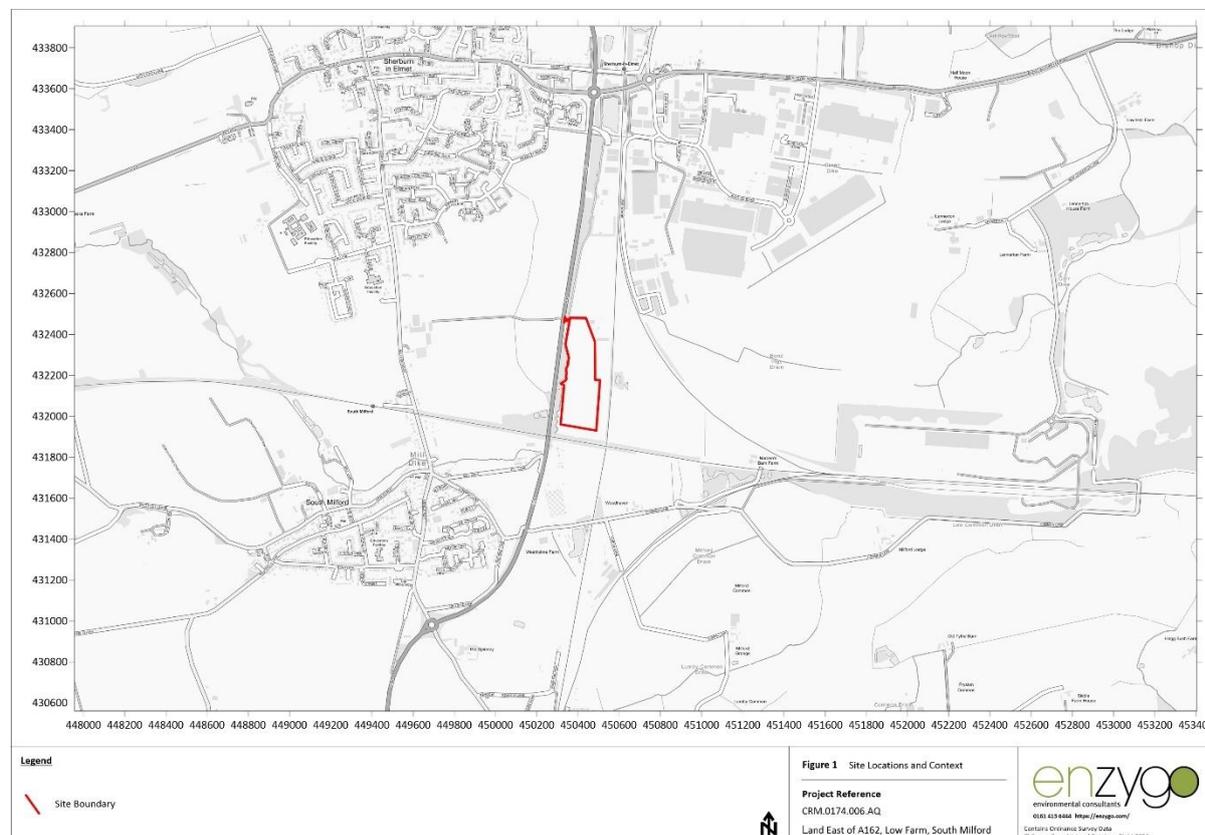
1.1.10A secondary output of the anaerobic digestion process is digestate, which will be used on local farms in place of raw manures and artificial fertilisers.

1.2 Site Location and Context

1.2.1 The facility is located on land east of A612, Low Farm, South Milford, Sherburn in Elmet at approximate National Grid Reference (NGR): 450420, 432210.

1.2.2 The site is located in a predominantly agricultural area with a sparse mixture of working farms and residential properties in the vicinity of the site. The nearest residential property is a dwelling on Mill Lane, Millford 386 m south of the centre of the site. Figure 1 shows the location of the site and surrounding areas.

Figure 1: Site Location



1.2.3 The proposed changes will not affect the main elements of the AD facility. It will have silage clamps, reception building for solid wastes, enclosed tanks for liquid wastes, enclosed anaerobic digestion tanks, biogas collection, storage and treatment, biogas use to generate energy (heat) to the facility, biogas upgrading to biomethane and injection into the gas grid, and separation of digestate into liquid and solid fractions and storage of the liquid digestate in a storage lagoon.

1.2.4 The AD facility comprises the following primary elements:

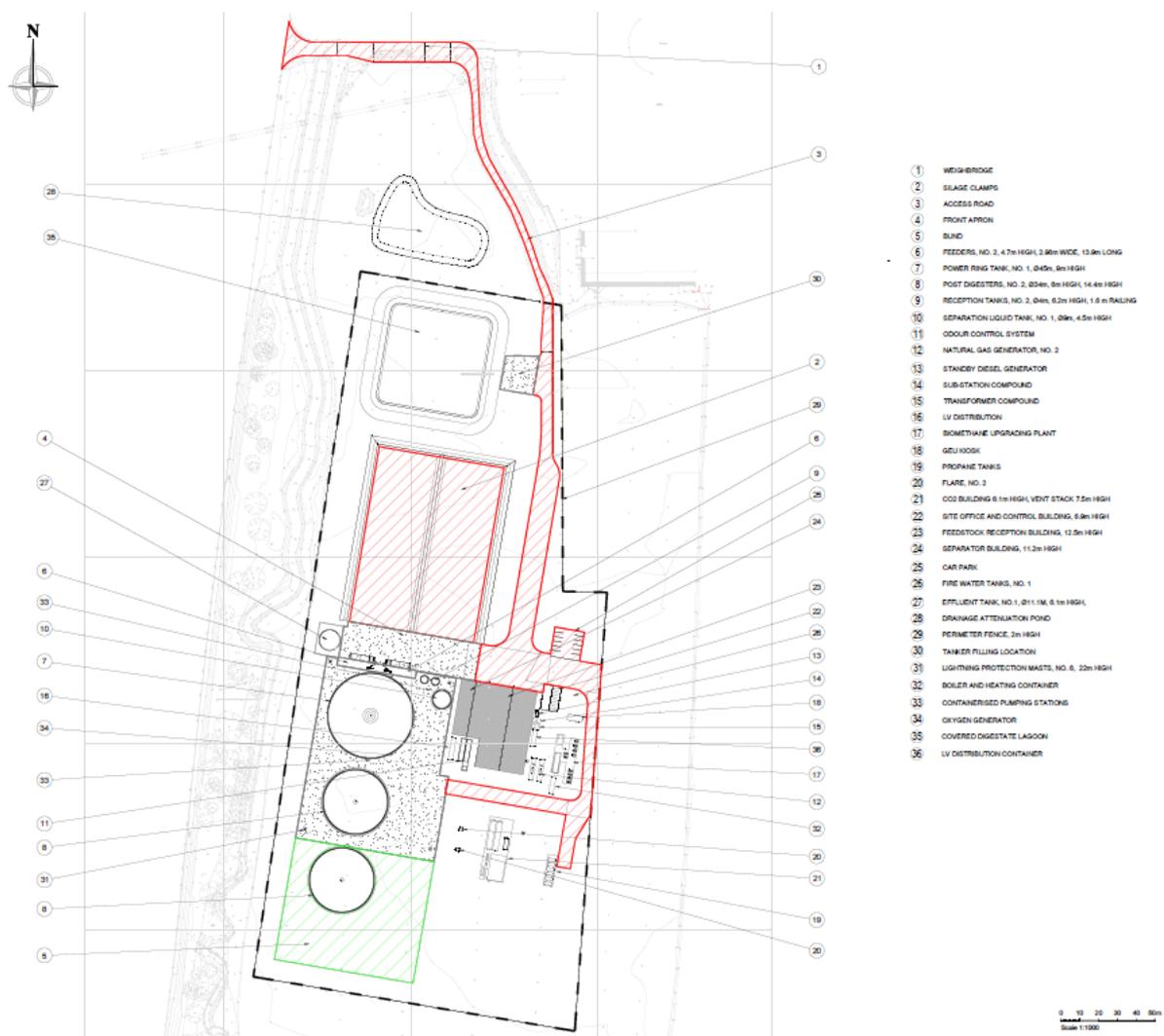
- Feedstock reception and storage: silage will be stored in SAFFO compliant silage clamps and will be covered except for the clamp face during removal of feedstocks. Manures will be stored inside a feedstock reception building which will be operated under negative pressure and have an inbuilt odour control system to control odours. Liquid feedstocks, such as, slurries will be stored in sealed reception tanks;
- The solid feedstocks will be loaded into the 2no feed hoppers with a tele-handler or loading shovel by the site operatives, according to a pre-defined ration;
- The feeders will consist of hoppers for conveyance of bulk solids. The hoppers will have covers which can retract when filling with feedstock and close when not in use. The solids are transferred into a feeding pump, where they are mixed with liquid feedstocks, in a sealed unit, with recirculated liquid, to make an organic pumpable substrate;

- The substrate is pumped into the process. The processing vessels are high-integrity, reinforced concrete tanks, two of which have membrane gas dome holders as covers. The vessels are gas tight, are heated when required using hot water recovered from a biogas boiler unit, and are mechanically mixed to ensure the substrate, bacteria and heat are well distributed around the vessel. Including the pre-treatment process, the total retention time is typically 40 days including the pre-treatment process;
- During digestion, biogas is continuously produced in the vessels, typically around 55% methane and 45% carbon dioxide;
- After digestion, the gas has been recovered from the substrate and the residual material is known as digestate. This contains indigestible fibre and nutrients. It is pumped to a separation system within a dedicated building, where the fibre is squeezed from the liquid phase. The fibre is kept within the building before removal from the site and is a clean, stackable, homogenous, low odour product that is a very popular soil improver for agricultural purposes;
- The liquid digestate fraction, after separation, is pumped into a purpose built, engineered lagoon. The lagoon will be formed from site soil and will be lined with a heavy duty liner and a cover. The liquid digestate is an excellent biofertiliser with a balanced source of nutrients and organic matter and will be spread to farmland for agricultural benefit. A minimum of 6 months digestate storage will be provided to ensure that the digestate is spread at the appropriate time of year and in line with regulations and good practice;
- A small portion of the biogas produced will be combusted in a boiler unit. This will provide heat to the digestors on the required demand. On site electricity will be provided by the natural gas engines;
- The remainder, and the largest portion, of the gas will be upgraded to convert it from biogas to biomethane. This is a clean renewable gas that is compliant with the gas grid specifications and regulations. The biomethane is continuously monitored and metered prior to injection into the gas grid;
- A side stream of clean, compressed carbon dioxide is produced from the upgrading of the biogas. It is intended that the carbon dioxide will be recovered and liquified before being sent off-site to end user (to displace non-renewable carbon dioxide).

1.2.5 Combustion emissions associated with the natural gas engine, biogas boiler, back-up emergency diesel generators and ammonia emissions from the manures and digestate have the potential to cause increases in ground level pollutant concentrations and cause impacts at sensitive locations within the vicinity of the site. Ammonia emissions also have the potential to impact at ecological sensitive receptors.

1.2.6 Figure 2 shows the proposal site layout.

Figure 2: Site Layout



1.2.7 An Air Quality Assessment has been undertaken to assess the significance of these impacts in line with the requirements of the National Planning Policy Framework and Environmental Permitting (England & Wales) Regulations 2016 (as amended).

2.0 Legislation Guidance and Policy

2.1.1 The following legislation, guidance and policy will be considered and adhered to during the preparation of the Air Quality Assessment:

- The Air Quality Standards (Amendment) Regulations, updated on 31st December 2016¹;
- Part IV of the Environment Act (1995);
- The National Planning Policy Framework (NPPF) December 2024, updated on 7th February 2025;
- The National Planning Practice Guidance (NPPG), relevant chapters updated on 1st November 2019;
- Industrial Emission Directive (2010/75/EU);
- Environmental Permitting (England & Wales) Regulations 2016 (as amended) – Chapter 4 Standard rules;
- SR2021 No 6: Anaerobic digestion facility, including use of the resultant biogas – installations, EA, Updated 5th July 2022²;
- Land-Use Planning & Development Control: Planning For Air Quality; January 2017³;
- Natural England’s approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. Natural England. June 2018⁴;
- The Air Quality Strategy for England, Department for Environment, Food and Rural Affairs (DEFRA), published 25th August 2023⁵;
- Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, 2022⁶;
- Air emissions risk assessment for your environmental permit, EA, updated on 21st July 2025⁷; and
- Environmental permitting: air dispersion modelling reports, EA, updated on 26th March 2024⁸.

2.2 Environmental Standards

2.2.1 The modelling assessment will be undertaken against the relevant long term and short-term environmental standards. The limits values, objectives and target values which are applicable to this assessment are summarised in Table 1 with relation to human health receptors and Table

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007

² <https://www.gov.uk/government/publications/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations>

³ Land-Use Planning & Development Control: Planning For Air Quality, EPUK/IAQM. 2017

⁴ Natural England’s approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. Natural England. June 2018

⁵ The Air Quality Strategy for England, DEFRA, 2023

⁶ Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, August 2022.

⁷ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

⁸ <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports>

3 in relation to ecological receptors. These criteria are collectively referred to as Environmental Quality Standards (EQSs).

Table 1: Air Quality Limit Values and Objectives

| Pollutant | Environmental Quality Standard | |
|--|--|--|
| | Concentration ($\mu\text{g}/\text{m}^3$) | Averaging Periods |
| Nitrogen dioxide (NO_2) | 40 | Annual mean |
| | 200 | 1-hour mean; not to be exceeded more than 18 times a year |
| Particulate matter with an aerodynamic diameter of less than $10 \mu\text{m}$ (PM_{10}) | 40 | Annual mean |
| | 50 | 24-hour mean; not to be exceeded more than 35 times a year |
| PM with an aerodynamic diameter of less than $2.5 \mu\text{m}$ ($\text{PM}_{2.5}$) | 20 | Annual mean |
| Carbon monoxide (CO) | 10,000 | 8-hour running mean |
| Sulphur Dioxide (SO_2) | 125 | 24-hour mean; not to be exceeded more than 3 times a year |
| | 350 | 1-hour mean; not to be exceeded more than 24 times a year |
| | 266 | 15-minute mean; not to be exceeded more than 35 times a year |
| Total Organic Carbon (TOCs) as Benzene (C_6H_6) | 5 | Annual mean |
| | 30 | 24 hour average |
| NH_3 | 180 | Annual mean |
| | 2,500 | 1-hour mean |

2.2.2 In accordance with the EA guidance⁷ it was assumed that the entire TOC emissions consisted of only benzene given that all the substances are unknown.

2.2.3 Table 2 summarises the advice provided in the DEFRA guidance LAQM.TG22⁶ on where the Air Quality Objectives (AQOs) for pollutants considered within this report apply. In reality it is likely that a high proportion of VOC releases are methane.

Table 2: Environmental Assessment Levels

| Averaging Period | Objectives Should Apply At | Objectives Should Not Apply At |
|-------------------------|---|---|
| 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 Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), 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, together with hotels Gardens of residential properties | Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term |
| 1-hour mean | All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, 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 reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer | Kerbside sites where the public would not be expected to have regular access |

2.3 Ecological Critical Loads and Levels

2.3.1 Impacts on ecological designations will be assessed in accordance with the EA guidance³. Critical loads (CLd) and levels (CLv) have been designated based on the sensitivity of the receiving habitat. Table 3 presents the CLv for the protection of vegetation for pollutants considered within this assessment.

Table 3: Critical Levels for the Protection of Vegetation

| Pollutant | Critical Level | |
|--------------------------------------|--|-------------------|
| | Concentration ($\mu\text{g}/\text{m}^3$) | Averaging Periods |
| Oxides of Nitrogen (NO_x) | 30 | Annual mean |
| | 75 or 200* | 24-hour mean |
| SO_2 | 10 | Annual mean |
| NH_3 | 1 ^a | Annual mean |
| | 3 ^b | Annual mean |
| Nutrient Nitrogen Deposition | Site Specific (See Table 22) | Annual mean |
| Acid Nitrogen Deposition | Site Specific (See Table 23) | Annual mean |

*a: Sensitive lichen communities & bryophytes and ecosystems where lichens & bryophytes are an important part of the ecosystem's integrity
b For all higher plants (all other ecosystems)*

2.3.2 The NH_3 CL used in this assessment are based on data from APIS from the relevant ecological designation. SO_2 impacts have been assessed against a CL of $10 \mu\text{g}/\text{m}^3$ on the worst-case assumption that lichens or bryophytes are present at the ecological designations.

