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Air Quality Assessment S73

Land East of A162, Low Farm, South Milford, Sherburn in Elmet, LS25 6FW

Engie Renewable Gas UK Limited

CRM.0174.006.AQ.R.001.P01

'Experience and expertise working in union'

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Air Quality Assessment

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Non-Technical Summary

i. Enzygo Limited was commissioned by Engie Renewable Gas UK Limited to undertake an 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. 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.

iii. Channelled emissions from the proposals will also be subject controls and, where applicable, emission limits as part of the operator's Environmental Permit.

iv. 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 as not significant.

v. Impacts on ammonia concentrations and nitrogen and acid deposition rates were predicted as not significant at all assessed sensitive ecological receptor locations.

vi. 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 Proposed Development's contributions will already be accounted for in background levels and loads as they are predominantly derived from locally sourced manures and feedstocks. Robust emissions assumptions have been used in this assessment and presents the maximum concentrations using 5 years of meteorological data.

vii. As such, given the assessment and proposed control measures, all impacts on human and ecological receptors from the proposed development are considered to be **not significant**.

1.0 Introduction

1.1 Background

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

1.1.2 The proposed AD plant will accept approximately 65,000 tonnes per annum (tpa) of feedstock from local farms. 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.

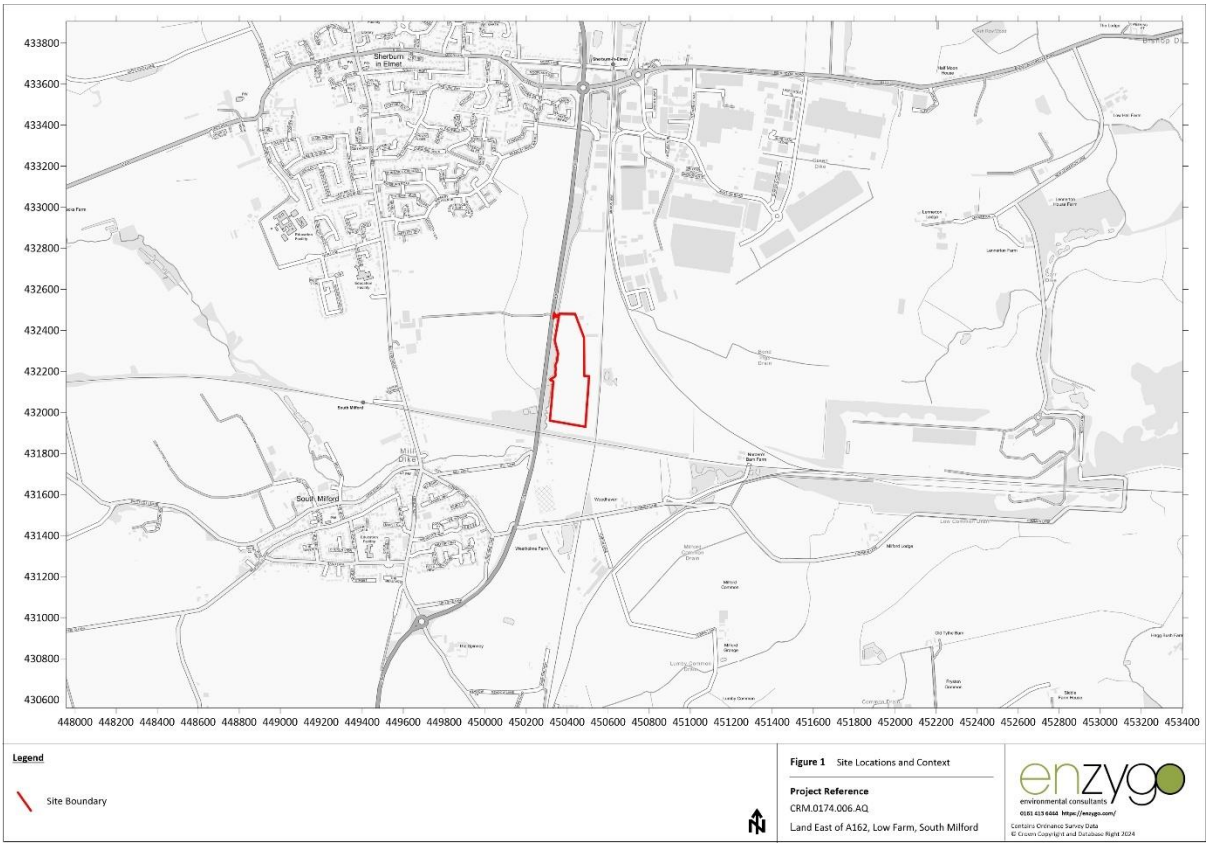
1.1.3 A secondary output of the anaerobic digestion process is digestate, which will be used on local farms in place of raw manures and artificial fertilisers.

1.2 Site Location and Context

1.2.1 The facility is located on land land east of A162, 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 386t m south of the site. Figure 1 shows the location of the site and surrounding areas.

Figure 1: Site Location



1.2.3 The proposals comprise the construction and operation of an AD facility which will comprise of the following primary elements:

- Feedstock reception and storage: silage will be stored in SAFFO complaint 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, with double membrane gas dome holders as covers. The vessels are gas tight, are heated using hot water recovered from a biogas Combined Heat and Power (ENGINE) 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, where the fibre is squeezed from the liquid phase. The fibre 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 gas produced will be combusted in a combined heat and power (ENGINE) unit. This will produce renewable electricity and heat to the on-site equipment based on the required demand;

- 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;

