Air Quality Assessment

Anaerobic Digestion Facility- Talgarth

25th July 2025

Project No.: SOL_24_P060_GPB

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Document Details	
Document Title	Air Quality Assessment
Document Subtitle	Anaerobic Digestion Facility - Talgarth
Project No.	SOL_24_P060_GPB
Date	25th July 2025
Version	QMS_7.5.38_TEM – Template – Report Long Form – New Style (Perm) v5
Author	Amanda Gair
Client Name	GP Biotec Ltd

Document History				
Version	Comments	Date	Author Initials	Reviewer Initials
I1	First Issue to Natural Resources Wales	25/07/2025	AG	SR

Signature Page

25th July 2025

Air Quality Assessment

Anaerobic Digestion Facility - Talgarth

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1. INTRODUCTION

1.1 Purpose of the Assessment

Sol Environment Ltd has been commissioned by GP Biotec Ltd to undertake an assessment of the likely local air quality impacts arising from the operation of Combined Heat and Power (CHP) units at an Anaerobic Digestion (AD) plant to the north of Talgarth, Brecon in Powys. The AD facility currently has two CHP units utilising biogas as a fuel but is looking to operate a third unit in addition to other activities at the installation. The AD facility is currently operated under permit EPR/AB3233DW/V008. The permit will be varied to support the proposed changes. The purpose of this air quality assessment is to determine the impact on local air quality arising as a result of emissions from the CHP units. The location of the site is presented in Figure 1.1.

The air quality assessment will determine the impact on air quality arising from the operation of the three CHP units and the change in impact for the additional CHP unit. The flare is only used for emergency use and would not operate at the same time as the CHP units and is not considered further. The standby boiler has not been assessed as it is below the Medium Combustion Plant (MCP) threshold for capacity.

Emissions to air from the facility will be regulated by Natural Resources Wales (NRW) and will be required to comply with medium combustion plant limits and have been derived from maximum permitted emission concentrations provided in Environment Agency SR2021 No. 6 . Emission limits for the following pollutants are provided:

- oxides of nitrogen (NO_x);
- sulphur dioxide (SO_2);
- carbon monoxide; and
- total volatile organic compounds.

This report presents the findings of a dispersion modelling assessment to determine the impact of the proposed facility on air quality at sensitive human and habitat receptors in the surrounding area.

A glossary of common air quality terminology is provided in Appendix A.