2.3.3 The significance of impacts will be compared against the relevant CLd and CLv obtained from the UK Air Pollution Information System (APIS)⁹.

2.4 Biomethane Upgrading Plant and Carbon Dioxide Recovery

2.4.1 The Biomethane Upgrading Plant (BUP) will separate the methane from the carbon dioxide in the raw biogas.

2.4.2 The methane will flow to the grid entry unit and then ultimately to the gas network. The carbon dioxide rich stream of gas will flow to the carbon dioxide recovery unit where it is further cleaned and liquified before being taken off site as a product.

2.4.3 The combination of BUP and carbon dioxide recovery should result in no point source emissions. In the event that the carbon dioxide recovery plant is shut down for maintenance purposes then the BUP will produce a stream of off gas. This off gas will be vented to atmosphere at the vent pipe on the BUP, item 17 on the site general arrangement drawing (Figure 2).

2.4.4 A monitoring programme (a leak detection and repair programme or LDAR) for VOCs (specifically methane) will be undertaken and this will include the BUP off-gas.

2.5 Local Planning Policy

2.5.1 The site falls within the planning jurisdiction of North Yorkshire Council, which is currently in the early stages of preparing the North Yorkshire Local Plan. Once adopted, the NYC Local Plan will set put policies and strategies that applications within the area will be considered against.

2.5.2 Until the adoption of The North Yorkshire Local Plan the currently planning policy to advise on the developments is the Selby District Core Strategy Local Plan. Work on a new local plan for Selby District Council has ceased and the NYC Local Plan when adopted will replace the existing Local Plan. Due to the formal decision to discontinue the progression of the emerging Selby Local Plan, the draft allocations and policies no longer hold any status as part of an emerging development plan.

2.5.3 The following policies from the current local plan are relevant to this assessment.

Selby District Core Strategy Local Plan (2013)

The Core Strategy is the long-term strategic vision for how the district will be shaped by setting out a number of broad policies to guide development. The Core Strategy was adopted at a meeting of the Full Council on 22 October 2013. The Core Strategy Local Plan is the main document in the suite of planning documents.¹⁰

Policy SP18 Protecting and Enhancing the Environment

"The high quality and local distinctiveness of the natural and manmade environment will be sustained by:

[...]

7. Ensuring that new development protects soil, air and water quality from all types of pollution"

Policy SP19 Design Quality

⁹ <http://www.apis.ac.uk/>

¹⁰ Selby District Core Strategy Local Plan, Selby District Council, October 2013

“Proposals for all new development will be expected to contribute to enhancing community cohesion by achieving high quality design and have regard to the local character, identity and context of its surroundings including historic townscapes, settlement patterns and the open countryside.

Where appropriate schemes should take account of design codes and Neighbourhood Plans to inform good design.

Both residential and non-residential development should meet the following key requirements:

[...]

k) Preventing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water, light or noise pollution or land instability.”

2.5.4 These policies have been considered by assessing the potential air pollution impacts of the proposed development.

3.0 Methodology

3.1 Emissions Assessment

3.1.1 Emissions associated with onsite combustion process and AD operations have potential to increase pollutant concentrations at sensitive receptor locations. These were quantified in the 2024 AQA through dispersion modelling, which concluded that given the assessment and proposed control measures, all impacts on human and ecological receptors from the proposed development were assessed to be not significant. This assessment updates the modelling to take account of the proposed changes. The methodology remains the same expect to reflect the changes to baseline data, meteorological data and plant emissions.

3.1.2 An industry standard atmospheric dispersion model, ADMS 6.0, was used to model releases of the identified substances. The dispersion modelling procedure was as follows:

- Information on plant exhaust dimensions and position were provided by Halstow Energy Limited ;
- Process conditions for the natural gas engines and biomass boiler were provided by Halstow Energy Limited;
- Emission rates were calculated based on the provided process conditions and where necessary based on the EA's SR2021 guidance ¹¹; and
- Meteorological conditions were obtained from Atmospheric Dispersion Modelling (ADM) Ltd.

3.1.3 The above information was entered into ADMS 6.0 software and processed to determine pollutant concentrations in the vicinity of the site. Results are then compared against the relevant assessment criteria to determine impact significance.

3.2 Dispersion Model

3.2.1 Dispersion modelling was undertaken using ADMS 6 (v6.0.2.1), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS 6 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

3.2.2 The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected long-term and short-term averages.

3.2.3 The modelling prediction produce by the ADMS-6 are widely accepted within the UK by the EA and DEFRA.

3.3 Modelling Scenarios

3.3.1 The modelled pollutant scenarios considered in the modelling assessment are summarised in Table 4.

¹¹ <https://www.gov.uk/government/publications/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations>

Table 4: Dispersion Modelling Scenarios

| Pollutant | Modelled As | |
|--------------------------------------|---------------------------------------|-------------------|
| | Short Term | Long Term |
| NO ₂ | 99.79th percentile (%ile) 1-hour mean | Annual mean |
| NO _x | 24-hour mean | Annual mean |
| NH ₃ | 1-hour mean | Annual mean |
| CO | 8-hour rolling mean | - |
| SO ₂ | 99.9%ile 15-minute mean | Annual mean |
| | 99.73%ile 1-hour mean | |
| | 99.18%ile 24-hour mean | |
| TOC as C ₆ H ₆ | - | Annual mean |
| PM ₁₀ | 90.41%ile 24-hour mean | Annual mean |
| PM _{2.5} | - | Annual mean |
| Nitrogen deposition | - | Annual deposition |
| Acid deposition | - | Annual deposition |

3.3.2 Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the percentiles (%ile) shown in Table 4 were selected to represent the permitted number of exceedances per year.

3.3.3 For the purposes of dispersion modelling it was considered that the entire particulate matter (PM) emission consisted of only PM₁₀ or PM_{2.5}. This allowed the maximum ground level impacts, with respect to the relevant criteria, to be assessed. Actual plant emissions of PM are unlikely to only consist of only the smaller PM fractions and therefore this can be considered as a worst-case assumption.

3.3.4 Similarly, it was considered that the entire TOC emission consisted of only benzene. This allowed the maximum ground level impacts to be assessed with respect to the AQLV. Actual plant emissions of TOCs are unlikely to consist mainly of methane, as such this is considered as a worst-case assessment.

3.4 Emission Process Conditions

Engines Generator and Boiler

3.4.1 Combustion products associated with the AD process will be emitted from dedicated stacks associated with the natural gas engines, emergency diesel generators and biogas boiler. It is understood that the flare will only operate during emergency scenarios, either a result of system failure or abnormal gas production, it is expected to operate infrequently. Given the limited operating schedule impacts relating to the flare emission are considered not significant and have not been assessed further during the preparation of the assessment.

3.4.2 The biogas boiler will provide required additional heat during periods when required. Based on ambient temperatures throughout the year Halstow Energy Limited have estimated this to be approximately 24% of the year

3.4.3 The process conditions associated with the combustion processes, as provided by Halstow Energy Limited, are detailed in Table 5.

Table 5: Combustion Emission Process Conditions

| Parameter | Unit | 2 No. Natural Gas Engines | Diesel Gen | Biogas Boiler |
|--|--------------------|----------------------------------|-------------------|-------------------|
| Stack Location | NGR | 450464, 432083 450468, 432083 | 450467, 432117 | 450478, 432072 |
| Stack Height | m | 14.0 | 3.0 | 7.7 |
| Stack Exit diameter | m | 0.5 | 0.2 | 0.3 |
| Exit Temperature | °C | 470 | 590 | 170 |
| Volumetric flow rate (at 0°C/wet) ^a | Nm ³ /h | 5065 | - | 800 (at 25°C wet) |
| Volumetric flow rate (Actual) ^b | m ³ /s | 3.83 | 0.79 | 033 |
| Flue gas efflux velocity | m/s | 19.5 | 25.15 | 4.67 |

a: Referenced wet gas flow rate

Odour Stack

3.4.4 The air extracted from the reception building and separation building will be emitted through dedicated stack following treatment for odours and ammonia. Air will be extracted at a rate of 3 air exchanges per hour and free building volumes of 16,380 m³ and 2,719.5 m³ for the reception and separation buildings respectively. Air will also passively be emitted from the liquid tanks. The process conditions associated with the odour stack, are detailed in Table 6.

Table 6: Odour Stack Process Conditions

| Parameter | Unit | Value |
|--------------------------|-------------------|----------------|
| Approx. Stack Location | NGR | 450429, 432091 |
| Stack Height | m | 14.0 |
| Stack Exit diameter | m | 0.8 |
| Exit Temperature | °C | 15 (ambient) |
| Volumetric flow rate | m ³ /s | 7.866 |
| Flue gas efflux velocity | m/s | 15.649 |

a: Referenced wet gas flow rate from technical data sheets

3.5 Combustion Emissions

3.5.1 Emission rates from natural gas engine was calculated based on maximum permitted emission concentrations as defined in medium combustion plant limits. The biogas boiler emissions were based on information provided by Halstow Energy and where concentrations were not provided maximum permitted limits were used as defined in Environment Agency SR2021 No 6². The specific diesel generator emissions were provided in the typical plant technical data sheet (Appendix B).

3.5.2 The calculated mass emissions rate in grams per second is shown in Table 7 and Table 8.

Table 7: Engine Emission Rates

| Pollutant | Maximum Emission Concentration (mg/Nm ³) ^a | Mass Emission Rate (g/s) |
|-----------------|---|--------------------------|
| NO _x | 95 | 0.267 |

a: Referenced at 5% O₂, 0°C, and moisture content 0%

b: Actual conditions assuming typical O₂ 9% and moisture content 11%

Table 8: Diesel Generator Emission Rates

| Pollutant | Emission (g/kWh) ^a | Mass Emission Rate (g/s) |
|-------------------|-------------------------------|--------------------------|
| NO _x | 8.008 | 0.654 |
| CO | 0.112 | 0.009 |
| TVOC | 0.332 | 0.027 |
| PM ₁₀ | 0.137 | 0.011 |
| PM _{2.5} | 0.137 | 0.011 |

a: maximum standby power rate 294 kW

Table 9: Biogas Boiler Emission Rates

| Pollutant | Maximum Emission Concentration (mg/Nm ³) ^a | Mass Emission Rate (g/s) |
|-----------------|---|--------------------------|
| NO _x | 200 | 0.049 |
| CO | 40 | 0.004 |
| SO ₂ | 107 | 0.016 |
| TVOCs | 1,000 | 0.148 |

a: Referenced at 3% O₂, 0°C, and moisture content 0%

b: Actual conditions assuming typical O₂ 9% and moisture content 11%

3.6 Ammonia Emissions

3.6.1 NH₃ emission rates were considered for the solid and liquid manure materials and solid and liquid digestate storage.

3.6.2 Solid waste feedstocks (FYM) will be delivered to site in articulated lorries or tractor and trailer units. Solid materials will be delivered into the site and tipped on a pad outside the building and then pushed into the building following completion of tipping. This assessment has assumed a worst case where material would be left outside for 30 minutes. The manure pad area was assumed as 50 m² and emitted at a height of 1 m.

3.6.3 Several bays will be deployed within the reception building to allow for segregation and rotation of the agricultural waste batches.

3.6.4 Liquid wastes (slurries and whey) will be unloaded from delivery vehicles (tractor and tanker) into dedicated tanks, via sealed pipework. The 2 no. 60 m³ tanks will be enclosed and will vent into the OCU.

3.6.5 The digestate separation system will be within a separate enclosed building and produce approximately 40 tonnes of solid digestate per day. The vented building air will pass through the OCU. The digestate will be stored in the building and periodically loaded into vehicles for removal from site each week.

3.6.6 Following separation liquid digestate will be piped in a 250 m³ holding tank before piping into the lagoon. The lagoon will be a lined earth bank construction, 4.5 m high with a designed 750 mm freeboard.

3.6.7 The lagoon will be covered and residual emissions will be via vents surrounding the lagoons.

3.6.8 Ammonia emission controlling methods have been proposed for the input wastes and digestate storage:

- All solid manure wastes to be stored in the waste reception building;
- All solid digestate to be stored in the separation building;

- Waste reception and separation buildings to be kept closed except during deliveries and under negative pressure and air passed through the OCU with ammonia abatement with minimum 96% removal efficiency and minimum 99% odour removal through a 14 m stack;
- Slurry to be stored in enclosed tanks with vent to OCU; and
- Liquid digestate to be stored in tank with OCU prior to lagoon with impermeable cover and vents.

3.6.9 There will be no emissions from the fully enclosed digesting process itself.

3.6.10A proportion of the manures will be sourced from nearby agricultural sources and the associated ammonia emissions will currently contribute to existing baselines. To assume a worst case, these emissions which would be replaced by improved controls were not subtracted from the baselines.

3.6.11 Digestate storage throughput ammonia emissions were also accounted for. There are no readily available emission factors in the UK for digestate storage however these were assumed to be pig slurry. The NH₃ emission rate has been calculated using the value from SCAIL for pig slurry in a lagoon with a cover as a surrogate. Pig slurry is often used as a surrogate for crop-based digestate as the dry matter (DM), Total Kjeldahl Nitrogen (TKN) and Total Ammoniacal Nitrogen (TAN) of pig slurry (4%, 3.6% and 2.5% respectively)¹² are similar to the values arising from crop-based digestate analysis. In the absence of an alternative surrogate for digestate, the surrogate manure values have been used.

3.6.12 Liquid and solid digestate has used pig slurry and pig manure emission factors respectively.

3.6.13 Additional short term emissions would occur from digester feeding and digestate removal from the site. Due to the transient nature of these emissions and the relatively small volumes, ammonia emissions from these activities would be negligible.

3.6.14 NH₃ emission rates were calculated using the SCAIL online tool¹³ which is supported by the Environment Agency. This requires the following inputs:

- Source location;
- Manure source;
- Storage type (e.g. covered, open);
- Mass of fresh manure per year;
- Area of storage; and
- Number of days storage per year.

3.6.15 The calculated emissions from proposed manure and digestate storage are based on representative mass and volume of materials, confirmed by Engie and detailed in Table 10.

¹² ADAS, MANNER-NPK Available at: <http://www.planet4farmers.co.uk/Manner.aspx>

¹³ <https://www.scail.ceh.ac.uk/cgi-bin/agriculture/input.pl>. [Online: Accessed October 2024]

Table 10: Modelled Emissions Source Details

| Reception Building and Deposit Pad | tpa | Emission Factor | Unit | Emission (kg/year) | Emission (g/s) |
|------------------------------------|-------|-----------------|-----------|--------------------|---------------------------|
| Chicken | 7,500 | 2.68 | kg/t/year | 20,100 | 0.637 |
| FYM (cattle) | 4,000 | 0.322 | kg/t/year | 1,288 | 0.041 |
| Pig Manure | 5,100 | 0.85 | kg/t/year | 4,335 | 0.137 |
| Horse Manure | 4,000 | 0.322 | kg/t/year | 1,288 | 0.041 |
| Total | | | | | 0.857 |
| 50 m ² Pad Area | | | | | 0.017 g/m ² /s |

| Solid Digestate Storage | tpa | Emission Factor | Unit | Emission (kg/year) | Emission (g/s) |
|-------------------------|--------|-----------------|-----------|--------------------|----------------|
| Pig Manure | 14,600 | 0.85 | kg/t/year | 12,410 | 0.394 |

| Liquid Slurry Tanks | Area (m ²) | Emission Factor | Unit | Emission (kg/year) | Emission (g/s) |
|---------------------|------------------------|-----------------|-------------------------|--------------------|----------------|
| Cattle Slurry | 12.57 | 0.73 | kg/m ² /year | 9.176 | 0.000291 |

| Liquid Digestate Lagoon | Area (m ²) | Emission Factor | Unit | Emission (kg/year) | Emission (g/s) | Emission per Vent |
|-------------------------|------------------------|-----------------|-------------------------|--------------------|----------------|-------------------|
| Pig Slurry | 3,072 | 0.23 | kg/m ² /year | 706.560 | 0.022405 | 0.00187 |

| Liquid Digestate Tanks | Area (m ²) | Emission Factor | Unit | Emission (kg/year) | Emission (g/s) |
|------------------------|------------------------|-----------------|-------------------------|--------------------|----------------|
| Pig Slurry | 63.62 | 0.23 | kg/m ² /year | 14.632 | 0.000464 |

3.6.16 All NH₃ emissions were assumed to be at ambient temperate and zero velocity. These parameters were entered into the ADMS 6 model.