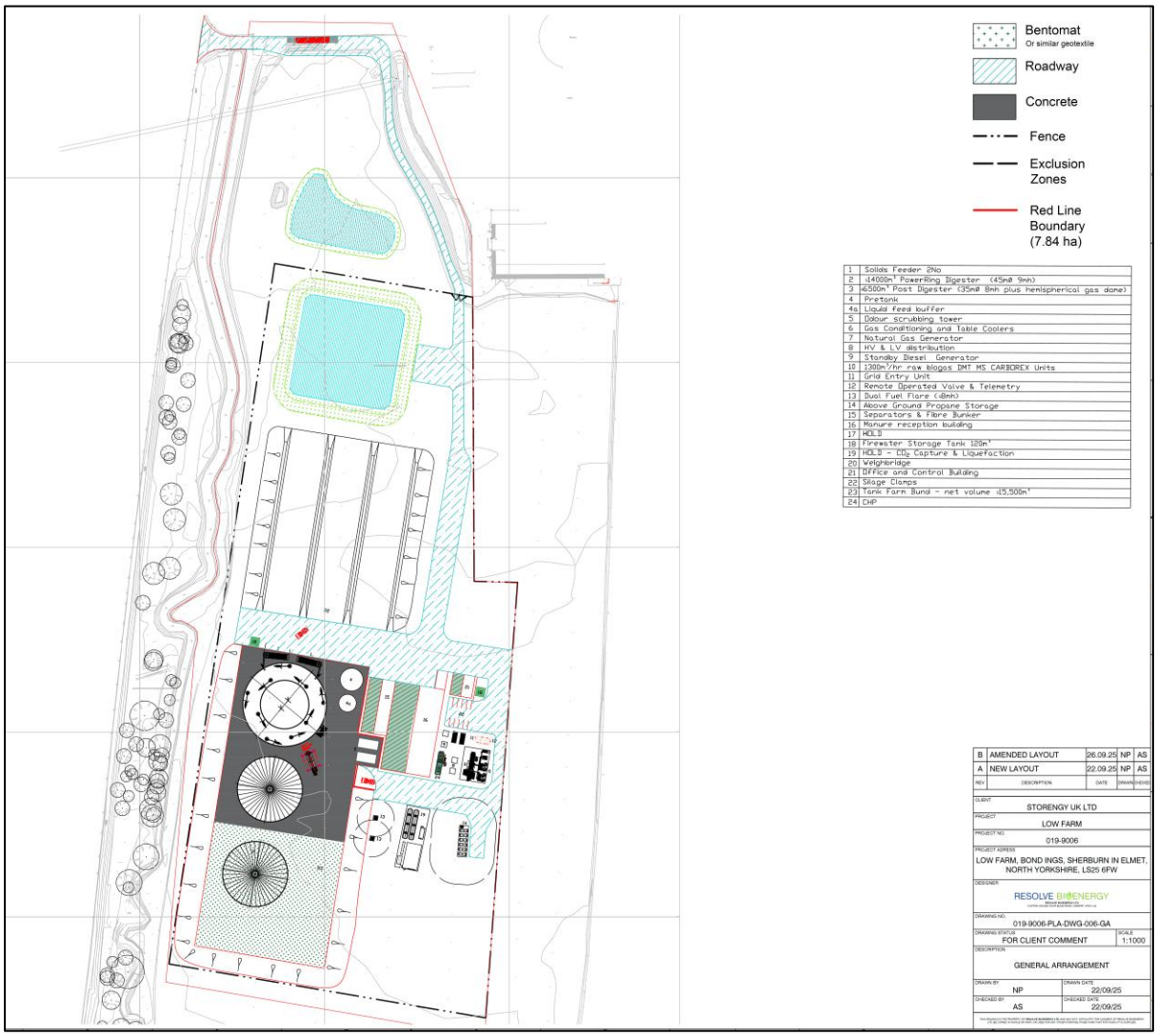
- A side stream of clean, compressed carbon dioxide is produced from the upgrading of the biogas. It is intended that the carbon dioxide will be recovered and liquified before being sent off-site to end user (to displace non-renewable carbon dioxide).

1.2.4 Combustion emissions associated with the ENGINE, 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.

1.2.5 Figure 2 shows the proposal site layout.

Figure 2: Site Layout



1.2.6 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 2016[1];
- Part IV of the Environment Act (1995);
- The National Planning Policy Framework (NPPF), 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 2022[2];
- Land-Use Planning & Development Control: Planning For Air Quality; January 2017[3];
- Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. Natural England. June 2018[4];
- The Air Quality Strategy for England, Department for Environment, Food and Rural Affairs (DEFRA), published 25th August 2023 [5];
- Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, 2022[6];
- Air emissions risk assessment for your environmental permit, EA, updated on 21st July 2025[7]; and
- Environmental permitting: air dispersion modelling reports, EA, updated on 26th March 2024[8].

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 (µg/m³)	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 µm (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 µm ($PM_{2.5}$)	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 guidance[7] 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.TG22[6] 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 (µg/m³)	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 µg/m³ 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 12 on the site general arrangement drawing.

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 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. This is currently being revised and given the advanced stage that the preparation of the new Selby Local Plan had reached, North Yorkshire Council had decided to continue with this work until is replaced by the North Yorkshire Local Plan.

2.5.2 The following policies from current and emerging local plans 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

"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.

[9] http://www.apis.ac.uk/
[10] Selby District Core Strategy Local Plan, Selby District Council, October 2013

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."

Selby New Local Plan

2.5.3 The new local plan will set a framework for future development in the former Selby district area up to 2040.

2.5.4 The decision to proceed with the Selby local plan for the former Selby district area was approved by North Yorkshire Council on 23 February 2023 and 21 February 2024. The latest consultation document[11] was reviewed for relevant policies

Policy NE7 - Air Quality

A. Development will not be supported where it:

1. *Results in further significant air quality deterioration, or the need to declare further Air Quality Management Areas (AQMAs); or*
2. *Results in any increase in the number of people exposed to poor air quality; or*
3. *Conflicts with elements of an Authority Air Quality Action Plan (AQAP); or*
4. *Causes adverse effects on internationally and nationally designated nature conservation sites which cannot be mitigated (as set out in Policy NE1 - Protecting Designated Sites and Species).*

B. Developments will only be permitted if the impact on air quality is acceptable and mechanisms are in place to mitigate adverse impacts. This will be achieved by:

1. *All developments promoting the uptake of low-emission mitigation (such as through electric vehicle charging provision) and supporting sustainable travel to reduce air quality impacts.*
2. *Developments in or affecting an Air Quality Management Area or where pre-application discussions have indicated that the development could result in the designation of an Air Quality Management Area or where the grant of planning permission would conflict with, or render unworkable, elements of the Authority Air Quality Action Plan, applicants must submit an Air Quality Assessment and/or a Dust Assessment Report and identify mitigation measures to ensure no significant adverse effects where development may:*

   i. Involve agricultural or industrial developments which have the potential to produce emissions and particulates which could affect residents; or

   ii. Create emissions of dust during demolition, earth moving and construction, or through site operations associated with mineral extraction, waste disposal or agriculture; or

[11] Selby Local Plan Revised Publication 2024, North Yorkshire Council, April 2024

iii. Impact on the air quality of a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar or Site of Special Scientific Interest (SSSI), or on a non-statutory site where there is a relevant sensitivity, or

iv. Create significant amounts of traffic (the level at which it has the potential to increase local air pollution or nitrogen deposition, either individually or cumulatively), as determined through a Transport Assessment and/or air quality modelling specific to a planning application.