3.6.17 The provision of the proposed AD plant will preclude the requirement for the current activities to handle manures from local farms and therefore are already likely to be contributing to local ammonia emissions and impacts. As these impacts have not been removed from the results the assessment can be considered as a worst case scenario.

3.7 Time Varied Emissions

3.7.1 Modelling has been undertaken assuming the engine operating concurrently for 24 hours per day for 365 days per year. This represents the worst case condition for NO_x combustion emissions and impacts.

3.7.2 The diesel generators are for backup use only when the natural gas engine plant is not operational and would operate for a maximum of 50 hours per year and are likely to make a negligible contribution to long term concentrations. The biogas boilers will be operational for approximately 24% of the time.

3.7.3 Long term PC concentrations were adjusted by a factor of 0.0057 and 0.24 for generator and boilers respectively. Short term (1 hour or less) concentrations were based on constant emissions to ensure the maximum possible concentrations were predicted.

3.7.4 Storage on the outside pad was assumed as a worst case of for a 30 minute period. Manure materials will typically be brought to the site up to 5 times per day. For robustness this was assumed to be one deposit 7days per week between the hours of 7 am and 7pm.

3.7.5 Maximum 24 hour VOC concentrations were based on the maximum impact from constant operation of the diesel generator.

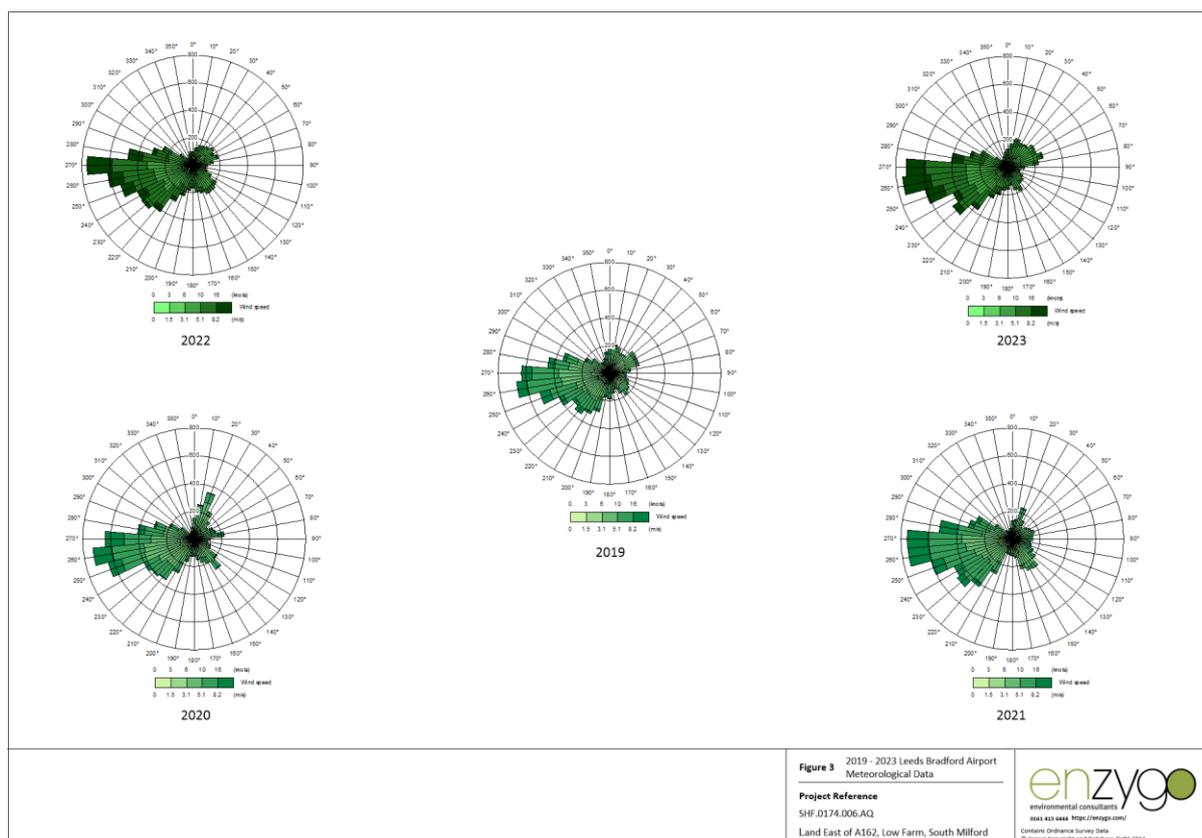
3.8 Assessment Extents

3.8.1 Ambient concentrations were predicted over an area to include the nearest sensitive receptors.

3.9 Meteorological Data

3.9.1 Similar to the original assessment hourly sequential data used in this assessment was obtained from Leeds/Bradford Airport meteorological station, located 30 km northwest of the AD facility at approximate NGR: 423110, 441590. This was updated to use the 5 years from 2019 to 2023 inclusive. Figure 4 shows the wind roses of utilised meteorological data.

Figure 3: Meteorological Data



3.9.2 The application site and meteorological station are located within similar rural contexts. The choice of this parameter therefore provides a suitable representative of meteorological conditions across the modelled domain.

3.9.3 Maximum emissions across the five years of meteorological data (2019 – 2023) were utilised to account for varying meteorological conditions. All meteorological data used in the assessment was provided by ADM Ltd.

3.10 Roughness Length

3.10.1 The specific roughness length (z_0) values specified with ADMS-6 are summarised in Table 11.

Table 11: Utilised Roughness Length

| Location | Roughness length (m) | ADMS Description |
|---|----------------------|--------------------|
| Application Site and Meteorological Station | 0.2 | Agricultural (min) |

3.10.2 Both the AD facility and meteorological station are located within rural locations and surrounded by agricultural fields. Given the surrounding area is void of significant building structures, which could increase turbulence, a value of 0.2 m is considered appropriate for the morphology of the assessment area.

3.11 Minimum Monin-Obukhov Length

3.11.1 The minimum Monin-Obukhov length values are summarised in Table 12.

Table 12: Utilised Minimum Monin-Obukhov Lengths

| Location | Monin-Obukhov length (m) | ADMS Description |
|---|--------------------------|---------------------|
| Application Site and Meteorological Station | 10 | Small Towns <50,000 |

3.11.2 The application of minimum Monin-Obukhov values considers the effect of heat production in populated areas which will influence atmospheric stability. The rural context of both the AD facility and meteorological site suggest a stable conditions and a value of 10 m is deemed appropriate.

3.12 Terrain Data

3.12.1 Areas of complex terrain have potential to affect the dispersion of pollutants which vary dependent on the height and location of modelled emission sources. The ADMS-5 user guidance suggest that terrain height effect should only be included where gradient exceed 1:10.

3.12.2 Ordnance Survey Landform Panorama terrain data was pre-processed using the dedicated function within ADMS 5 and covers a 11.5 km x 11.5 km area extending from the centre of the proposed site.

3.13 Building Effects

Buildings can influence the dispersion of pollutant and may lead to increases to ground level concentrations. A review of adjacent buildings was therefore undertaken and subsequently included within the model and are summarised in Table 13. Onsite building heights were provided by the project architect and considered to an accurate representation.

Table 13: Building Geometries

| Building | NGR (m) | | Height (m) | Length/Diameter (m) | Width (m) | Angle (°) |
|--------------------------|----------|----------|------------|---------------------|-----------|-----------|
| | X | Y | | | | |
| 1 Digester | 450379.1 | 432115.7 | 9.0 | 45.0 | Circular | N/A |
| 2 Post Digester 1 | 450371.5 | 432068.2 | 14.0 | 35.0 | Circular | N/A |
| 3 Post Digester 2 | 450364.1 | 432025.3 | 14.0 | 35.0 | Circular | N/A |
| 4 Effluent Tank | 450361.3 | 432155.7 | 6.1 | 11.1 | Circular | N/A |
| 5 Separation Liquid Tank | 450412.9 | 432116.6 | 4.5 | 9.0 | Circular | N/A |
| 6 Silage Clamps | 450407.8 | 432210.1 | 6.0 | 99.9 | 90.42 | 189.5 |

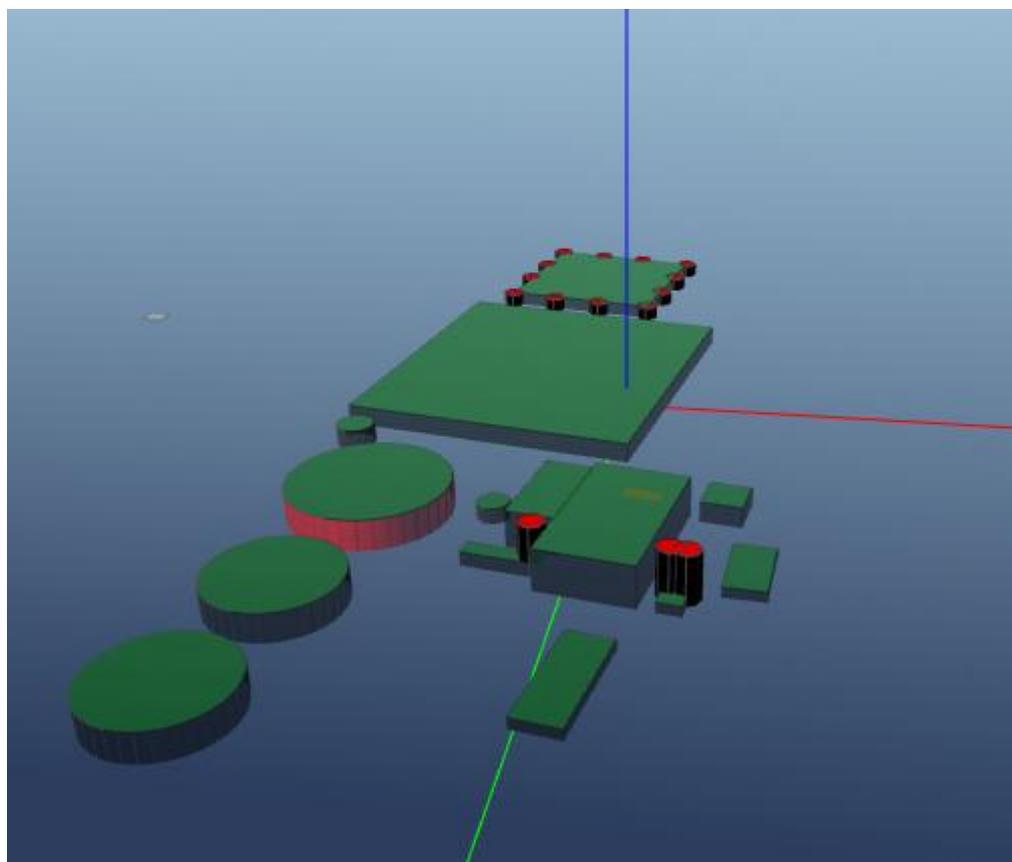
| Building | | NGR (m) | | Height (m) | Length/Diameter (m) | Width (m) | Angle (°) |
|----------|-----------------------------|----------|----------|------------|---------------------|-----------|-----------|
| | | X | Y | | | | |
| 7 | Separator Building | 450429.3 | 432114.7 | 10.5 | 29.8 | 13.92 | 189.9 |
| 8 | Feedstock Reception | 450448.0 | 432102.4 | 12.0 | 47.6 | 26.68 | 189.9 |
| 9 | Office and Control Building | 450474.7 | 432126.0 | 6.0 | 11.7 | 11.55 | 189.1 |
| 10 | NG Generators | 450465.8 | 432081.4 | 3.0 | 12.1 | 6.51 | 189.2 |
| 11 | CO2 Capture | 450445.8 | 432044.3 | 3.0 | 33.2 | 12.35 | 190.3 |
| 12 | Odour Control System | 450421.4 | 432091.2 | 4.0 | 5.0 | 21.04 | 189.4 |
| 13 | Biomethane Upgrading Plant | 450482.9 | 432094.7 | 3.0 | 20.7 | 11.18 | 184.1 |
| 14 | Digestate Lagoon | 450374.3 | 432141.9 | 4.5 | 54.1 | 53.80 | 189.7 |

3.13.1 Figure 4 shows a graphical representation of the modelled building layout and the ADMS 6 model input. A 3D image of the model inputs is shown in Figure 5. The diesel emergency generators are not shown on this image as they were modelled separately and aggregated to the predicted impacts.

Figure 4: Modelled Building Layout and Emission Sources



Figure 5: 3D image of modelled buildings and point sources



3.14 NO_x to NO₂ Conversion

3.14.1 Ground level NO_x concentrations were predicted through dispersion modelling. NO₂ concentrations reported in the results section assume conversion from NO_x to NO₂, based upon EA guidance⁸ detailed below:

- 50% for short-term average concentrations
- 100% for long-term average concentrations

3.15 15-minute SO₂ Conversion

3.15.1 Throughout the assessment, 15-minute mean SO₂ concentrations have been calculated using the following correction factor based upon empirical relationships with the 99.9th percentile of 1-hour means, as described in EA guidance⁸:

99.9th percentile of 15-minute means = 1.34 x 99.9th percentile of 1-hour means

3.16 Deposition Rates

3.16.1 Deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06'¹⁴. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used are presented within Table 14.

Table 14: Conversion Factors to Determine Dry Deposition Velocity

| Pollutant | Grassland Deposition Velocity (m/s) | Forest Deposition Velocity (m/s) |
|-----------------|-------------------------------------|----------------------------------|
| NO ₂ | 0.0015 | 0.003 |
| SO ₂ | 0.012 | 0.024 |
| NH ₃ | 0.02 | 0.03 |

3.16.2 Predicted ground level pollutant concentrations of NO₂ and SO₂ were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors. The standard conversion factors are shown in Table 15.

Table 15: Conversion Factors to Units of Equivalents

| Species | Conversion Factor (µg/m ² /s to kg/ha/yr) | Conversion Factor from kg/ha/yr to keq/ha/yr |
|------------------------|--|--|
| N from NO _x | 96 | 0.07 |
| S | 157.7 | 0.06 |
| N from NH ₃ | 259.7 | 0.07 |

3.16.3 The total N and S proportion were calculated from NO_x, NH₃ and SO₂ concentrations. The proportion of the EQS consisting of the PC and PEC were then calculated using the tool available on the APIS website⁹.

¹⁴ AQTAG 06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, EA, 2014

3.17 Significance of Impacts

EPUK and IAQM Guidance

3.17.1 The assessment considered the following scenarios in order to quantify impacts at sensitive receptors in the vicinity of the site:

- Do-minimum (DM) (predicted background concentrations without the proposed installation); and
- Do-something (DS) (predicted background concentrations including with the addition of emissions from the proposed installation).

3.17.2 Receptors potentially sensitive to changes in pollutant concentrations were identified within the assessment extents. LAQM.TG22⁶ provides the following examples of where annual mean AQOs should apply:

- Residential properties;
- Schools;
- Hospitals; and
- Care homes.

3.17.3 The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in Table 2. These are based upon the guidance provided within the EPUK and IAQM guidance¹⁵.

Table 16: Significance of Impacts – Long Term Concentrations

| Long Term Average Concentration | % Change in Concentration Relative to AQO | | | |
|---------------------------------|---|------------|-------------|-------------|
| | 1 | 2-5 | 6-10 | >10 |
| 75% or less of AQO | Negligible | Negligible | Slight | Moderate |
| 76 - 94% of AQO | Negligible | Slight | Moderate | Moderate |
| 95 - 102% of AQO | Slight | Moderate | Moderate | Substantial |
| 103 - 109% of AQO | Moderate | Moderate | Substantial | Substantial |

3.17.4 The criteria shown in Table 16 is adapted from the EPUK and IAQM guidance with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance¹⁵.

3.17.5 For short term impacts, the EPUK and IAQM guidance¹⁵ suggests the following criteria, as shown in Table 17, based on EA guidance.

Table 17: Significance of Impacts – Short Term Concentrations

| % Change in Hourly Concentration Relative to AQO | | | |
|--|--------|----------|-------------|
| <10 | 10-20 | 20-50 | >50 |
| Negligible | Slight | Moderate | Substantial |

3.17.6 Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 16 and Table 17, the EPUK and IAQM guidance states that this framework is to be used as a

¹⁵ Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, January 2017

starting point to make a judgement on significance of effect but other influences might need to be accounted for.

3.17.7 Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;
- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41 µg/m³ should attract less significance than an annual mean of 51 µg/m³.

EA Guidance Criteria

3.17.8 Guidance for assessing the significance of emissions impacts from point sources are also given in the EA's online guidance⁷.

3.17.9 Predicted pollutant concentrations are summarised in the following formats:

- Process contribution (PC) - Predicted pollutant concentration as a result of emissions from the site only; and
- Predicted environmental concentration (PEC) - Total predicted pollutant concentration as a result of emissions from the site and existing baseline levels.

3.17.10 The significance of predicted impact has been assessed in accordance with criteria in the EA guidance 'Air emissions risk assessment for your environmental permit'⁷ and through consideration of likely effects. The EA guidance states that process contributions can be considered insignificant if:

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

3.17.11 If both criteria are met predicted impacts can be considered insignificant and no further analysis is required.

3.17.12 If the above criteria are not met, then a second stage of screening is required to determine the impact of the PEC:

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and
- The long-term PEC is less than 70% of the long-term environmental standards.

3.17.13 If both criteria are met during the second stage of screening, then predicted impacts can be considered insignificant. Should these criteria be exceeded then the PEC should be checked against the EQS.

EA Guidance Ecological Screening

3.17.14 If emissions that affect Special Protection Areas (SPAs), Special Areas of Conservation (SACs), RAMSAR sites or Site of Special Scientific Interest (SSSIs) meet both of the following criteria outlined within the EA guidance⁷, they can be considered insignificant:

- the short-term PC is less than 10% of the short-term environmental standard for protected conservation areas; and
- the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas.

3.17.15 If the predicted long-term PC is greater than 1% and the PEC is less than 70% of the long-term environmental standard, the emissions can be considered insignificant. Should the predicted PEC be greater than 70% of the long-term environmental standard, the PEC should be checked against the EQS for the ecological receptor.

3.17.16 When considering impacts at locally designated sites if emissions meet both of the following criteria, impacts can be considered insignificant if:

- The short-term PC is less than 100% of the short-term environmental standard; and
- The long-term PC is less than 100% of the long-term environmental standard.

3.17.17 The EA guidance also states that the APIS⁹ critical load function tool should be used to determine whether there is an exceedance of deposition of nutrient nitrogen or acidity, as the standard of exceedance is site-specific.

3.18 Modelling Uncertainties

3.18.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and
- Variability - randomness of measurements used.

3.18.2 Whilst uncertainty in the model inputs and parameters cannot be fully reduced, the analysis of maximum emissions across the five years of meteorological data (2019 – 2023) provides sensitivity analysis which sufficiently accounts for variations in meteorological conditions.

3.18.3 Worse case assumptions regarding the application of emission rates such as not including the containment effects of the manure building as well as concurrent usage of the engine and Biogas Boiler within the model also minimise potential uncertainties. As such, a sufficient degree of confidence can be placed in the results.

4.0 Baseline Conditions

4.1.1 Existing air quality conditions in the vicinity of the installation were identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.2 Local Air Quality Management

4.2.1 As required by the Environment Act (1995), North Yorkshire Council (NYC) has undertaken Review and Assessment of air quality within its area of administration including the former Selby District. This process has indicated that one area where pollutant concentrations are above the annual mean AQOs for NO₂ within the district and an Air Quality Management Area (AQMA) have been declared:

AQMA No.1 - The designated area incorporates 1 to 21 New Street odd number inclusive, 16 to 30 New Street even numbers inclusive, 50 Ousegate, 1 to 5 The Crescent inclusive, Park House, The Crescent and Thornden Buildings, New Street.

4.2.2 The AQMA is approximately 11 km from the proposed development site and has therefore not been considered further in this assessment.

4.3 Local Air Quality Monitoring

4.3.1 NYC monitors pollutant concentrations using passive methods throughout their area of administration. A review of the most recent Air Quality Status Report¹⁶ indicated that there were no representative monitoring sites within 10 km of the proposed development and as such NYC monitoring has not been considered further to represent background concentrations.

4.4 DEFRA Background Pollutant Concentrations

4.4.1 Pollutant background concentrations for the surrounding area human receptor locations were sourced from the DEFRA background maps¹⁷ and national monitoring networks.

4.4.2 Background concentrations and baseline deposition rates for ecological receptor locations have been sourced from the APIS website⁹.

4.4.3 The proposed site is in grid square NGR: 450500, 432500. Data for this location was downloaded from the DEFRA website for NO_x, NO₂, PM₁₀, PM_{2.5}, CO and TOC (as C₆H₆) for the purpose of this assessment. Background concentrations for human exposure to NH₃ was taken from the United Kingdom Eutrophying & Acidifying Network (UKEAP) National Ammonia Monitoring Network. The closest monitoring station is Tadcaster located 12.3 km from the development site, classified as a rural background location and was used as a background concentrations for the site and human receptor locations. The site background annual mean concentrations used are summarised in Table 18.

Table 18: Predicted Background Pollutant Concentrations

| Pollutant | Predicted Background Concentration (µg/m ³) | Previous Assessment Background Concentration (µg/m ³) |
|-----------------|---|---|
| NO _x | 9.43 | 11.69 |
| NO ₂ | 7.38 | 8.96 |
| CO | 300.0 | 300.0 |
| SO ₂ | 5.61 | 5.61 |

¹⁶ 2025 Air Quality Annual Status Report, North Yorkshire Council. June 2025

¹⁷ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

| Pollutant | Predicted Background Concentration ($\mu\text{g}/\text{m}^3$) | Previous Assessment Background Concentration ($\mu\text{g}/\text{m}^3$) |
|-------------------|---|---|
| Benzene | 0.17 | 0.17 |
| NH ₃ | 2.51 | 1.40 |
| PM ₁₀ | 13.20 | 13.62 |
| PM _{2.5} | 6.0 | 7.60 |

4.4.4 Background concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} were predicted for 2025, whilst CO and SO₂ were predicted for 2001, and benzene predicted for 2010. The most recent complete year of NH₃ monitoring is from 2024. These are the most recent predictions available from DEFRA and deemed appropriate for use.

4.4.5 A comparison with the background concentrations used in the previous assessment have been provide in Table 18. This indicates that where updated information was available lower background concentrations are predicted with the exception of ammonia.

Short term Background Concentrations

4.4.6 It was assumed that the short-term background concentration of a substance is twice its long-term concentration as suggested within EA risk assessment for your environmental permit guidance⁷.

4.5 Human Sensitive Receptors

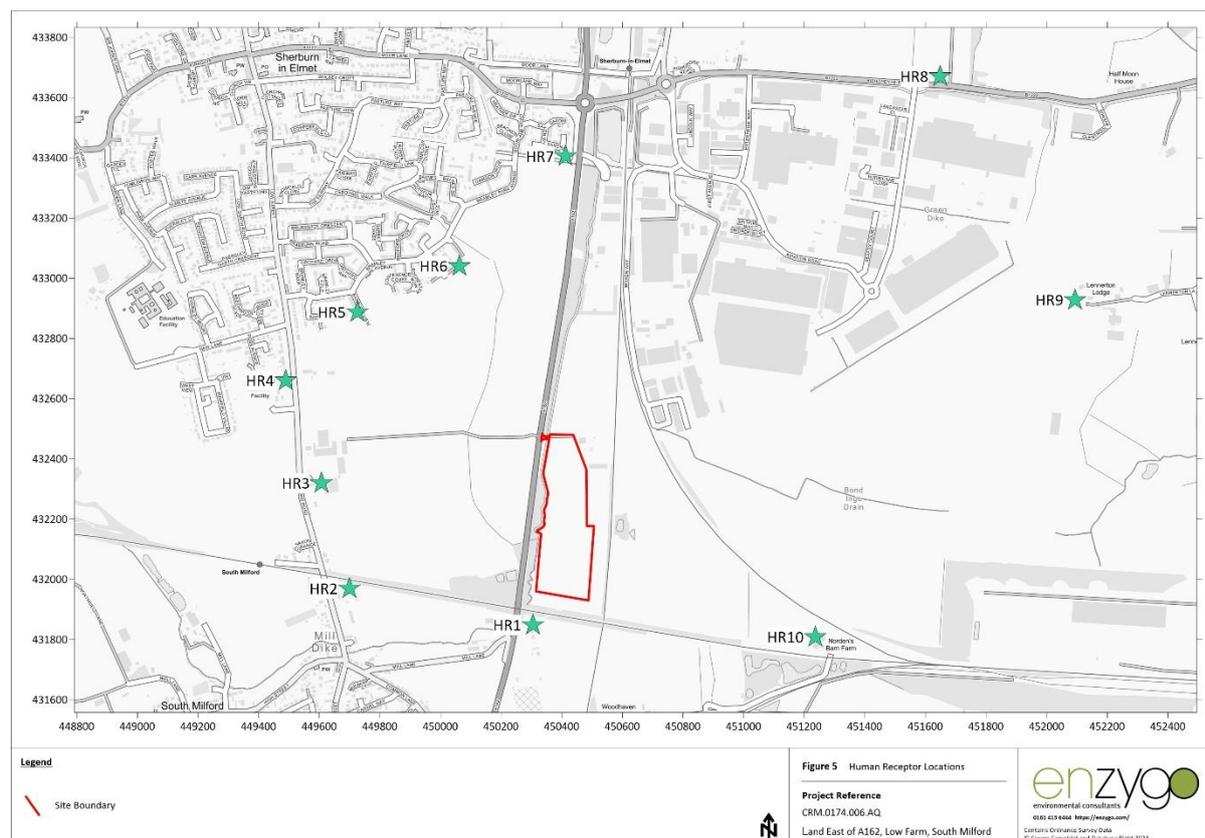
4.5.1 Sensitive receptor locations surrounding the facility were identified from a desk-top study. These were modelled at the minimum height of relevant exposure. These are the same locations as the previous assessment and are summarised in Table 19.

Table 19: Sensitive Human Receptors

| Receptor | | Use | NGR (m) | | Distance from Centre of Site (m) | Height (m) |
|----------|--------------------------------------|------------------------|----------|----------|----------------------------------|------------|
| | | | X | Y | | |
| HR1 | Mill Lane, South Millford | Residential | 450305.1 | 431848.1 | 386 | 1.5 |
| HR2 | Craglands, South Millford | Residential | 449699.2 | 431969.0 | 765 | 1.5 |
| HR3 | Home Lea Cottage | Residential | 449607.5 | 432319.2 | 823 | 1.5 |
| HR4 | 22 Milford Road/Primary School | Residential/ School | 449489.4 | 432659.7 | 1,034 | 1.5 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | Residential | 449726.1 | 432886.8 | 968 | 1.5 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | Residential | 450062.1 | 433040.2 | 900 | 1.5 |
| HR7 | Saxon Mews, Sherburn in Elmet | Residential | 450412.9 | 433404.5 | 1,189 | 1.5 |
| HR8 | Ashfield | Residential | 451647.9 | 433670.0 | 1,901 | 1.5 |
| HR9 | Lennerton Lodge | Residential | 452093.9 | 432927.7 | 1,816 | 1.5 |
| HR10 | Norden's Barn Farm | Residential | 451236.8 | 431807.9 | 910 | 1.5 |

4.5.2 The sensitive locations identified in Table 19 represent worst-case locations, i.e., the locations at which air quality impacts from the proposals are expected to be the greatest. Figure 6 shows the location of sensitive human receptors.

Figure 6: Human Receptor Locations



4.5.3 Specific background concentrations at sensitive locations are detailed in Table 20.

Table 20: Predicted Background Concentration at Sensitive Human Locations

| Receptor | | Predicted Background Concentration ($\mu\text{g}/\text{m}^3$) | | | | | | |
|----------------|--------------------------------------|---|-----------------|------------------|-------------------|---------------|-----------------|-------------------------------|
| | | NO _x | NO ₂ | PM ₁₀ | PM _{2.5} | CO | SO ₂ | C ₆ H ₆ |
| HR1 | Mill Lane, South Millford | 7.17 | 9.14 | 12.94 | 5.97 | 572.00 | 6.17 | 0.27 |
| HR2 | Craglands, South Millford | 7.22 | 9.21 | 12.60 | 6.13 | 586.00 | 6.96 | 0.29 |
| HR3 | Home Lea Cottage | 7.10 | 9.05 | 13.00 | 6.04 | 614.00 | 5.84 | 0.31 |
| HR4 | 22 Milford Road/Primary School | 7.10 | 9.05 | 13.00 | 6.04 | 614.00 | 5.84 | 0.31 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 7.10 | 9.05 | 13.00 | 6.04 | 614.00 | 5.84 | 0.31 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 8.12 | 10.44 | 12.04 | 6.06 | 594.00 | 6.22 | 0.30 |
| HR7 | Saxon Mews, Sherburn in Elmet | 8.12 | 10.44 | 12.04 | 6.06 | 594.00 | 6.22 | 0.30 |
| HR8 | Ashfield | 7.35 | 9.38 | 12.11 | 5.79 | 578.00 | 5.46 | 0.28 |
| HR9 | Lennerton Lodge | 6.43 | 8.14 | 11.90 | 5.62 | 568.00 | 6.42 | 0.26 |
| HR10 | Norden's Barn Farm | 6.80 | 8.65 | 12.60 | 5.77 | 554.00 | 5.82 | 0.26 |
| Maximum | | 8.12 | 10.44 | 13.00 | 6.13 | 614.00 | 6.96 | 0.31 |

4.6 Ecological Sensitive Receptors

4.6.1 With regard to receptors of ecological sensitivity, the EA guidance 'Air emissions risk assessment for your environmental permit'⁷ states:

"Note that conservation sites need only be considered where they fall within set distances of the activity:

- SPAs, SACs or RAMSAR sites within 10 km of the facility; and
- SSSIs, National Nature Reserves (NNRs), Local Nature Reserves (LNRs), Local Wildlife Sites (LWS), Country Wildlife Sites (CWS) and Ancient Woodland (AW) within 2 km of the facility"

4.6.2 A desktop study using the Multi-Agency Geographic Information for the Countryside (MAGIC) was undertaken to identify any ecological designations within the distances stated above. Information on LWS and their citations were provided by the Ecology Consultant.

4.6.3 Natural England request that SSSI sites within greater distances from sites and these designations within 10 km were also assessed as sensitive receptors.