C. Mitigation measures should ensure consistency with the Council's Air Quality Action Plan and the Habitats Regulations Assessment where impacts are related to the diversity of ecosystems, and where impacts are traffic related, the North Yorkshire Local Transport Plan.

2.5.5 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 have been quantified through dispersion modelling in accordance with the methodology outlined in the following Sections.

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 Engie Renewable Gas UK Limited ;
- Process conditions for the engine and boiler were provided by Engie Renewable Gas UK Limited ;
- Emission rates were calculated based on the provided process conditions and where necessary based on the EA's SR2021 guidance [12]; 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.

[12] 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_6H_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 PM_{10} 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 during periods when additional heat is required. Based on ambient temperatures throughout the year Engie Renewable Gas UK 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 Engie Renewable Gas UK 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	9.8	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 will also be emitted through dedicated stack following treatment for odours and ammonia. Air will be extracted from the reception building at a rate of 3 air exchanges per hour and free building volume of 16,380 m^3. 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 Combustion emissions will be subject to medium combustion plant limits. Emission rates from engine and boiler combustion sources were calculated based on maximum permitted emission concentrations as defined in Environment Agency SR2021 No 8[2]. 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% O_2, 0°C, and moisture content 0%
b: Actual conditions assuming typical O_2 9% and moisture content 11%

Table 8: Diesel Generator Emission Rates

Pollutant	Emission (g/kWh)[a]	Mass Emission Rate (g/s)
NOx	8.008	0.654

Pollutant	Emission (g/kWh)[a]	Mass Emission Rate (g/s)
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)
NOx	200	0.049
CO	40	0.004
SO_2	100	0.015

a: Referenced at 5% O_2, 0°C, and moisture content 0%
b: Actual conditions assuming typical O_2 9% and moisture content 11%

3.6 Ammonia Emissions

3.6.1 NH_3 emission rates were considered for the manure stores and solid and liquid digestate storage.

3.6.2 Solid waste feedstocks (FYMs) 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.

3.6.3 Several bays will be deployed within the 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 m^3 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 periodically loaded into vehicles for removal from site each week.

3.6.6 The total liquid digestate output is a function of the feedstock mix however the expected liquid digestate is circa 37,230 tonnes per year. Following separation it will be piped in a 250 m^3 holding tank before pipining into the lagoon. The lagoon will be a lined earth bank construction, 4.5m high with a designed 750 mm freeboard.

3.6.7 As part of the best available techniques for permit compliance the lagoon will be covered and make allowances for residual biogas capture i.e. back to the plant.

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 seperation 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.

3.6.10 A 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 NH_3 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)[13] are similar to the values arising from crop-based digestate analysis. In the absence of an alternative surrogate for food waste-based digestate, the surrogate manure values for crop based digestate 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 NH_3 emission rates were calculated using the SCAIL online tool[14] 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 SCAIL outputs considered emission releases from proposed manure and digestate storage. Emission rates are based approximate mass and volume of materials, confirmed by Engie and detailed in Table 10.

[13] ADAS, MANNER-NPK Available at: http://www.planet4farmers.co.uk/Manner.aspx

[14] 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	7500	2.68	kg/t/year	20100	0.637
FYM (cattle)	4000	0.322	kg/t/year	1288	0.041
Pig Manure	5100	0.85	kg/t/year	4335	0.137
Horse Manure	4000	0.322	kg/t/year	1288	0.041
Total					0.857
50 m^2 Pad Area					0.017 g/m2/s

Solid Digestate Storage	tpa	Emission Factor	Unit	Emission (kg/year)	Emission (g/s)
Pig Manure	14600	0.85	kg/t/year	12410	0.394

Liquid Slurry Tanks	Area (m^2)	Emission Factor	Unit	Emission (kg/year)	Emission (g/s)
Cattle Slurry	12.57	0.73	kg/m2/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	3072	0.23	kg/m2/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/m2/year	14.632	0.000464

3.6.16 All NH_3 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 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. For the majority of the year waste will be brought to the site once 2 or 3 days per week. For robustness this was assumed to be one deposit 5 days per week. During July and October the amount of materials are greater than with on average 2.7 daily trips in July and 1.7 in October. During these periods it was assumed that 3 trips would be made on 7 days per week (21 trips in total). These are considered conservative assumptions based on material masses.