The receptor points chosen to represent the closest points to the AD facility are displayed in Table 21 and Figure 71: Geological designation and therefore not considered further as a sensitive receptor

4.6.4 Figure 7. These are the same locations as the previous assessment.

Table 21: Ecological Sensitive Receptors

| Ecological Receptor | | Designation | NGR (m) | | Distance (m) |
|---------------------|-----------------------------------|----------------------------------|----------|----------|--------------|
| | | | X | Y | |
| ER1 | Hook Moor | SSSI | 443427.5 | 435265.5 | 7,639 |
| ER2 | Micklefield Quarries ¹ | SSSI | 444615.3 | 432429.3 | 5,802 |
| ER3 | Roach Lime Hills | SSSI | 441990.1 | 431344.0 | 8,462 |
| ER4 | Townclose Hills | SSSI | 440926.3 | 430490.2 | 9,633 |
| ER5 | Madbanks and Ledsham Banks | SSSI | 446379.8 | 430284.3 | 4,451 |
| ER6 | Fairburn and Newton Ings Woodland | SSSI | 446889.6 | 427704.8 | 5,687 |
| ER7 | Fairburn and Newton Ings Woodland | SSSI | 447403.9 | 427268.6 | 5,750 |
| ER8 | Fairburn and Newton Ings Woodland | SSSI | 445494.8 | 427887.6 | 6,520 |
| ER9 | Sherburn Willows | SSSI | 448818.7 | 432351.2 | 1,603 |
| ER10 | Stutton Ings | SSSI | 448268.8 | 440334.9 | 8,442 |
| ER11 | Kirkby Wharfe | SSSI | 450848.3 | 439479.3 | 7,323 |
| ER12 | Bolton Percy Ings | SSSI | 453469.8 | 439900.1 | 8,313 |
| ER13 | Burr Closes | SSSI | 459523.5 | 433981.9 | 9,291 |
| ER14 | Ash Tree Dike and Ponds | SINC | 450236.2 | 432011.4 | 236 |
| ER15 | Sherburn Willows | Yorkshire Wildlife Trust Reserve | 448820.6 | 432350.6 | 1,601 |

1: Geological designation and therefore not considered further as a sensitive receptor

Figure 7: Ecological Sensitive Receptors



4.6.5 For all designations the most sensitive habitat deemed present has been assessed.

Ecological Impacts Baselines

4.6.6 CLs have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. The CLs for nitrogen and acid deposition were obtained via the APIS website¹ and are presented in Table 22 and Table 23. The most sensitive habitats were assessed for each designation to provide a robust approach. CLs associated for local designations were obtained via the search by location function provided by APIS.

Table 22: Nitrogen Critical Load

| Ecological Designation | Most Sensitive Feature | Critical Load Class | Nitrogen Critical Load (kgN/ha/yr) | | |
|------------------------|-----------------------------------|--------------------------|------------------------------------|-----|----|
| | | | Min | Max | |
| ER1 | Hook Moor | Orobanche reticulata | Hay Meadows | 10 | 20 |
| ER3 | Roach Lime Hills | Calcareous grassland | Calcareous grassland | 10 | 20 |
| ER4 | Townclose Hills | Calcareous grassland | Calcareous grassland | 10 | 20 |
| ER5 | Madbanks and Ledsham Banks | Calcareous grassland | Calcareous grassland | 10 | 20 |
| ER6 | Fairburn and Newton Ings Woodland | Galium Palustre Woodland | Broadleaved Woodland | 10 | 15 |
| ER7 | Fairburn and Newton Ings Woodland | Galium Palustre Woodland | Broadleaved Woodland | 10 | 15 |
| ER8 | Fairburn and Newton Ings Woodland | Galium Palustre Woodland | Broadleaved Woodland | 10 | 15 |

| Ecological Designation | Most Sensitive Feature | Critical Load Class | Nitrogen Critical Load (kgN/ha/yr) | | |
|------------------------|-------------------------|------------------------|------------------------------------|-----|----|
| | | | Min | Max | |
| ER9 | Sherburn Willows | Tall-Herb Fen | Rich fens | 10 | 20 |
| ER10 | Stutton Ings | Fen Meadow | Rich fens | 15 | 25 |
| ER11 | Kirkby Wharfe | Urtica dioica Woodland | Broadleaved Woodland | 10 | 15 |
| ER12 | Bolton Percy Ings | Grassland | Hay meadows | 10 | 20 |
| ER13 | Burr Closes | Grassland | Hay meadows | 10 | 20 |
| ER14 | Ash Tree Dike and Ponds | Rich fen | Rich fens | 15 | 25 |
| ER15 | Sherburn Willows | Tall-Herb Fen | Rich fens | 10 | 20 |

4.6.7 Table 24 shows the relevant critical loads for acid deposition.

Table 23: Acid Critical Load

| ID | Most Sensitive Feature | Critical Load Class | Critical Load (ke/ha/yr) | | |
|------|-----------------------------------|----------------------|--------------------------|--------|--------|
| | | | CLmaxS | CLminN | CLmaxN |
| ER1 | Orobanche reticulata | Calcareous grassland | 4.000 | 0.856 | 4.856 |
| ER2 | Feature is not sensitive | | | | |
| ER3 | Lowland Calcareous Grassland | Calcareous grassland | 4.000 | 1.071 | 5.071 |
| ER4 | Lowland Calcareous Grassland | Calcareous grassland | 4.000 | 1.071 | 5.071 |
| ER5 | Lowland Calcareous Grassland | Calcareous grassland | 4.000 | 0.856 | 4.856 |
| ER6 | Galium Palustre Woodland | Broadleaved Woodland | 1.517 | 0.142 | 1.659 |
| ER7 | Galium Palustre Woodland | Broadleaved Woodland | 1.517 | 0.142 | 1.659 |
| ER8 | Galium Palustre Woodland | Broadleaved Woodland | 1.517 | 0.142 | 1.659 |
| ER9 | Lowland Calcareous Grassland | Calcareous grassland | 4.000 | 0.856 | 4.856 |
| ER10 | Feature is not sensitive | | | | |
| ER11 | Urtica dioica Woodland | Broadleaved Woodland | 0.944 | 0.357 | 1.301 |
| ER12 | Sanguisorba officinalis Grassland | Calcareous grassland | 4.000 | 1.071 | 5.071 |
| ER13 | Sanguisorba officinalis Grassland | Calcareous grassland | 4.000 | 1.071 | 5.071 |
| ER14 | Feature is not sensitive | | | | |
| ER15 | Lowland Calcareous Grassland | Calcareous grassland | 4.000 | 0.856 | 4.856 |

4.6.8 Designations ER2, ER9 and ER13 have no defined sensitivity to acidification and, as such no assessment against acidification is required or possible at these receptors. Acid CLDs for all areas that are not European designations were taken from the APIS 'search by location' function.

4.6.9 Maximum background deposition rates and concentrations are summarised in Table 24. It is also noted whether the habitat is listed as having lichens or bryophytes present as this determines the critical level for ammonia concentrations.

Table 24: Background Deposition Rates and Concentrations

| ID | Deposition Rate | | | Concentration ($\mu\text{g}/\text{m}^3$) | | | Lichens or Bryophytes Sensitive |
|-----|----------------------|------------------|---------|--|-----------------|-----------------|---------------------------------|
| | Nitrogen (kgN/ha/yr) | Acid (keq/ha/yr) | | NO _x | SO ₂ | NH ₃ | |
| | | Nitrogen | Sulphur | | | | |
| ER1 | 14.05 | 0.99 | 0.19 | 17.51 | 1.64 | 1.51 | No |
| ER3 | 13.79 | 0.99 | 0.19 | 13.98 | 2.20 | 1.41 | No |
| ER4 | 13.60 | 0.97 | 0.19 | 13.34 | 1.92 | 1.37 | Yes |

| ID | Deposition Rate | | | Concentration ($\mu\text{g}/\text{m}^3$) | | | Lichens or Bryophytes Sensitive |
|------|----------------------|------------------|---------|--|-----------------|-----------------|---------------------------------|
| | Nitrogen (kgN/ha/yr) | Acid (keq/ha/yr) | | NO _x | SO ₂ | NH ₃ | |
| | | Nitrogen | Sulphur | | | | |
| ER5 | 13.85 | 0.99 | 0.17 | 12.29 | 1.46 | 1.54 | No |
| ER6 | 26.17 | 1.87 | 0.23 | 12.44 | 1.60 | 1.45 | Yes |
| ER7 | 26.56 | 1.90 | 0.22 | 14.96 | 1.70 | 1.58 | Yes |
| ER8 | 25.77 | 1.84 | 0.24 | 12.59 | 1.71 | 1.50 | Yes |
| ER9 | 13.87 | 0.99 | 0.15 | 10.43 | 1.37 | 1.60 | No |
| ER10 | 14.80 | 0.99 | 0.15 | 8.79 | 1.00 | 1.88 | No |
| ER11 | 27.48 | 1.96 | 0.18 | 8.43 | 1.02 | 1.85 | Yes |
| ER12 | 14.64 | 1.05 | 0.13 | 7.94 | 0.96 | 1.80 | No |
| ER13 | 14.65 | 1.04 | 0.15 | 7.92 | 1.09 | 1.79 | No |
| ER14 | 14.65 | 1.04 | 0.15 | 11.02 | 1.67 | 1.72 | No |
| ER15 | 13.87 | 0.99 | 0.15 | 10.43 | 1.37 | 1.60 | No |

4.6.10 Designation ER2 has no defined sensitivity to acidification and, as such no assessment against acidification is required or possible at these receptors

5.0 Results

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 3.

5.1.2 As stated previously, maximum concentrations across the five years of meteorological data (2019 - 2023) were utilised to account for varying meteorological conditions.

5.2 Human Receptors

Nitrogen Dioxide

5.2.1 Predicted annual mean NO₂ process concentrations at sensitive receptors are summarised in Table 25.

Table 25: Predicted Annual Mean NO₂ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|------|-----------------------|------|
| | | PC | PEC | PC | PEC |
| HR1 | Mill Lane, South Millford | 0.6 | 11.9 | 1.5 | 29.7 |
| HR2 | Craglands, South Millford | 0.1 | 10.7 | 0.3 | 26.8 |
| HR3 | Home Lea Cottage | 0.1 | 10.5 | 0.2 | 26.2 |
| HR4 | 22 Milford Road/Primary School | 0.1 | 10.5 | 0.2 | 26.2 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 0.1 | 10.5 | 0.3 | 26.3 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 0.1 | 12.0 | 0.4 | 30.0 |
| HR7 | Saxon Mews, Sherburn in Elmet | 0.1 | 11.9 | 0.2 | 29.9 |
| HR8 | Ashfield | 0.1 | 12.0 | 0.2 | 30.0 |
| HR9 | Lennerton Lodge | 0.1 | 10.1 | 0.3 | 25.3 |
| HR10 | Norden's Barn Farm | 0.2 | 11.0 | 0.4 | 27.6 |

Predicted concentrations were assessed against the relevant EQSs: Annual mean EQS of 40 µg/m³.

5.2.2 Predicted 99.79%ile 1-hour mean NO₂ process concentrations at sensitive receptors are summarised in Table 26.

Table 26: Predicted 99.79%ile 1-Hour Mean NO₂ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|------|-----------------------|------------------|
| | | PC | PEC | PC | PEC ^a |
| HR1 | Mill Lane, South Millford | 36.3 | 58.8 | 18.2 | 20.5 |
| HR2 | Craglands, South Millford | 17.0 | 38.1 | 8.5 | 9.5 |
| HR3 | Home Lea Cottage | 11.3 | 32.1 | 5.7 | 6.3 |
| HR4 | 22 Milford Road/Primary School | 8.6 | 29.4 | 4.3 | 4.8 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 12.1 | 32.9 | 6.0 | 6.7 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 13.1 | 36.9 | 6.6 | 7.5 |
| HR7 | Saxon Mews, Sherburn in Elmet | 7.8 | 31.6 | 3.9 | 4.4 |
| HR8 | Ashfield | 4.0 | 27.9 | 2.0 | 2.3 |
| HR9 | Lennerton Lodge | 5.0 | 25.0 | 2.5 | 2.8 |
| HR10 | Norden's Barn Farm | 9.1 | 30.8 | 4.6 | 5.1 |

Predicted concentrations were assessed against the relevant EQSs: 99.79%ile 1-hour mean EQS of 200 µg/m³

a: PEC proportion of the EQS minus twice the long-term background.

5.2.3 As indicated in Table 25 predicted annual mean NO₂ concentrations were well below 75% of the relevant EQS at all sensitive receptor locations for all meteorological data sets

5.2.4 The PC proportions of the annual mean exceeded 1%, at one receptor location. However as the PEC is below 70% of the EQS impacts on annual mean NO₂ concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.5 As indicated in Table 26 predicted 99.79%ile 1-hour mean NO₂ concentrations were also well below the relevant EQS at all sensitive receptor locations.

5.2.6 PC proportions of the EQS exceed 10%, at one receptor locations and PC proportion greater than 20% of the EQS minus twice the long-term background. However the PEC is well below the EQS of 200 µg/m³. Impacts at this locations is deemed as slight using EPUK/IAQM criteria and negligible at other receptors.

5.2.7 As such, impacts on 1-hour mean NO₂ concentrations can be considered as negligible or slight according to the criteria detailed in Section 3.17.

5.2.8 Overall, NO₂ predicted concentrations are slightly lower than the previous assessment and NO₂ impacts remain as **not significant**.

Particulate Matter PM₁₀

5.2.9 Predicted annual mean PM₁₀ process concentrations are summarised in Table 27.

Table 27: Predicted Annual Mean PM₁₀ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|------|-----------------------|------|
| | | PC | PEC | PC | PEC |
| HR1 | Mill Lane, South Millford | 0.03 | 13.3 | 0.08 | 33.3 |
| HR2 | Craglands, South Millford | 0.01 | 12.7 | 0.02 | 31.8 |
| HR3 | Home Lea Cottage | 0.00 | 13.4 | 0.01 | 33.4 |
| HR4 | 22 Milford Road/Primary School | 0.00 | 13.4 | 0.01 | 33.4 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 0.01 | 13.4 | 0.01 | 33.4 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 0.01 | 12.2 | 0.02 | 30.6 |
| HR7 | Saxon Mews, Sherburn in Elmet | <0.01 | 12.2 | 0.01 | 30.6 |
| HR8 | Ashfield | <0.01 | 12.9 | 0.01 | 32.2 |
| HR9 | Lennerton Lodge | <0.01 | 12.7 | 0.01 | 31.8 |
| HR10 | Norden's Barn Farm | 0.01 | 13.3 | 0.02 | 33.3 |

Predicted concentrations were assessed against the relevant EQS of 40 µg/m³.

5.2.10 Predicted 90.41%ile 24-hour mean PM₁₀ concentrations are summarised in Table 28.

Table 28 Predicted 90.41%ile 24-Hour Mean PM₁₀ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|------|-----------------------|------|
| | | PC | PEC | PC | PEC |
| HR1 | Mill Lane, South Millford | 0.13 | 26.7 | 0.3 | 0.6 |
| HR2 | Craglands, South Millford | 0.02 | 25.5 | <0.1 | 0.1 |
| HR3 | Home Lea Cottage | 0.01 | 26.7 | <0.1 | 0.1 |
| HR4 | 22 Milford Road/Primary School | 0.01 | 26.7 | <0.1 | 0.1 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 0.02 | 26.7 | <0.1 | 0.1 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 0.03 | 24.5 | 0.1 | 0.1 |
| HR7 | Saxon Mews, Sherburn in Elmet | 0.01 | 24.4 | <0.1 | <0.1 |
| HR8 | Ashfield | 0.01 | 25.8 | <0.1 | <0.1 |

| Receptor | | Concentration ($\mu\text{g}/\text{m}^3$) | | Proportion of EQS (%) | |
|----------|--------------------|--|------|-----------------------|------|
| | | PC | PEC | PC | PEC |
| HR9 | Lennerton Lodge | 0.01 | 25.5 | <0.1 | <0.1 |
| HR10 | Norden's Barn Farm | 0.02 | 26.6 | <0.1 | 0.1 |

Predicted concentrations were assessed against the relevant EQS of $50 \mu\text{g}/\text{m}^3$.

- 5.2.11 As indicated in Table 27, predicted annual mean PM_{10} concentrations were below 75% of the relevant EQS at all sensitive receptor locations.
- 5.2.12 The PC proportion of the EQS does not exceed 1% at all receptor locations and can be considered negligible and screened out as insignificant according to the criteria detailed in Section 3.17.
- 5.2.13 As indicated in Table 28, predicted 90.41stile 24-Hour Mean PM_{10} concentrations were also well below the relevant EQS at all sensitive receptor locations.
- 5.2.14 The PC proportion of the EQS is less than 10% at all sensitive receptor locations. As such, impacts on 24-hour mean PM_{10} concentrations can be considered negligible and screened out as insignificant according to the criteria detailed in Section 3.17.
- 5.2.15 Overall, predicted concentrations are slightly lower than the previous assessment and PM_{10} impacts remain as **not significant**.

Particulate Matter ($\text{PM}_{2.5}$)

- 5.2.16 Predicted annual mean $\text{PM}_{2.5}$ concentrations are summarised in Table 30.

Table 29: Predicted Annual Mean $\text{PM}_{2.5}$ Concentrations.

| Receptor | | Concentration ($\mu\text{g}/\text{m}^3$) | | Proportion of EQS (%) | |
|----------|--------------------------------------|--|-----|-----------------------|------|
| | | PC | PEC | PC | PEC |
| HR1 | Mill Lane, South Millford | 0.032 | 7.5 | 0.16 | 37.5 |
| HR2 | Craglands, South Millford | 0.007 | 7.3 | 0.03 | 36.4 |
| HR3 | Home Lea Cottage | 0.004 | 7.4 | 0.02 | 37.0 |
| HR4 | 22 Milford Road/Primary School | 0.003 | 7.4 | 0.02 | 37.0 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 0.005 | 7.4 | 0.03 | 37.0 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 0.007 | 7.3 | 0.04 | 36.3 |
| HR7 | Saxon Mews, Sherburn in Elmet | 0.003 | 7.3 | 0.02 | 36.3 |
| HR8 | Ashfield | 0.002 | 7.4 | 0.01 | 37.0 |
| HR9 | Lennerton Lodge | 0.004 | 7.3 | 0.02 | 36.3 |
| HR10 | Norden's Barn Farm | 0.008 | 7.4 | 0.04 | 37.0 |

Predicted concentrations were assessed against the relevant EQSs: Annual mean EQS of $20 \mu\text{g}/\text{m}^3$.

- 5.2.17 As indicated in Table 30, predicted annual mean $\text{PM}_{2.5}$ concentrations were well below 75% of the relevant EQS at all sensitive receptor locations.
- 5.2.18 The PC proportion of the EQS does not exceed 1% at all receptor locations and can be considered negligible and screened out as insignificant according to the criteria detailed in Section 3.17.
- 5.2.19 It should also be considered that the assessment assumes that all particulate matter is emitted as $\text{PM}_{2.5}$. The actual emission proportion is likely to be much less than this.
- 5.2.20 Overall, predicted concentrations are slightly lower than the previous assessment and $\text{PM}_{2.5}$ impacts remain as **not significant**.

CO Concentration

5.2.21 Predicted 8-hour rolling mean CO concentrations are summarised in Table 30.

Table 30: Predicted 8-Hour Rolling Mean CO Concentrations

| Receptor | | Concentration ($\mu\text{g}/\text{m}^3$) | | Proportion of EQS (%) | |
|----------|--------------------------------------|--|--------|-----------------------|------|
| | | PC | PEC | PC | PECa |
| HR1 | Mill Lane, South Millford | 0.9 | 572.9 | <0.1 | <0.1 |
| HR2 | Craglands, South Millford | 0.3 | 1172.3 | <0.1 | <0.1 |
| HR3 | Home Lea Cottage | 0.3 | 1228.3 | <0.1 | <0.1 |
| HR4 | 22 Milford Road/Primary School | 0.2 | 1228.2 | <0.1 | <0.1 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 0.3 | 1228.3 | <0.1 | <0.1 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 0.3 | 1188.3 | <0.1 | <0.1 |
| HR7 | Saxon Mews, Sherburn in Elmet | 0.1 | 1188.1 | <0.1 | <0.1 |
| HR8 | Ashfield | 0.1 | 1156.1 | <0.1 | <0.1 |
| HR9 | Lennerton Lodge | 0.1 | 1136.1 | <0.1 | <0.1 |
| HR10 | Norden's Barn Farm | 0.3 | 1108.3 | <0.1 | <0.1 |

Predicted concentrations were assessed against the relevant EQSs: 8-hour rolling mean EQS of $10,000 \mu\text{g}/\text{m}^3$.

a: PEC proportion of the EQS minus twice the long-term background

5.2.22 As indicated in Table 30, the PC proportion of the EQS does not exceed 10% at all receptor locations. Therefore, impacts on 8-hour rolling mean CO concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.23 Overall, predicted concentrations are slightly lower than the previous assessment and CO impacts remain as **not significant**.

SO₂

24-Hour Mean

5.2.24 Predicted 24-hour mean SO₂ concentrations at sensitive human receptor locations are summarised in Table 31.

Table 31: Predicted 24-Hour SO₂ Concentrations

| Receptor | | Concentration ($\mu\text{g}/\text{m}^3$) | | Proportion of EQS (%) | |
|----------|--------------------------------------|--|-------|-----------------------|-------|
| | | PC | PEC | PC | PECa |
| HR1 | Mill Lane, South Millford | <0.01 | 12.34 | <0.01 | <0.01 |
| HR2 | Craglands, South Millford | <0.01 | 13.92 | <0.01 | <0.01 |
| HR3 | Home Lea Cottage | <0.01 | 11.68 | <0.01 | <0.01 |
| HR4 | 22 Milford Road/Primary School | <0.01 | 11.68 | <0.01 | <0.01 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | <0.01 | 11.68 | <0.01 | <0.01 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | <0.01 | 12.44 | <0.01 | <0.01 |
| HR7 | Saxon Mews, Sherburn in Elmet | <0.01 | 12.44 | <0.01 | <0.01 |
| HR8 | Ashfield | <0.01 | 10.92 | <0.01 | <0.01 |
| HR9 | Lennerton Lodge | <0.01 | 12.84 | <0.01 | <0.01 |
| HR10 | Norden's Barn Farm | <0.01 | 11.64 | <0.01 | <0.01 |

Predicted concentrations were assessed against the relevant EQSs: 24-hour mean EQS of $125 \mu\text{g}/\text{m}^3$.

a: PC proportion of the EQS minus twice the long-term background

1-Hour Mean

5.2.25 Predicted 1-hour mean SO₂ concentrations at sensitive human receptor locations are summarised in Table 32.

Table 32 Predicted 1-Hour SO₂ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|------|-----------------------|-------|
| | | PC | PEC | PC | PECa |
| HR1 | Mill Lane, South Millford | <0.01 | 12.3 | <0.01 | <0.01 |
| HR2 | Craglands, South Millford | <0.01 | 13.9 | <0.01 | <0.01 |
| HR3 | Home Lea Cottage | <0.01 | 11.7 | <0.01 | <0.01 |
| HR4 | 22 Milford Road/Primary School | <0.01 | 11.7 | <0.01 | <0.01 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | <0.01 | 11.7 | <0.01 | <0.01 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | <0.01 | 12.4 | <0.01 | <0.01 |
| HR7 | Saxon Mews, Sherburn in Elmet | <0.01 | 12.4 | <0.01 | <0.01 |
| HR8 | Ashfield | <0.01 | 10.9 | <0.01 | <0.01 |
| HR9 | Lennerton Lodge | <0.01 | 12.8 | <0.01 | <0.01 |
| HR10 | Norden's Barn Farm | <0.01 | 11.6 | <0.01 | <0.01 |

Predicted concentrations were assessed against the relevant EQSs: 1-hour mean EQS of 350 µg/m³.

a: PC proportion of the EQS minus twice the long-term background

15-Minute Mean

5.2.26 Predicted 15-minute mean SO₂ concentrations at sensitive human receptor locations are summarised in Table 33.

Table 33: Predicted 15-minute SO₂ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|------|-----------------------|-------|
| | | PC | PEC | PC | PECa |
| HR1 | Mill Lane, South Millford | <0.01 | 12.3 | <0.01 | <0.01 |
| HR2 | Craglands, South Millford | <0.01 | 13.9 | <0.01 | <0.01 |
| HR3 | Home Lea Cottage | <0.01 | 11.7 | <0.01 | <0.01 |
| HR4 | 22 Milford Road/Primary School | <0.01 | 11.7 | <0.01 | <0.01 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | <0.01 | 11.7 | <0.01 | <0.01 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | <0.01 | 12.4 | <0.01 | <0.01 |
| HR7 | Saxon Mews, Sherburn in Elmet | <0.01 | 12.4 | <0.01 | <0.01 |
| HR8 | Ashfield | <0.01 | 10.9 | <0.01 | <0.01 |
| HR9 | Lennerton Lodge | <0.01 | 12.8 | <0.01 | <0.01 |
| HR10 | Norden's Barn Farm | <0.01 | 11.6 | <0.01 | <0.01 |

Predicted concentrations were assessed against the relevant EQSs: 15-minute mean EQS of 266 µg/m³.

a: PC proportion of the EQS minus twice the long-term background

5.2.27 As indicated in Table 31 to Table 33, the PC proportion of the relevant EQS does not exceed 10% at all sensitive receptor locations for each short term averaging period (15 minute, 1-hour and 24-hour).

5.2.28 Based on the EA screening criteria, impacts on all SO₂ concentrations can be screened out as insignificant and no further analysis is required for this substance. Therefore, impacts on all SO₂ concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.29 Overall, predicted concentrations are slightly lower than the previous assessment and SO₂ impacts remain as **not significant**.

Total Organic Compounds (TOC) as Benzene

Annual Mean

5.2.30 Predicted annual mean TOC concentrations at sensitive human receptor locations are summarised in Table 34.

Table 34: Predicted Annual Mean TOC Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|-----|-----------------------|-----|
| | | PC | PEC | PC | PEC |
| HR1 | Mill Lane, South Millford | 0.11 | 0.5 | 2.2 | 9.8 |
| HR2 | Craglands, South Millford | 0.02 | 0.4 | 0.4 | 8.3 |
| HR3 | Home Lea Cottage | 0.01 | 0.4 | 0.3 | 8.9 |
| HR4 | 22 Milford Road/Primary School | 0.01 | 0.4 | 0.2 | 8.9 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 0.02 | 0.5 | 0.4 | 9.0 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 0.02 | 0.4 | 0.5 | 8.7 |
| HR7 | Saxon Mews, Sherburn in Elmet | 0.01 | 0.4 | 0.2 | 8.4 |
| HR8 | Ashfield | 0.01 | 0.4 | 0.2 | 7.9 |
| HR9 | Lennerton Lodge | 0.01 | 0.4 | 0.3 | 7.4 |
| HR10 | Norden's Barn Farm | 0.03 | 0.4 | 0.6 | 7.6 |

Predicted concentrations were assessed against the relevant EQS: annual mean EQS of 5 µg/m³.

24-Hour Mean

5.2.31 Predicted 24-hour mean TOC concentrations are summarised in Table 35.

Table 35: Predicted 24-Hour Mean TOC Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|-----|-----------------------|------------------|
| | | PC | PEC | PC | PEC ^a |
| HR1 | Mill Lane, South Millford | 8.05 | 8.8 | 26.8 | 27.5 |
| HR2 | Craglands, South Millford | 1.91 | 2.7 | 6.4 | 6.5 |
| HR3 | Home Lea Cottage | 1.44 | 2.3 | 4.8 | 4.9 |
| HR4 | 22 Milford Road/Primary School | 1.00 | 1.9 | 3.3 | 3.4 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 1.81 | 2.7 | 6.0 | 6.2 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 1.61 | 2.4 | 5.4 | 5.5 |
| HR7 | Saxon Mews, Sherburn in Elmet | 0.94 | 1.8 | 3.1 | 3.2 |
| HR8 | Ashfield | 0.45 | 1.2 | 1.5 | 1.5 |
| HR9 | Lennerton Lodge | 0.52 | 1.2 | 1.7 | 1.8 |
| HR10 | Norden's Barn Farm | 1.37 | 2.1 | 4.6 | 4.7 |

Predicted concentrations were assessed against the relevant EQS of 30 µg/m³.

a: PC proportion of the EQS minus twice the long-term background

5.2.32 As indicated in Table 34, predicted annual mean TOC concentrations were well below the relevant EQS at all sensitive receptor locations for all meteorological data sets

5.2.33 The PC proportion of the annual mean exceeds 1%, at one receptor locations and cannot initially be screened out as insignificant using EA criteria. However, the PEC proportion is less than 70% of EQS and impacts are therefore screened out as insignificant in line with EA guidance.

- 5.2.34 As such, impacts on annual mean TOC concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.
- 5.2.35 As indicated in Table 35, predicted 24-hour mean TOC concentrations were below the relevant EQS at all sensitive receptor locations.
- 5.2.36 The PC proportion of the relevant EQS exceeds 10% at one sensitive receptor locations for 24-hour mean concentrations. However the PC proportion is less than 20% of the EQS minus twice the long-term background.
- 5.2.37 As such, impacts on 1-hour mean NH₃ concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.
- 5.2.38 In addition, the assessment has used a conservative assessment by assuming that all TOCs are emitted as benzene.
- 5.2.39 Overall, predicted concentrations are much lower than the previous assessment due a lower volume of biogas combusted and all TOC impacts remain as **not significant**.

Ammonia

Annual Mean

- 5.2.40 Predicted annual mean NH₃ concentrations at sensitive human receptor locations are summarised in Table 36.

Table 36: Predicted Annual Mean NH₃ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|------|-----------------------|-----|
| | | PC | PEC | PC | PEC |
| HR1 | Mill Lane, South Millford | 0.84 | 3.34 | 0.5 | 8.3 |
| HR2 | Craglands, South Millford | 0.12 | 2.62 | 0.1 | 6.6 |
| HR3 | Home Lea Cottage | 0.06 | 2.56 | <0.1 | 6.4 |
| HR4 | 22 Milford Road/Primary School | 0.04 | 2.54 | <0.1 | 6.4 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 0.07 | 2.57 | <0.1 | 6.4 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 0.15 | 2.65 | 0.1 | 6.6 |
| HR7 | Saxon Mews, Sherburn in Elmet | 0.07 | 2.57 | <0.1 | 6.4 |
| HR8 | Ashfield | 0.04 | 2.54 | <0.1 | 6.4 |
| HR9 | Lennerton Lodge | 0.07 | 2.57 | <0.1 | 6.4 |
| HR10 | Norden's Barn Farm | 0.11 | 2.61 | 0.1 | 6.5 |

Table Notes: Predicted concentrations were assessed against the relevant EQSs: annual mean EQS of 180 µg/m³.

1-Hour Mean

- 5.2.41 Predicted 1-hour mean NH₃ concentrations at sensitive human receptor locations are summarised in Table 37.

Table 37: Predicted 1-Hour NH₃ Concentrations

| Receptor | | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|--------------------------------------|------------------------------------|-------|-----------------------|------------------|
| | | PC | PEC | PC | PEC ^a |
| HR1 | Mill Lane, South Millford | 226.2 | 231.2 | 9.0 | 9.1 |
| HR2 | Craglands, South Millford | 55.5 | 60.5 | 2.2 | 28.4 |
| HR3 | Home Lea Cottage | 37.6 | 42.6 | 1.5 | 19.3 |
| HR4 | 22 Milford Road/Primary School | 22.9 | 27.9 | 0.9 | 11.7 |
| HR5 | 10 Bartlett View, Sherburn in Elmet | 36.0 | 41.0 | 1.4 | 18.4 |
| HR6 | 25 Egremont Place, Sherburn in Elmet | 38.4 | 43.4 | 1.5 | 19.7 |
| HR7 | Saxon Mews, Sherburn in Elmet | 20.9 | 25.9 | 0.8 | 10.7 |
| HR8 | Ashfield | 10.4 | 15.4 | 0.4 | 5.3 |
| HR9 | Lennerton Lodge | 11.5 | 16.5 | 0.5 | 5.9 |
| HR10 | Norden's Barn Farm | 37.8 | 42.8 | 1.5 | 19.4 |

Table Notes: Predicted concentrations were assessed against the relevant EQSs: 1-hour mean EQS of 2,500 µg/m³.

a: PC proportion of the EQS minus twice the long-term background

5.2.42 As indicated in Table 36 predicted annual mean NH₃ concentrations were well below 75% of the relevant EQS at all sensitive receptor locations for all meteorological data sets

5.2.43 In addition, the PC proportions of the annual mean does not exceed 1%, at all receptor locations. As such, impacts on annual mean NH₃ concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.44 As indicated in Table 37 predicted 1-hour mean NH₃ concentrations were also well below the relevant EQS at all sensitive receptor locations.