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

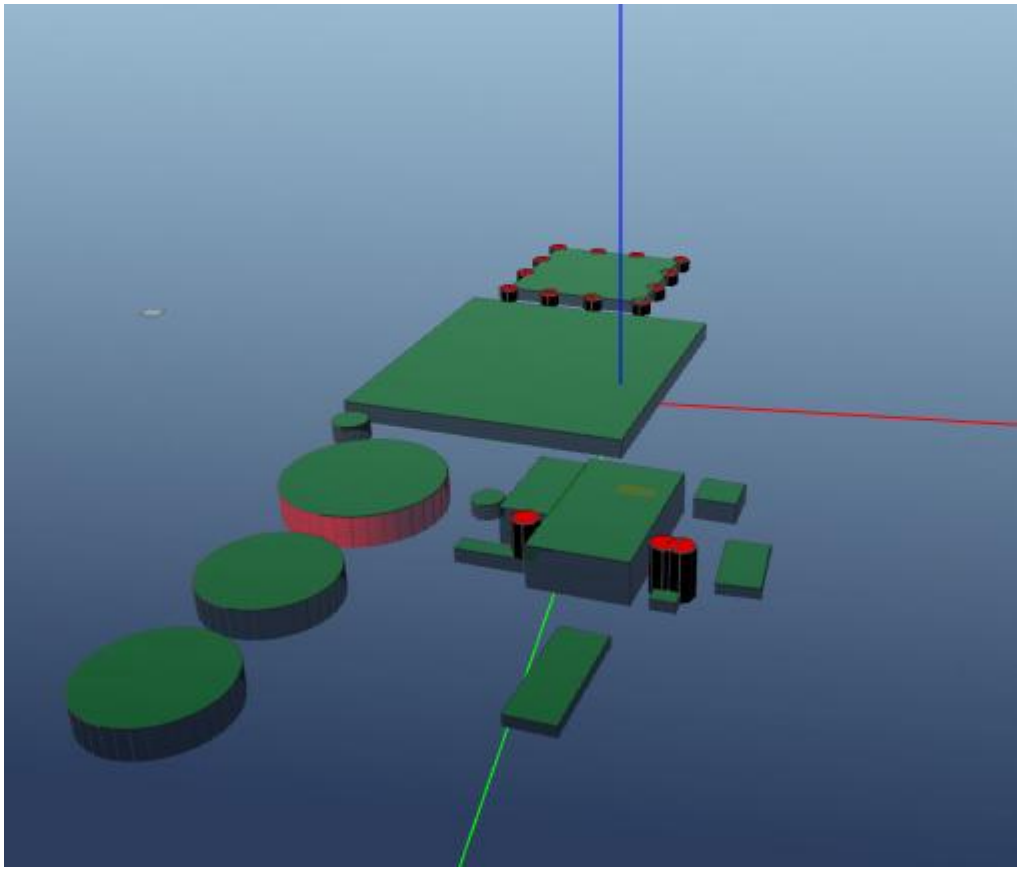
Table 13: Building Geometries

Building		NGR (m)		Height (m)	Length/ Diameter (m)	Width (m)	Angle (°)
		X	Y				
1	Power RIng Tank	450379.1	432115.7	9.0	45.0	Circular	N/A
2	Post Digester 1	450371.5	432068.2	8.0	35.0	Circular	N/A
3	Post Digester 2	450364.1	432025.3	8.0	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
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 **Error! Reference source not found.**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

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



3.14 NO_x to NO_2 Conversion

3.14.1 Ground level NO_x concentrations were predicted through dispersion modelling. NO_2 concentrations reported in the results section assume conversion from NO_x to NO_2, based upon EA guidance[8] detailed below:

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

3.15 15-minute SO_2 Conversion

3.15.1 Throughout the assessment, 15-minute mean SO_2 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 guidance[8]:

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[15]. Predicted pollutant concentrations were multiplied by the relevant

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

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 NO_2 and SO_2 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, NH_3 and SO_2 concentrations. The proportion of the EQS consisting of the PC and PEC were then calculated using the tool available on the APIS website**Error! Bookmark not defined.**.

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.TG22[6] 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

guidance[16].

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 guidance[16].

3.17.5 For short term impacts, the EPUK and IAQM guidance[16] 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 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 NO_2 concentration of 41 µg/m^3 should attract less significance than an annual mean of 51 µg/m^3.

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

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 guidance[7].

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 guidance[7], 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 APIS**Error! Bookmark not defined.** 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 NO_2. 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 in the former Selby district using passive methods throughout their area of administration. A review of the most recent Air Quality Status Report [17] 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 maps[18] and national monitoring networks.

4.4.2 Background concentrations and baseline deposition rates for ecological receptor locations have been sourced from the APIS website**Error! Bookmark not defined.**.

4.4.3 The proposed site is in grid square NGR: 450500, 432500. Data for this location was downloaded from the DEFRA website for NOx, NO_2, PM_{10}, $PM_{2.5}$, CO and TOC (as C_6H_6) for the purpose of this assessment. Background concentrations for human exposure to NH_3 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 19.

Table 18: Predicted Background Pollutant Concentrations

Pollutant	Predicted Background Concentration (µg/m³)
NO_x	11.69
NO_2	8.96
CO	300.0
SO_2	5.61

[17] 2023 Air Quality Annual Status Report, Former District of Selby, North Yorkshire Council. June 2023.
[18] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

Pollutant	Predicted Background Concentration (µg/m³)
Benzene	0.17
NH_3	1.40
PM_{10}	13.62
$PM_{2.5}$	7.60

4.4.4 Background concentrations for NO_x, NO_2, PM_{10} and $PM_{2.5}$ were predicted for 2024, whilst CO and SO_2 were predicted for 2001, and benzene predicted for 2010. The most recent complete year of NH_3 monitoring is from 2023. These are the most recent predictions available from DEFRA and deemed appropriate for use.

Short term Background Concentrations

4.4.5 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 guidance[7].

4.5 Human Sensitive Receptors

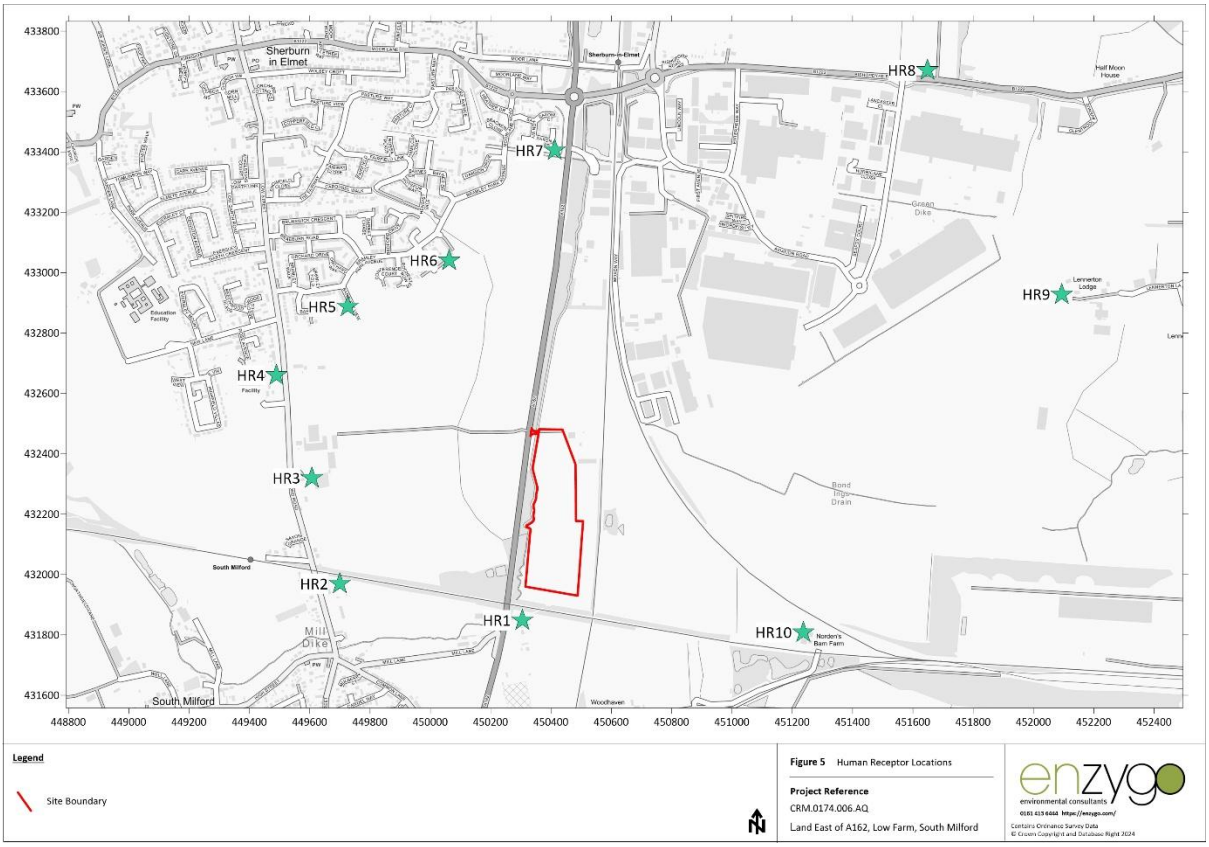
4.5.1 Sensitive receptor locations surrounding the facility were identified from a desk-top study. These were modelled at the minimum height of relevant exposure. The modelled receptors are summarised in Table 19.