5.2.45 The PC proportion of the relevant EQS does not exceed 10% at all sensitive receptor locations for 1-hour mean concentrations.

5.2.46 As such, impacts on 1-hour mean NH₃ concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.47 Overall, predicted concentrations are higher than the previous assessment however all NH₃ impacts remain as **not significant**.

5.3 Ecological Receptors

Oxides of Nitrogen

5.3.1 Predicted annual mean NO_x concentrations at sensitive ecological receptors are summarised in Table 38.

Table 38: Predicted Annual Mean NO_x Concentrations

| Receptor | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|------------------------------------|-------|-----------------------|-----|
| | PC | PEC | PC | PEC |
| ER1 | 0.01 | 17.52 | 0.03 | 58 |
| ER3 | <0.01 | 17.51 | 0.02 | 58 |
| ER4 | <0.01 | 17.51 | 0.02 | 58 |
| ER5 | 0.02 | 17.53 | 0.07 | 58 |
| ER6 | 0.02 | 17.53 | 0.06 | 58 |
| ER7 | 0.02 | 17.53 | 0.05 | 58 |

| Receptor | Concentration ($\mu\text{g}/\text{m}^3$) | | Proportion of EQS (%) | |
|----------|--|-------|-----------------------|-----|
| | PC | PEC | PC | PEC |
| ER8 | 0.02 | 17.53 | 0.06 | 58 |
| ER9 | 0.04 | 17.55 | 0.13 | 58 |
| ER10 | 0.01 | 17.52 | 0.03 | 58 |
| ER11 | 0.01 | 17.52 | 0.03 | 58 |
| ER12 | 0.01 | 17.52 | 0.04 | 58 |
| ER13 | 0.01 | 17.52 | 0.05 | 58 |
| ER14 | 0.82 | 18.33 | 2.74 | 61 |
| ER15 | 0.05 | 17.56 | 0.18 | 59 |

Table Notes: Predicted concentrations were assessed against the relevant CL: $30 \mu\text{g}/\text{m}^3$.

5.3.2 Predicted 24-hour mean NO_x concentrations are summarised in Table 39.

Table 39: Predicted 24-Hour Mean NO_x Concentrations

| Receptor | Concentration ($\mu\text{g}/\text{m}^3$) | | Proportion of EQS (%) | |
|----------|--|------|-----------------------|-----|
| | PC | PEC | PC | PEC |
| ER1 | 5.6 | 40.6 | 7.4 | 54 |
| ER3 | 0.3 | 28.3 | 0.4 | 38 |
| ER4 | 0.2 | 26.9 | 0.2 | 36 |
| ER5 | 0.5 | 25.1 | 0.7 | 33 |
| ER6 | 0.5 | 25.4 | 0.7 | 34 |
| ER7 | 0.4 | 30.4 | 0.6 | 40 |
| ER8 | 0.4 | 25.6 | 0.6 | 34 |
| ER9 | 1.9 | 22.8 | 2.6 | 30 |
| ER10 | 1.9 | 19.5 | 2.6 | 26 |
| ER11 | 0.3 | 17.2 | 0.5 | 23 |
| ER12 | 0.3 | 16.2 | 0.5 | 22 |
| ER13 | 0.2 | 16.1 | 0.3 | 21 |
| ER14 | 38.8 | 60.8 | 51.7 | 81 |
| ER15 | 34.2 | 55.1 | 45.6 | 73 |

Table Notes: Predicted concentrations were assessed against the relevant CL: $75 \mu\text{g}/\text{m}^3$.

5.3.3 As indicated in Table 38, the PC proportion of the annual mean EQS does not exceed 1% at European designated locations and well below 100% at all locally designated locations.

5.3.4 The maximum 24 hour mean concentrations are based on a worst case scenario of the diesel generators operating. Table 39 also indicates, that PC proportion of the 24-hour EQS would exceed 10% at European designated locations for this scenarios but is well below 100% at all locally designated locations (E14 and E15).

5.3.5 The PECs are also below the EQS and as such all 24 hour mean impacts can be screened as insignificant.

5.3.6 Overall, predicted concentrations are slightly higher than the previous assessment however all NO_x impacts on ecological designations remain as **not significant**.

Sulphur Dioxide

5.3.7 Predicted annual mean SO₂ concentrations are summarised in in Table 40.

Table 40: Predicted Annual Mean SO₂ Concentrations

| Receptor | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|------------------------------------|-----|-----------------------|-----|
| | PC | PEC | PC | PEC |
| ER1 | <0.01 | 1.6 | <0.01 | 16 |
| ER3 | <0.01 | 2.2 | <0.01 | 22 |
| ER4 | <0.01 | 1.9 | <0.01 | 19 |
| ER5 | <0.01 | 1.5 | <0.01 | 15 |
| ER6 | <0.01 | 1.6 | <0.01 | 16 |
| ER7 | <0.01 | 1.7 | <0.01 | 17 |
| ER8 | <0.01 | 1.7 | <0.01 | 17 |
| ER9 | <0.01 | 1.4 | <0.01 | 14 |
| ER10 | <0.01 | 1.0 | <0.01 | 10 |
| ER11 | <0.01 | 1.0 | <0.01 | 10 |
| ER12 | <0.01 | 1.0 | <0.01 | 10 |
| ER13 | <0.01 | 1.1 | <0.01 | 11 |
| ER14 | <0.01 | 1.7 | <0.01 | 17 |
| ER15 | <0.01 | 1.4 | <0.01 | 14 |

Table Notes: Predicted concentrations were assessed against the worst case CL: 10 µg/m³.

5.3.8 As indicated in Table 40, the PC proportion of the annual mean EQS does not exceed 1% at European designated locations and well below 100% at all locally designated locations. Based on the initial EA screening criteria, impacts on annual mean SO₂ concentrations can be screened out as insignificant.

5.3.9 Overall, predicted concentrations are slightly lower than the previous assessment and all SO₂ impacts on ecological designations remain as **not significant**.

Ammonia

5.3.10 Predicted annual mean NH₃ concentrations are summarised in in Table 41.

Table 41: Predicted Annual Mean NH₃ Concentrations

| Receptor | Concentration (µg/m ³) | | Proportion of EQS (%) | |
|----------|------------------------------------|------|-----------------------|-----|
| | PC | PEC | PC | PEC |
| ER1 | 0.002 | 1.51 | 0.1 | 50 |
| ER3 | 0.001 | 1.41 | <0.1 | 47 |
| ER4 | 0.001 | 1.37 | 0.1 | 137 |
| ER5 | 0.007 | 1.55 | 0.2 | 52 |
| ER6 | 0.005 | 1.45 | 0.5 | 145 |
| ER7 | 0.006 | 1.59 | 0.6 | 159 |
| ER8 | 0.004 | 1.50 | 0.4 | 150 |
| ER9 | 0.025 | 1.63 | 0.8 | 54 |
| ER10 | 0.004 | 1.88 | 0.1 | 63 |
| ER11 | 0.004 | 1.85 | 0.4 | 185 |
| ER12 | 0.004 | 1.80 | 0.1 | 60 |
| ER13 | 0.004 | 1.79 | 0.1 | 60 |
| ER14 | 0.979 | 2.70 | 32.6 | 90 |

| Receptor | Concentration ($\mu\text{g}/\text{m}^3$) | | Proportion of EQS (%) | |
|----------|--|------|-----------------------|-----|
| | PC | PEC | PC | PEC |
| ER15 | 0.026 | 1.63 | 0.9 | 54 |

Table Notes: Predicted concentrations were assessed against the relevant CL: $3 \mu\text{g}/\text{m}^3$ for all receptors with the exception of ER8, ER9, ER13, ER14 and ER16 a worst CL of $1 \mu\text{g}/\text{m}^3$ has been used due to the potential presence of lichens and/or bryophytes at these locations

5.3.11As indicated in Table 41, the PC proportion of the annual mean EQS does not exceed 1% at all European designated locations and below 100% at all locally designated locations. Based on the initial EA screening criteria, impacts on annual mean ammonia concentrations can be screened out as insignificant.

5.3.12Overall, predicted concentrations are slightly higher than the previous assessment however all NH_3 impacts on ecological designations remain as **not significant**.

Nitrogen Deposition

5.3.13Predicted annual mean nitrogen deposition rates are summarised in Table 42.

Table 42: Predicted Annual Mean Nitrogen Deposition Rates

| Receptor | Deposition Rate ($\text{kgN}/\text{ha}/\text{yr}$) | | Proportion of EQS (%) | | | |
|----------|--|------|-----------------------|-------|----------|------|
| | | | Low EQS | | High EQS | |
| | PC | PEC | PC | PEC | PC | PEC |
| ER1 | 0.01 | 14.1 | 0.1 | 141 | 0.1 | 70 |
| ER3 | 0.01 | 13.8 | 0.1 | 138 | <0.1 | 69 |
| ER4 | 0.01 | 13.6 | 0.1 | 136 | <0.1 | 68 |
| ER5 | 0.06 | 13.9 | 0.6 | 139.1 | 0.3 | 70 |
| ER6 | 0.04 | 26.2 | 0.4 | 262 | 0.3 | 175 |
| ER7 | 0.03 | 26.6 | 0.3 | 266 | 0.2 | 177 |
| ER8 | 0.03 | 25.8 | 0.3 | 258 | 0.2 | 172 |
| ER9 | 0.14 | 14.0 | 1.4 | 140.1 | 0.7 | 70.0 |
| ER10 | 0.02 | 14.8 | 0.2 | 99 | 0.1 | 59 |
| ER11 | 0.02 | 27.5 | 0.2 | 275 | 0.2 | 183 |
| ER12 | 0.02 | 14.7 | 0.2 | 147 | 0.1 | 73 |
| ER13 | 0.02 | 14.7 | 0.2 | 147 | 0.1 | 73 |
| ER14 | 5.20 | 19.9 | 34.7 | 132 | 20.8 | 79 |
| ER15 | 0.14 | 14.0 | 1.4 | 140 | 0.7 | 70 |

Table Notes: Predicted concentrations were assessed against the relevant low CL for the designation

5.3.14As indicated in Table 42, the PC proportion of the EQS is below 1% at European designated locations where a critical load has been provided with the exception of Sherburn Willows SSSI (1.4%) and well below 100% at all local designations (E14 and E15).

5.3.15Whilst the PEC shows that the CLs are exceeded at some locations, it is done so as a base condition and not as an impact of the Proposed Development. Impacts at these locations can be screened out as insignificant at all receptors with the exception of ER9.

5.3.16Further discussion on the impacts at Sherburn Willows by an ecologist is provided in Appendix B. This indicates that development impacts remain as not significant at this location.

5.3.17Overall predicted N deposition is slightly higher than the previous assessment however all nitrogen deposition impacts remain as **not significant**.

Acid Deposition

5.3.18 Predicted annual mean acid deposition rates are summarised in Table 43. The APIS critical load function tool was used to determine whether there is an exceedance of the CL function for acid deposition.

Table 43: Predicted Annual Mean Acid Deposition Rates

| Receptor | Acid Deposition Rate (keq/ha/yr) | | | % of Critical Load Function | | Exceedance of CL Function (keq/ha/yr) |
|----------|----------------------------------|--------|--------|-----------------------------|-------|---------------------------------------|
| | S | N | Total | PC | PEC | |
| ER1 | <0.0001 | 0.0007 | 0.0007 | 0.02 | 20.5 | No Exceedance |
| ER3 | <0.0001 | 0.0006 | 0.0006 | 0.01 | 19.7 | No Exceedance |
| ER4 | <0.0001 | 0.0005 | 0.0005 | 0.01 | 19.3 | No Exceedance |
| ER5 | <0.0001 | 0.0042 | 0.0042 | 0.09 | 20.6 | No Exceedance |
| ER6 | <0.0001 | 0.0031 | 0.0031 | 0.19 | 112.9 | No Exceedance |
| ER7 | <0.0001 | 0.0023 | 0.0023 | 0.14 | 114.7 | No Exceedance |
| ER8 | <0.0001 | 0.0018 | 0.0018 | 0.11 | 111.2 | No Exceedance |
| ER9 | <0.0001 | 0.0098 | 0.0098 | 0.20 | 20.5 | No Exceedance |
| ER10 | <0.0001 | 0.0017 | 0.002 | Not Sensitive | | No Exceedance |
| ER11 | <0.0001 | 0.0018 | 0.0018 | 0.14 | 150.8 | No Exceedance |
| ER12 | <0.0001 | 0.0015 | 0.002 | 0.03 | 20.8 | No Exceedance |
| ER13 | <0.0001 | 0.0018 | 0.002 | 0.03 | 20.7 | No Exceedance |
| ER14 | <0.0001 | 0.3716 | 0.372 | Not Sensitive | | No Exceedance |
| ER15 | <0.0001 | 0.0100 | 0.010 | 0.21 | 20.5 | No Exceedance |

5.3.19 As shown in Table 43, the APIS critical load function tool indicated that the PC proportion of the EQS does not exceed 1% at European designated locations where a critical load has been provided and well below 100% at all local designations.

5.3.20 Whilst the PEC shows that the CLs are exceeded at some locations, it is done so as a base condition and not as an impact of the Proposed Development. Impacts at these locations can be screened out as insignificant.

5.3.21 No acid CL is provided for Hook Moor SSSI (ER1). The qualifying feature (*Orobanche reticulata*) has not been identified as being sensitive to acid deposition and the predicted maximum PC deposition rate of 0.0008 keq/ha/yr is negligible due to the distance between the sites. In addition, NE have identified the condition of the SSSI as 'favourable' and not identified acid deposition as a concern or threat to the SSSI¹⁸.

5.3.22 Overall, deposition is slightly higher than the previous assessment however all acid deposition impacts on ecological designations remain as **not significant**.

5.4 In Combination Effects

5.4.1 The background concentrations and levels include emissions up to 2022 and therefore any new planning developments that may have caused additional ammonia emissions not accounted for in background levels were included in the search.

¹⁸

<https://designatedsites.naturalengland.org.uk/SiteFeatureCondition.aspx?SiteCode=S1003201&SiteName=Sheburn%20Willows%20SSSI> [Online: Accessed January 2026]

5.4.2 A search of new permitted sites (from 1st January 2022) within 5 km of one of the above ecological sites and with the potential to emit ammonia has been undertaken for the previous assessment by reviewing the planning portals from the planning authorities in the area. This included NYC and Leeds City Council.

5.4.3 An updated review has been carried out to identify any further developments in the interim period. The results are as shown below.

North Yorkshire Council

5.4.4 Planning Reference ZG2023/0774/FULM. Land South Of Bartlett View And Rochester Row Milford Road Sherburn In Elmet North Yorkshire. The erection of 106 residential dwellings and associated works. No air quality impacts identified.

5.4.5 Planning Reference ZG2025/0983/OUTM. Land At Low Street To South Milford By-pass South Milford North Yorkshire. Outline planning application for the construction of up to 180 dwellings (Class C3) including access from Low Street (all other matters are reserved). No air quality impacts identified.

5.4.6 Planning Reference ZG2025/0982/OUTM. Land At Tadcaster Road Sherburn-in-Elmet North Yorkshire. Outline application for the development of up to 300 dwellings with drainage, access, open space, landscaping and associated infrastructure. No air quality ecological impacts identified.