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 (µg/m³)						
		NO_x	NO_2	PM_{10}	$PM_{2.5}$	CO	SO_2	C_6H_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 1: Geological designation and therefore not considered further as a sensitive receptor

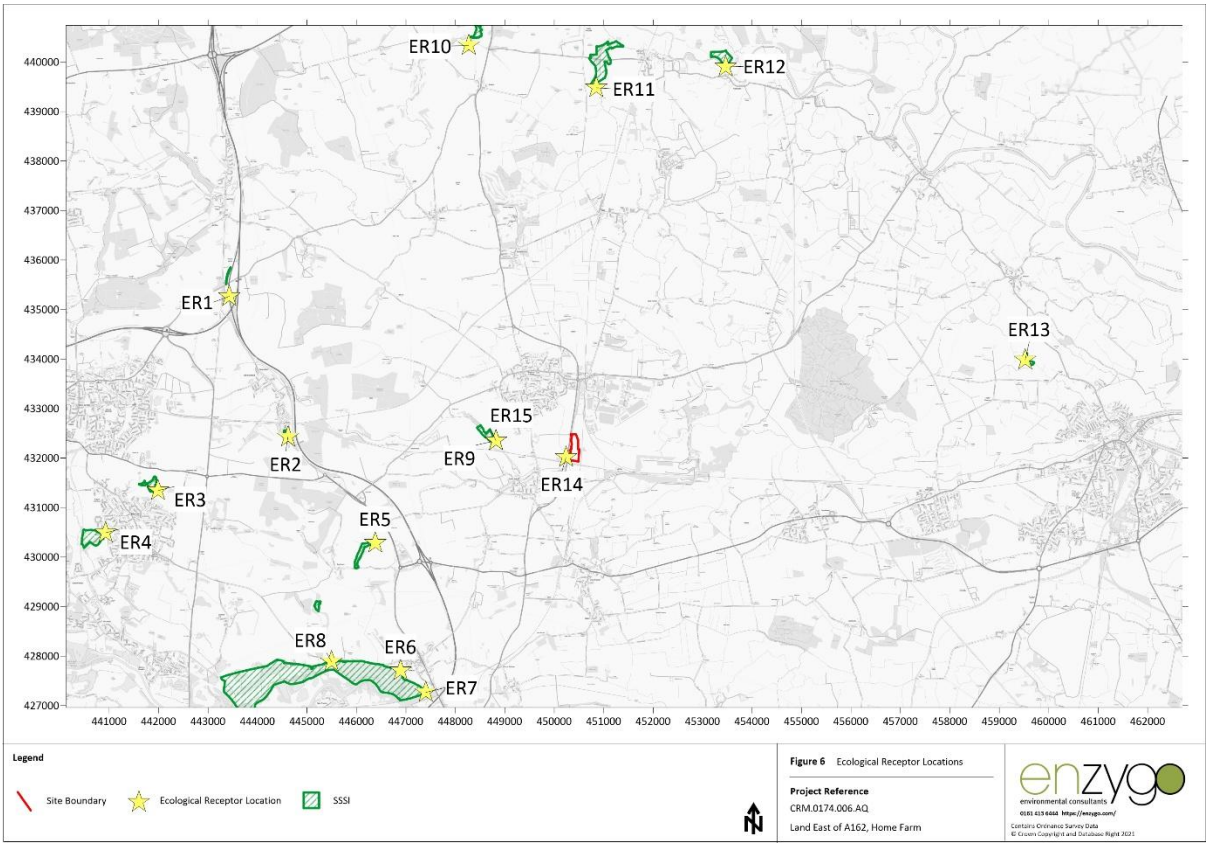
4.6.4 Figure 7.

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 Quarrys[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 website[1] 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	Broadleafed Woodland	10	15
ER7	Fairburn and Newton Ings Woodland	Galium Palustre Woodland	Broadleafed Woodland	10	15
ER8	Fairburn and Newton Ings Woodland	Galium Palustre Woodland	Broadleafed 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	Broadleafed 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 (µg/m^3)			Lichens or Bryophytes Sensitive
	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)					
		Nitrogen	Sulphur	NO_x	SO_2	NH_3	
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 (µg/m³)			Lichens or Bryophytes Sensitive
	Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)					
		Nitrogen	Sulphur	NO_x	SO_2	NH_3	
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 NO_2 process concentrations at sensitive receptors are summarised in Table 25.

Table 25: Predicted Annual Mean NO_2 Concentrations

Receptor		Concentration (µg/m³)		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 NO_2 process concentrations at sensitive receptors are summarised in Table 26.

Table 26: Predicted 99.79%ile 1-Hour Mean NO_2 Concentrations

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC[a]
HR1	Mill Lane, South Millford	30.2	52.8	**15.1**	17.0
HR2	Craglands, South Millford	13.4	34.5	6.7	7.5
HR3	Home Lea Cottage	12.2	33.0	6.1	6.8
HR4	22 Milford Road/Primary School	9.4	30.2	4.7	5.3
HR5	10 Bartlett View, Sherburn in Elmet	10.7	31.5	5.3	5.9
HR6	25 Egremont Place, Sherburn in Elmet	11.6	35.3	5.8	6.6
HR7	Saxon Mews, Sherburn in Elmet	8.3	32.0	4.1	4.7
HR8	Ashfield	4.7	28.5	2.3	2.6
HR9	Lennerton Lodge	5.7	25.7	2.8	3.2
HR10	Norden's Barn Farm	7.5	29.2	3.8	4.2

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 NO_2 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 NO_2 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 NO_2 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 and impacts. However the PEC is well below the EQS of 200 µg/m^3. 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 NO_2 concentrations can be considered as negligible or slight according to the criteria detailed in Section 3.17.

5.2.8 Overall NO_2 impacts are therefore considered as **not significant**.

Particulate Matter PM_{10}

5.2.9 Predicted annual mean PM_{10} process concentrations are summarised in Table 27.

Table 27: Predicted Annual Mean PM_{10} Concentrations

Receptor		Concentration (µg/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR1	Mill Lane, South Millford	0.02	13.3	0.06	33.3
HR2	Craglands, South Millford	0.01	12.7	0.01	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	0.00	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	0.00	12.2	0.01	30.6
HR8	Ashfield	0.00	12.9	0.01	32.2
HR9	Lennerton Lodge	0.00	12.7	0.01	31.8
HR10	Norden's Barn Farm	0.0	13.3	0.02	33.3

Predicted concentrations were assessed against the relevant EQS of 40 µg/m^3.

5.2.10 Predicted 90.41%ile 24-hour mean PM_{10} concentrations are summarised in Table 28.

Table 28 Predicted 90.41%ile 24-Hour Mean PM_{10} Concentrations

Receptor		Concentration (µg/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR1	Mill Lane, South Millford	0.09	26.7	0.2	0.4
HR2	Craglands, South Millford	0.02	25.5	0.0	0.1
HR3	Home Lea Cottage	0.01	26.7	0.0	0.0
HR4	22 Milford Road/Primary School	0.01	26.7	0.0	0.0
HR5	10 Bartlett View, Sherburn in Elmet	0.02	26.7	0.0	0.1
HR6	25 Egremont Place, Sherburn in Elmet	0.02	24.5	0.0	0.1
HR7	Saxon Mews, Sherburn in Elmet	0.01	24.4	0.0	0.0
HR8	Ashfield	0.01	25.8	0.0	0.0
HR9	Lennerton Lodge	0.01	25.5	0.0	0.0

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR10	Norden's Barn Farm	0.02	26.6	0.0	0.1

Predicted concentrations were assessed against the relevant EQS of 50 µg/m³.

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 90.41%ile 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 As such all PM_{10} impacts are considered as not significant.

Particulate Matter ($PM_{2.5}$)

5.2.16 Predicted annual mean $PM_{2.5}$ concentrations are summarised in Table 30.

Table 29: Predicted Annual Mean $PM_{2.5}$ Concentrations.

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR1	Mill Lane, South Millford	0.023	7.5	0.12	37.4
HR2	Craglands, South Millford	0.006	7.3	0.03	36.4
HR3	Home Lea Cottage	0.003	7.4	0.02	37.0
HR4	22 Milford Road/Primary School	0.003	7.4	0.01	37.0
HR5	10 Bartlett View, Sherburn in Elmet	0.005	7.4	0.02	37.0
HR6	25 Egremont Place, Sherburn in Elmet	0.006	7.3	0.03	36.3
HR7	Saxon Mews, Sherburn in Elmet	0.003	7.3	0.01	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	0.007	7.4	0.03	37.0

Predicted concentrations were assessed against the relevant EQSs: Annual mean EQS of 20 µg/m³.

5.2.17 As indicated in Table 30, predicted annual mean $PM_{2.5}$ 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 $PM_{2.5}$. The actual emission proportion is likely to be much less than this.

5.2.20 As such all $PM_{2.5}$ impacts are considered 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 (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PECa
HR1	Mill Lane, South Millford	62.9	634.9	0.6	0.7
HR2	Craglands, South Millford	12.3	1184.3	0.1	0.1
HR3	Home Lea Cottage	18.0	1246.0	0.2	0.2
HR4	22 Milford Road/Primary School	9.7	1237.7	0.1	0.1
HR5	10 Bartlett View, Sherburn in Elmet	9.1	1237.1	0.1	0.1
HR6	25 Egremont Place, Sherburn in Elmet	12.0	1200.0	0.1	0.1
HR7	Saxon Mews, Sherburn in Elmet	5.9	1193.9	0.1	0.1
HR8	Ashfield	3.3	1159.3	0.0	0.0
HR9	Lennerton Lodge	5.1	1141.1	0.1	0.1
HR10	Norden's Barn Farm	62.9	634.9	0.6	0.7

Predicted concentrations were assessed against the relevant EQSs: 8-hour rolling mean EQS of 10,000 µg/m³.
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 As such, all CO impacts are considered as **not significant.**

SO_2

24-Hour Mean

5.2.24 Predicted 24-hour mean SO_2 concentrations at sensitive human receptor locations are summarised in Table 31.

Table 31: Predicted 24-Hour SO_2 Concentrations

Receptor		Concentration (µg/m³)		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 µg/m³.
a: PC proportion of the EQS minus twice the long-term background

1-Hour Mean

5.2.25 Predicted 1-hour mean SO_2 concentrations at sensitive human receptor locations are summarised in Table 32.

Table 32 Predicted 1-Hour SO_2 Concentrations

Receptor		Concentration (µg/m³)		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 SO_2 concentrations at sensitive human receptor locations are summarised in Table 33.

Table 33: Predicted 15-minute SO_2 Concentrations

Receptor		Concentration (µg/m³)		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 SO_2 concentrations can be screened out as insignificant and no further analysis is required for this substance. Therefore, impacts on all SO_2 concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.29 As such, all SO_2 impacts are considered 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/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR1	Mill Lane, South Millford	<0.01	0.4	<0.01	7.6
HR2	Craglands, South Millford	<0.01	0.4	<0.01	7.9
HR3	Home Lea Cottage	<0.01	0.4	<0.01	8.6
HR4	22 Milford Road/Primary School	<0.01	0.4	<0.01	8.6
HR5	10 Bartlett View, Sherburn in Elmet	<0.01	0.4	<0.01	8.6
HR6	25 Egremont Place, Sherburn in Elmet	<0.01	0.4	<0.01	8.2
HR7	Saxon Mews, Sherburn in Elmet	<0.01	0.4	<0.01	8.2
HR8	Ashfield	<0.01	0.4	<0.01	7.7
HR9	Lennerton Lodge	<0.01	0.4	<0.01	7.2
HR10	Norden's Barn Farm	<0.01	0.4	<0.01	7.1

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

5.2.31 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

5.2.32 The PC proportion of the annual mean exceeds 1%, at all 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.

5.2.33 As such, impacts on annual mean NO_2 concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.34 In addition, the assessment assumes that all TOCs are benzene. Therefore, all TOC impacts are considered as **not significant**.