5.4.7 Planning Reference ZG2025/0160/OUTM. Land At Station Road Tadcaster. Outline application (some matters reserved) for residential development of 101 dwellings. No air quality impacts identified.

Leeds City Council

5.4.8 No recent planning applications were identified that could have cumulative impacts on the ecological sensitive receptors.

Wakefield Council

5.4.9 Planning Reference 24/00231/FUL. Proposed development of 218no. dwellings with associated car parking, public open space, landscaping and infrastructure with access from Womersley Road. No ecological impacts identified in air quality assessment.

York City Council

5.4.10 No recent planning applications were identified that could have cumulative impacts on the ecological sensitive receptors.

5.4.11 As such no other developments are likely to have a cumulative impact with the Proposed Development.

Summary

5.4.12 All in-combination impacts remain as not significant.

5.5 Construction Dust

5.5.1 The construction period is unlikely to be over a long period of time or require extensive earthworks or construction near sensitive receptors. Therefore, any impacts are likely to be transient and not significant. Notwithstanding this, good practice measures to control dust emissions should be carried out at all times.

6.0 Conclusions

- 6.1.1 Enzygo Limited was commissioned by Halstow Energy Limited to undertake an Air Quality Assessment to support of the application for the construction and operation of an Agricultural Anaerobic Digestion Plant with access to the National Grid on land to the land east of A162, Low Farm, South Milford, Sherburn in Elmet.
- 6.1.2 Combustion and ammonia emissions associated with the AD facility have the potential to cause increases in ground level pollutant concentrations and deposition rates at sensitive locations. As such, an Air Quality Assessment was required to assess impacts at sensitive locations in the vicinity of the site. The emissions from the operation of the proposals will be subject to required controls and emissions limits within the Environmental Permitting regime
- 6.1.3 Modelling was based on the plant emitting the maximum permitted pollutant concentration for a full calendar year, as well the use of the maximum concentrations over 5 assessment years. Constant use of the diesel generators was assumed in the model for short term impacts and ensured a robust assessment. In practice the generators will only emit when the engine is not operating.
- 6.1.4 Ammonia emissions were calculated based on fresh manure import proportions and included additional measures of containment and abatement controls on the site.
- 6.1.5 Following analysis of the results the relevant concentration related EQS was not exceeded at any human receptors and impacts were considered as not significant.
- 6.1.6 All ecological impacts could initially be screened as insignificant with the exception of 1 receptor where further analysis by an ecologist deemed the impacts as not significant. As such, all ecological impacts were subsequently deemed as not significant.
- 6.1.7 In addition, a proportion of the proposed development contributions will already be accounted for in background levels and loads as they are derived from locally sourced manures and feedstocks and that robust emissions assumptions have been used in this assessment. This assessment presents the maximum concentrations using 5 years of meteorological data.
- 6.1.8 Overall, impacts were similar to the previous assessment. As such, given the assessment and proposed control measures, all impacts on human and ecological receptors from the proposed development are considered to remain **not significant**.

7.0 Abbreviations

| | |
|-------------------------------|---|
| %ile | Percentile |
| AD | Anaerobic Digestion |
| ADM | Atmospheric Dispersion Modelling |
| ADMS | Atmospheric Dispersion Modelling Software |
| APIS | Atmospheric Pollution Information System |
| AQA | Air Quality Assessment |
| AQLV | Air Quality Limit Value |
| AQMA | Air Quality Management Area |
| AQO | Air Quality Objective |
| AQTAG | Air Quality Technical Advisory Group |
| ASR | Annual Status Report |
| AW | Ancient Woodland |
| CERC | Cambridge Environmental Research Consultants |
| ENGINE | Combined Heating and Power |
| CL | Critical Level/Load |
| CO ₂ | Carbon Dioxide |
| CO | Carbon Monoxide |
| CWS | Country Wildlife Site |
| DEFRA | Department for Environment, Food and Rural Affairs |
| EA | Environment Agency |
| EQS | Environmental Quality Standard |
| CH ₄ | Methane |
| C ₆ H ₆ | Benzene |
| LAQM | Local Air Quality Management |
| LNR | Local Nature Reserve |
| LWS | Local Wildlife Site |
| MAGIC | Multi-Agency Geographic Information for the Countryside |
| NGR | National Grid Reference |
| NH ₃ | Ammonia |
| NNR | National Nature Reserve |
| NO | Nitric Oxide |
| NO ₂ | Nitrogen Dioxide |
| NO _x | Oxides of nitrogen |
| NPPF | National Planning Policy Framework |
| NPPG | National Planning Practice Guidance |
| NYC | North Yorkshire Council |
| PC | Process Contribution |
| PEC | Predicted Environmental Concentration |
| SAC | Special Area of Conservation |
| SO ₂ | Sulphur Dioxide |
| SPA | Special Protection Area |
| SSSI | Site of Special Scientific Interest |
| TOC | Total Organic Carbon |
| z ₀ | Roughness Length |

Appendix A: Generator Technical Data

KOHLER

Industrial Diesel Generator Set – D330 50 Hz

Engine

General

| | |
|--|-------------------------------|
| Engine brand | DOOSAN / HYUNDAI |
| Engine ref. | P126TI-II * |
| Air inlet system | Turbo |
| Fuel | Diesel Fuel/HVO |
| Emission level | Fuel consumption optimization |
| Cylinder configuration | L |
| Number of cylinders | 6 |
| Displacement (l) | 11,05 |
| Bore (mm) * Stroke (mm) | 123 * 155 |
| Compression ratio | 17 : 1 |
| Speed 50Hz (RPM) | 1500 |
| Maximum stand-by power at rated RPM (kW) | 294 |
| Charge Air coolant | Air/Air |
| Frequency regulation, steady state (%) | +/- 0.25% |
| Injection Type | Direct |
| Governor type | Electronic |
| Air cleaner type, models | Dry |

Fuel system

| | |
|---|-------|
| Maximum fuel pump flow (l/h) | 270 |
| Max head on fuel return line (m fuel) | 1 |
| Consumption with cooling system | |
| Fuel consumption @ ESP Max Power (l/h) | 77,60 |
| Fuel consumption @ PRP Max Power (l/h) | 63,10 |
| Fuel consumption @ 75% of PRP Power (l/h) | 47 |
| Fuel consumption @ 50% of PRP Power (l/h) | 31,30 |

Emissions

| | |
|-----------------------|--------|
| Emission PM (g/kW.h) | 0,1370 |
| Emission CO (g/kW.h) | 0,1120 |
| Emission NOx (g/kW.h) | 8,0080 |
| Emission HC (g/kW.h) | 0,3320 |

* Engine reference may be partially modified depending on genset application, options selected by the customer and lead time required.

Lubrication System

| | |
|---|------|
| Oil system capacity including filters (l) | 25 |
| Min. oil pressure (bar) | 0,50 |
| Max. oil pressure (bar) | 10 |
| Oil sump capacity (l) | 23 |
| Oil consumption 100% ESP 50Hz (l/h) | 0,06 |

Air Intake system

| | |
|----------------------------------|-----|
| Max. intake restriction (mm H2O) | 635 |
| Combustion air flow (l/s) | 335 |

Exhaust system

| | PRP | ESP |
|-------------------------------------|-----|-----|
| Exhaust gas flow (L/s) | | 790 |
| Exhaust gas temperature @ ESP (°C) | | 590 |
| Heat rejection to exhaust (kW) | | 254 |
| Max. exhaust back pressure (mm H2O) | | 600 |

Cooling system

| | |
|--|-----------------|
| Radiator & Engine capacity (l) | 50,50 |
| Fan power 50Hz (kW) | 10 |
| Fan air flow w/o restriction (m3/s) | 5 |
| Available restriction on air flow (mm H2O) | 20 |
| Type of coolant | Glycol-Ethylene |
| Radiated heat to ambient (kW) | 35 |
| Heat rejection to coolant HT (kW) | 116 |
| HT circuit flow rate (l/min) | 265 |
| Coolant capacity HT, engine only (l) | 19 |
| Max coolant temperature, Shutdown (°C) | 103 |
| Max. pressure at inlet of HT water pump (mbar) | 883 |
| Thermostat begin of opening HT (°C) | 71 |
| Thermostat end of opening HT (°C) | 85 |

Appendix B: Ecology Technical Note on Nitrogen Deposition



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Manchester M1 2HK

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Your Ref:
Our Ref: SHF.0174.006.EC.R.001

Date: 9th January 2026
Email: chris.schofield@enzygo.com

RE: Home Farm – Ecology Technical Note

Introduction and Background

Consent for the Agricultural Anaerobic Digestion (AD) facility and associated plant and equipment and soft landscaping was granted by North Yorkshire Council on 31st July 2025 under application reference NY/2024/0200/FUL at the site above; the description of the development being:

“Development of an Agricultural Anaerobic Digestion (AD) Facility and associated plant and equipment and soft landscaping at Agricultural land to the east of the A612, Home Farm, Bond Ings, Sherburn in Elmet, LS25 6FW.”

The Applicant is proposing changes to the figuration of the site and a S73 Minor-Material Amendment (“MMA”) application is to be submitted. The red line boundary and the description of the approved proposal are unchanged through this application.

The consented application was supported by an Ecological Impact Assessment (EIA) (Enzygo, 2024a), DEFRA Metric Biodiversity Net Gain (BNG) Calculation (Enzygo, 2024b) and Landscape and Ecological Management Plan (LEMP) (Enzygo, 2024c). Also submitted was an Air Quality Assessment (Enzygo, 2024d) which included details of appropriate control measures in order to conclude that all impacts on ecological receptors from the proposed development are considered to be not significant.

As confirmed on the updated General Arrangement drawings, the location and footprint of the silage clamps, digestate lagoon and attenuation pond remain unchanged, however, changes are proposed in the southern part of the site in relation to the digester tanks and feedstock reception building.

As a result of these changes, the Air Quality Assessment has been revisited and associated air quality emissions remodelled. This remodelling has identified that all impacts on ecological receptors could be screened out as insignificant with the exception of predicted Nitrogen deposition at Sherburn Willows SSSI, with the Process Contribution (PC) proportion of the EQS (Environmental Quality Standard) at this receptor recorded as 1.4%, and the PEC (Predicted Environmental Concentration) exceeding the critical load.

This Technical Note presents further assessment of any potential likely significant effects of N deposition on the interest features of Sherburn Willows SSSI utilising desk-based tools and professional judgement.

Further Assessment of Likely Significant Effects

As detailed within the SSSI citation, the interest features of Sherburn Willows SSSI are its Magnesian limestone (i.e. calcareous) grassland, and its fen, marsh and swamp habitat. The Air Pollution Information System (APIS) website (see [Air Pollution Information System](#)) confirms that both these habitats are sensitive to Nitrogen deposition, with calcareous grassland that more sensitive of the two and with lower minimum and maximum critical loads, and therefore the habitat which has been used within the Air Quality screening assessment.



APIS details to effects and implications of Nitrogen deposition on calcareous grasslands which in summary comprise enriching the grassland, favouring fast-growing grasses over specialist wildflowers and reducing species diversity, as well as altering soil chemistry and competitive balance, degrading habitat quality even under traditional management.

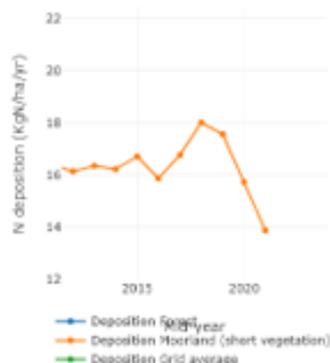
- ▲ Natural England provide details of the condition of the SSSI features, and in relation to Sherburn Willows SSSI confirm both the calcareous grassland and fen, marsh and swamp habitats were most recently recorded as in favourable condition (see [Sherburn Willows SSSI feature condition](#)). The most recent condition assessment for calcareous grassland was 2014, and fen, marsh and swamp was 2010. The published condition assessment comments for the calcareous grassland state the following:

“Continued problems with grazing as at last assessment but cutting regime is adequately managing the sward. Scrub species present throughout but this years growth only. Calcareous grassland very diverse including following indicator species: Common bird’s-foot trefoil, Cowslip, Devil’s-bit scabious, Fairy flax, Greater Knapweed, Mouse-ear hawkweed, Oxeye daisy, Hawkbits, Salad burnet, Small scabious, Tor-grass and Upright brome. Other species found: Agrimony, Burnet-saxifrage, Common Restharrow, Field scabious, Harebell, Orchid, Quaking grass, Small sedges and Wild basil”

This does not include any mention of any existing air quality related issues, nor any details related to those effects of Nitrogen deposition as reported by APIS and summarised above (e.g. no mention of favouring fast-growing grasses, alteration of soil chemistry, degradation of habitat quality, and the grassland is described as “very diverse” with numerous indicator species). The only concern is raised in relation to grazing levels. This is an important factor as this indicates there was no reported adverse effects on the SSSI habitats from the background N deposition levels which exceed the low nitrogen critical load value given by APIS for this habitat.

In addition, in review of the Air Quality Assessment it is recognised that the maximum increase in N deposition at Sherburn Willows SSSI is 0.14 kg N/ha/y which is 1.4% of the low critical load of 10 kg N/ha/y. This critical level is presented as a range with the N deposition at only 0.7% of the upper critical load of 20 kg N/ha/y, and if a mid-point were taken of 15 kg N/ha/y, the N deposition would be 0.9% of the critical load and therefore below the 1% screening threshold where impacts can be screened out as insignificant. This confirms the only exceedance of this threshold is at the lower and more precautionary end of this critical load range, and an indication of the low margin of the exceedance.

It is also noted that there has been a recent trend of decline of the background N deposition levels at this receptor, with particularly notable decline since 2018. This trend is illustrated in the chart below taken from APIS.



▲ **Insert 1: N Deposition at Sherburn Willows SSSI between 2012 and 2021**

The year of the most recent Natural England condition assessment was 2014 and at which time the background N deposition level was 16.22 kg N/ha/y. In 2021, the most recent available year of data, this background deposition was 13.87 kg N/ha/y. The Air Quality Assessment confirms the total maximum annual N deposition including this proposed development, would be 14 kg N/ha/y. This is therefore far below the levels recorded in 2014, and which was the year the condition of the habitats within the SSSI were assessed as favourable. This gives a clear indication the predicted PEC from the development would not cause adverse effects and revised proposal impacts can be considered to be not significant.

It should also be noted that the above recent decreasing trend indicates that current 2025 background levels are very likely below those 2014 levels, and there is no reason to expect that future background levels would not continue to follow this trend. Predicted increases associated with this proposal are so minor that it is assessed as significantly unlikely they would serve to counter this trend.

Through a combination of the above factors it is reasonably assessed that the notably minor exceedance of the 1% screening threshold for Nitrogen deposition is significantly unlikely to result in any adverse effects on the interest features of Sherburn Willows SSSI.

Conclusion

Following the further assessment presented in this document, it is confirmed there is no change in the conclusions from the previous Air Quality assessment, that impacts ecological receptors, including Sherburn Willows SSSI, remain not significant.

Other than the Air Quality considerations presented here, it is confirmed that the minor changes to the scheme proposed under this 573 application do not alter any other assessment or conclusions detailed within the existing Ecological Impact Assessment (*Enzygo, 2024a*). Recognising the detail presented in this Technical Note, it is therefore considered unnecessary for any formal update to the **EcJA** to be submitted.

The layout changes have resulted in minor alteration and update to the submitted Landscape Planting proposals and an updated DEFRA Metric calculation has been submitted reflecting these changes. It is confirmed that the scheme is still comfortably anticipated to meet the +10% net gain threshold as mandated by the Environment Act 2021. It is also confirmed that these minor Landscape updates do not significantly change any of the details and proposed management and monitoring measures detailed within the previously submitted Landscape and Ecological Management Plan (*Enzygo, 2024c*).

▲ I trust this satisfies your requirements. Please let me know if any further information is required.

Your Sincerely

Chris Schofield – Principal Ecologist

Enzygo Ltd



Enzygo specialise in a wide range of technical services:

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