24-Hour Mean

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

Table 35: Predicted 24-Hour Mean TOC Concentrations

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR1	Mill Lane, South Millford	<0.1	0.8	<0.1	<0.1
HR2	Craglands, South Millford	<0.1	0.8	<0.1	<0.1
HR3	Home Lea Cottage	<0.1	0.9	<0.1	<0.1
HR4	22 Milford Road/Primary School	<0.1	0.9	<0.1	<0.1
HR5	10 Bartlett View, Sherburn in Elmet	<0.1	0.9	<0.1	<0.1
HR6	25 Egremont Place, Sherburn in Elmet	<0.1	0.8	<0.1	<0.1
HR7	Saxon Mews, Sherburn in Elmet	<0.1	0.8	<0.1	<0.1

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR8	Ashfield	<0.1	0.8	<0.1	<0.1
HR9	Lennerton Lodge	<0.1	0.7	<0.1	<0.1
HR10	Norden's Barn Farm	<0.1	0.7	<0.1	<0.1

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

5.2.36 As indicated in Table 35, predicted 24-hour mean TOC concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.37 The PC proportion of the EQS is greater than 10% at 7 sensitive receptors and exceeds 20% of the EQS minus twice the long term background and is not screened as insignificant at 2 receptors. However, the EQS is not exceeded at these locations although EPUK and IAQM guidance would describe the impacts as 'moderate to substantial'.

5.2.38 However, the assessment has used an extremely conservative assessment by assuming that all TOCs are emitted as benzene. The proportion of benzene emission from the industrial combustion of gas is reported to be 9.1% of the total non-methanogenic VOC (NMVOC) fraction within the group[19]. The assessment has considered total VOCs including methane and therefore the benzene proportion is likely to be much lower than this.

5.2.39 Whilst the combustion of biogas can lead to greater VOC emissions than natural gas the magnitudes have been shown to be similar[20]. Monitoring requirements as part of the Environmental Permit would confirm this.

5.2.40 On the basis of the conservative assessment approach, whereby the assessment has assumed maximum permitted TVOC emissions as 100% benzene, and that predicted PEC concentrations at locations of relevant exposure are within the AQS, it is considered that the air quality standards for benzene would be met and TOC impacts are considered as not significant.

Ammonia

Annual Mean

5.2.41 Predicted annual mean NH_3 concentrations at sensitive human receptor locations are summarised in Table 36.

Table 36: Predicted Annual Mean NH_3 Concentrations

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR1	Mill Lane, South Millford	0.39	1.77	0.22	4.4
HR2	Craglands, South Millford	0.07	1.45	0.04	3.6
HR3	Home Lea Cottage	0.04	1.42	0.02	3.6
HR4	22 Milford Road/Primary School	0.03	1.41	0.02	3.5
HR5	10 Bartlett View, Sherburn in Elmet	0.05	1.43	0.03	3.6
HR6	25 Egremont Place, Sherburn in Elmet	0.08	1.46	0.04	3.6
HR7	Saxon Mews, Sherburn in Elmet	0.04	1.42	0.02	3.6
HR8	Ashfield	0.03	1.41	0.01	3.5

[19] Passant, N.R. (2002) Speciation of UK emissions of non-methane volatile organic compounds. AEA Technology. AEAT/ENV/R/0545 Issue 1. 2002

[20] Regulated Emissions of Biogas Engines—On Site Experimental Measurements and Damage Assessment on Human Health. Table 15. Alarico Macor and Alberto Benato. January 2020

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
HR9	Lennerton Lodge	0.04	1.42	0.02	3.6
HR10	Norden's Barn Farm	0.07	1.45	0.04	3.6

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

1-Hour Mean

5.2.42 Predicted 1-hour mean NH_3 concentrations at sensitive human receptor locations are summarised in Table 37.

Table 37: Predicted 1-Hour NH_3 Concentrations

Receptor		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC[a]
HR1	Mill Lane, South Millford	340.4	343.1	**13.6**	13.6
HR2	Craglands, South Millford	58.9	61.6	2.4	29.8
HR3	Home Lea Cottage	29.5	32.2	1.2	14.9
HR4	22 Milford Road/Primary School	17.9	20.7	0.7	9.1
HR5	10 Bartlett View, Sherburn in Elmet	21.2	24.0	0.8	10.7
HR6	25 Egremont Place, Sherburn in Elmet	55.6	58.4	2.2	28.2
HR7	Saxon Mews, Sherburn in Elmet	32.4	35.2	1.3	16.4
HR8	Ashfield	17.3	20.1	0.7	8.8
HR9	Lennerton Lodge	21.6	24.3	0.9	10.9
HR10	Norden's Barn Farm	68.8	71.5	2.8	34.9

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

5.2.43 As indicated in Table 36 predicted annual mean NH_3 concentrations were well below 75% of the relevant EQS at all sensitive receptor locations for all meteorological data sets

5.2.44 In addition, the PC proportions of the annual mean does not exceed 1%, at all receptor locations. As such, impacts on annual mean NH_3 concentrations can be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.45 As indicated in Table 37 predicted 1-hour mean NH_3 concentrations were also well below the relevant EQS at all sensitive receptor locations.

5.2.46 PC proportions of the EQS is exceeded 10%, at one receptor location but the PC proportion is less than 20% of the EQS minus twice the long-term background and impacts. 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.

5.2.47 As such, impacts on 1-hour mean NH_3 concentrations can be screened out as insignificant according to the criteria detailed in Section 3.17.

5.2.48 Therefore all NH_3 impacts are considered as **not significant**.

5.3 Ecological Receptors

Oxides of Nitrogen

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

Table 38: Predicted Annual Mean NOx Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.01	17.52	0.02	58
ER3	0.00	17.51	0.02	58
ER4	0.00	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
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	2.72	61
ER15	0.04	17.55	0.13	58

Table Notes: Predicted concentrations were assessed against the relevant CL: 30 µg/m³.

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

Table 39: Predicted 24-Hour Mean NOx Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.2	35.2	0.3	47
ER3	0.2	28.1	0.2	38
ER4	0.2	26.9	0.2	36
ER5	0.5	25.1	0.7	33
ER6	0.4	25.3	0.6	34
ER7	0.4	30.3	0.6	40
ER8	0.4	25.6	0.6	34
ER9	1.6	22.5	2.2	30
ER10	0.2	17.8	0.3	24
ER11	0.3	17.2	0.4	23
ER12	0.2	16.1	0.3	21
ER13	0.2	16.0	0.3	21
ER14	26.8	48.9	35.8	65
ER15	1.6	22.5	2.2	30

Table Notes: Predicted concentrations were assessed against the relevant CL: 75µg/m³.

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

5.3.5 However the PECs in this scenario are well below 70% of the EQS and as such all 24 hour mean impacts can be screened as insignificant.

5.3.6 As such, all NO_x impacts on ecological designations can be considered as **not significant** and there is no requirement for further assessment.

Sulphur Dioxide

5.3.7 Predicted annual mean SO_2 concentrations are summarised in in Table 40.

Table 40: Predicted Annual Mean SO_2 Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	**PC**	**PEC**	**PC**	**PEC**
ER3	<0.01	1.6	<0.01	16
ER4	<0.01	2.2	<0.01	22
ER5	<0.01	1.9	<0.01	19
ER6	<0.01	1.5	<0.01	15
ER7	<0.01	1.6	<0.01	16
ER8	<0.01	1.7	<0.01	17
ER9	<0.01	1.7	<0.01	17
ER10	<0.01	1.4	<0.01	14
ER11	<0.01	1.0	<0.01	10
ER12	<0.01	1.0	<0.01	10
ER13	<0.01	1.0	<0.01	10
ER14	<0.01	1.1	<0.01	11
ER15	<0.01	1.7	<0.01	17

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 SO_2 concentrations can be screened out as insignificant.

5.3.9 As such, all sulphur dioxide impacts on ecological designations can be considered as **not significant** and there is no requirement for further assessment.

Ammonia

5.3.10 Predicted annual mean NH_3 concentrations are summarised in in Table 41.

Table 41: Predicted Annual Mean NH_3 Concentrations

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.001	1.51	0.04	50
ER3	0.001	1.41	0.03	47
ER4	0.001	1.37	0.10	46
ER5	0.004	1.54	0.14	154
ER6	0.004	1.45	0.37	145
ER7	0.003	1.58	0.35	158

Receptor	Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER8	0.003	1.50	0.31	150
ER9	0.014	1.61	0.46	161
ER10	0.002	1.88	0.08	188
ER11	0.003	1.85	0.27	185
ER12	0.003	1.80	0.09	60
ER13	0.003	1.79	0.09	60
ER14	0.555	2.28	18.51	76
ER15	0.014	1.61	0.46	54

Table Notes: Predicted concentrations were assessed against the relevant CL: 3 µg/m³ for all receptors with the exception of ER8, ER9, ER13, ER14 and ER16 a worst CL of 1 µg/m³ has been used due to the potential presence of lichens and/or bryophytes at these locations

5.3.11 As 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.

5.3.12 As such, all ammonia impacts on ecological designations can be considered as **not significant** and there is no requirement for further assessment.

Nitrogen Deposition

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

Table 42: Predicted Annual Mean Nitrogen Deposition Rates

Receptor	Deposition Rate (kgN/ha/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	0.04	13.9	0.4	139	0.2	69
ER6	0.03	26.2	0.3	262	0.2	175
ER7	0.02	26.6	0.2	266	0.1	177
ER8	0.02	25.8	0.2	258	0.1	172
ER9	0.08	13.9	0.8	139	0.4	69.7
ER10	0.01	14.8	0.1	99	0.1	59
ER11	0.02	27.5	0.2	275	0.1	183
ER12	0.01	14.7	0.1	147	0.1	73
ER13	0.02	14.7	0.2	147	0.1	73
ER14	3.00	17.7	20.0	118	12.0	71
ER15	0.08	13.9	0.8	139	0.4	70

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

5.3.14 As indicated in Table 42, 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.

5.3.15 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.

5.3.16 No nitrogen CL is provided for Hook Moor SSSI (ER1). The qualifying feature (Orobanche reticulata) has not been identified as being sensitive to nitrogen deposition and the predicted maximum PC deposition rate of 0.008 kgN/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 nitrogen deposition as a concern or threat to the SSSI[21].

5.3.17 As such, all nitrogen deposition impacts are considered 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	0.0005	0.0005	0.01	20.5	No Exceedance
ER3	<0.0001	0.0004	0.0004	0.01	19.7	No Exceedance
ER4	<0.0001	0.0004	0.0004	0.01	19.3	No Exceedance
ER5	<0.0001	0.0028	0.0028	0.06	20.6	No Exceedance
ER6	<0.0001	0.0024	0.0024	0.14	112.9	No Exceedance
ER7	<0.0001	0.0014	0.0014	0.09	114.7	No Exceedance
ER8	<0.0001	0.0013	0.0013	0.08	111.2	No Exceedance
ER9	<0.0001	0.0055	0.0055	0.11	20.5	No Exceedance
ER10	<0.0001	0.0009	0.001	Not Sensitive		No Exceedance
ER11	<0.0001	0.0011	0.0011	0.09	150.8	No Exceedance
ER12	<0.0001	0.0011	0.001	0.02	20.8	No Exceedance
ER13	<0.0001	0.0012	0.001	0.02	20.7	No Exceedance
ER14	<0.0001	0.2144	0.214	Not Sensitive		No Exceedance
ER15	<0.0001	0.0055	0.005	0.11	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

21 https://designatedsites.naturalengland.org.uk/SiteFeatureCondition.aspx?SiteCode=s1005559&SiteName=Hook%20Moor%20SSSI [accessed February 2025]

addition, NE have identified the condition of the SSSI as 'favourable' and not identified acid deposition as a concern or threat to the SSSI[21].

5.3.22 As such, all acid deposition impacts are considered 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.

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 by reviewing the planning portals from the planning authorities in the area. This included NYC and Leeds City Council. The results are as shown below.

North Yorkshire Council

5.4.2 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.

Leeds City Council

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

Wakefield Council

5.4.4 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

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

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

5.5 Construction Dust

5.5.1 The construction period is unlikely to be over a long period of time given the retrospective nature of this application 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 Engie Renewable Gas UK 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 Further consideration was required for 24-hour mean TOC emissions as they could not screened as insignificant. However given that the EQS was not exceeded, the conservative assumption that all TOCs were emitted at maximum permitted limits as benzene, the assumption that emergency generator emissions were constant and the use of maximum 5 year concentrations led to the not significant judgement.

6.1.7 All ecological impacts were subsequently deemed as not significant.

6.1.8 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.

6.1.9 As such, given the assessment and proposed control measures, all impacts on human and ecological receptors from the proposed development are considered to be **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_6H_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 ambiant (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

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