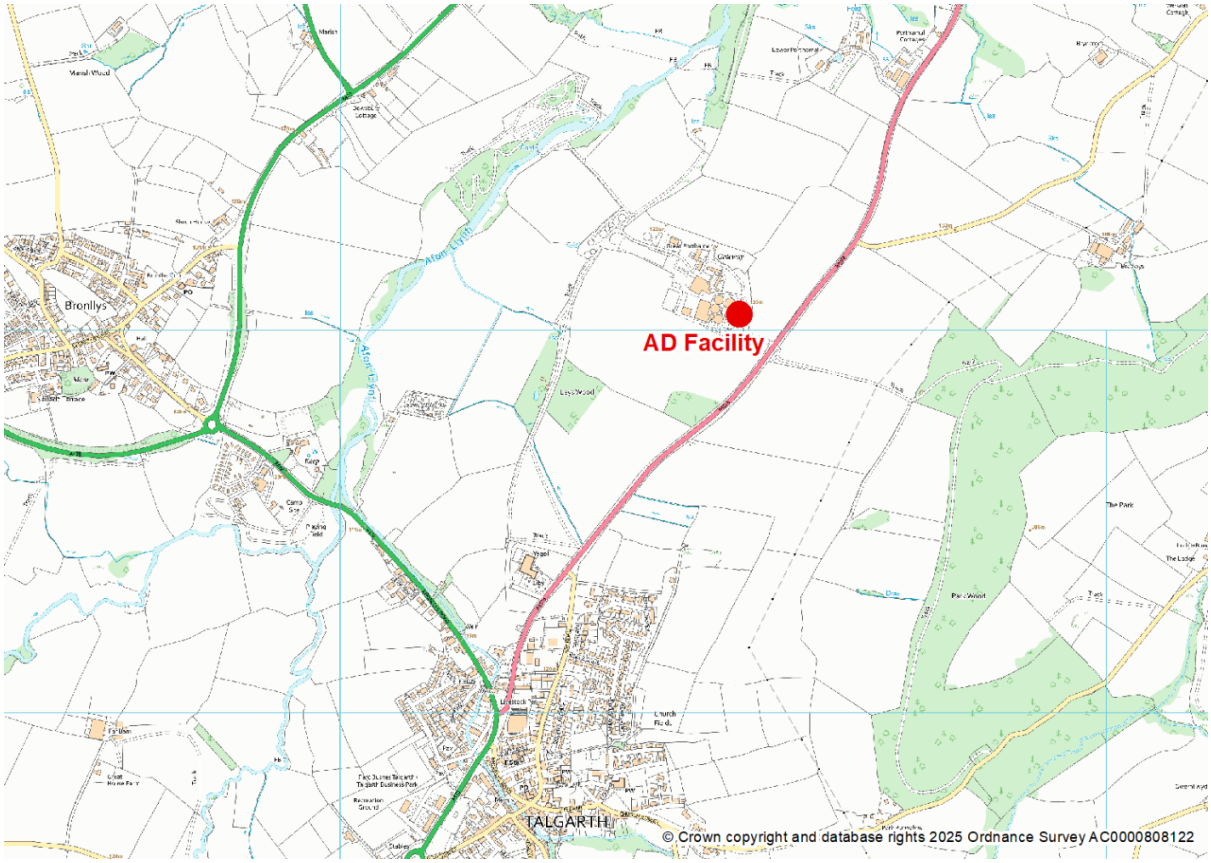

Figure 1.1 – Site Location

2. LEGISLATION AND POLICY

2.1 The European Directive on Ambient Air and Cleaner Air for Europe

European Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008, sets legally-binding Europe-wide limit values for the protection of public health and sensitive habitats. The Directive streamlines the European Union's air quality legislation by replacing four of the five existing Air Quality Directives within a single, integrated instrument.

The pollutants included are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter of less than 10 micrometres (µm) in aerodynamic diameter (PM10), particulate matter of less than 2.5 µm in aerodynamic diameter lead (PM2.5), lead (Pb), carbon monoxide (CO), benzene, ozone (O3), polycyclic aromatic hydrocarbons (PAHs), cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg).

2.2 Air Quality (Wales) Regulations

The Air Quality Standards Regulations 2010 have adopted into UK law the limit values required by EU Directive 2008/50/EC and came into force on the 10th June 2010. These regulations prescribe the 'relevant period' (referred to in Part I2V of the Environment Act 1995) that local authorities must consider in their review of the future quality of air within their area. The regulations also set out the air quality objectives to be achieved by the end of the 'relevant period'.

Ozone is not included in the Regulations as, due to its trans-boundary nature, mitigation measures must be implemented at a national level rather than at a local authority level.

The environmental assessment levels (EALs), air quality standards and objectives for the pollutants considered in the assessment are presented in Appendix B.

2.3 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 also requires local authorities to periodically review and assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

The Department of Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their Review and Assessment work . This guidance, referred to in this chapter as LAQM.TG(22), has been used where appropriate in the assessment.

2.4 Medium Combustion Plant Directive (MCPD)

The Medium Combustion Plant Directive (2015/2193) came into force on 18th December 2015 and regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth.

It regulates emissions of SO_2, NO_x and dust into the air with the aim of reducing those emissions and the risks to human health and the environment they may cause. It also lays down rules to monitor emissions of carbon monoxide (CO).

It fills the regulatory gap at EU level between large combustion plants (> 50 MWth), covered under the Industrial Emissions Directive (IED) and smaller appliances (heaters and boilers <1 MWth) covered by the Ecodesign Directive.

The Medium Combustion Plant is implemented through the Environmental Permitting Regulations (EPR).

The design and operation of all new Medium Combustion Plants must ensure compliance with emission limit values (ELVs) set out in the MCPD; these ELVs are summarised in Table 2.1 and 2.2.

Table 2.1 - MCPD Emission Limits for New MCP other than Engines and Gas Turbines (mg/Nm³)

Pollutant	Emission Limit (Dry gas at 273.15K, 101.3mb and 3% O_2 for liquid or gaseous fuels and 6% for solid fuels)					
	Solid Biomass	Other Solid Fuels	Gas Oil	Liquid Fuels Other Than Gas Oil	Natural Gas	Gaseous Fuels Other Than Natural Gas
SO_2	200(1)	400	-	350(2)	-	35(3)(4)
NO_x	300(5)	300(5)	200	300(6)	100	200
Dust	20(7)	20(7)	-	20(8)	-	

(1) The value does not apply in the case of plants firing exclusively woody solid biomass.
(2) Until 1 January 2025, 1 700 mg/Nm³ in the case of plants which are part of SIS or MIS.
(3) 400 mg/Nm³ in the case of low calorific gases from coke ovens, and 200 mg/Nm³ in the case of low calorific gases from blast furnaces, in the iron and steel industry.
(4) 100 mg/Nm³ in the case of biogas.
(5) 500 mg/Nm³ in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5 MW.
(6) Until 1 January 2025, 450 mg/Nm³ when firing heavy fuel oil containing between 0,2 % and 0,3 % N and 360 mg/Nm³ when firing heavy fuel oil containing less than 0,2 % N in the case of plants which are part of SIS or MIS.
(7) 50 mg/Nm³ in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5 MW; 30 mg/Nm³ in the case of plants with a total rated thermal input greater than 5 MW and less than or equal to 20 MW.
(8) 50 mg/Nm³ in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5

Table 2.2 - MCPD Emission Limits for New MCP for Engines and Gas Turbines (mg/Nm³)

Pollutant	Emission Limit (Dry gas at 273.15K, 101.3mb and 15% O_2)				
		Gas Oil	Liquid Fuels Other Than Gas Oil	Natural Gas	Gaseous Fuels Other Than Natural Gas
SO_2	Engines and gas turbines	-	120(9)	-	15(10)
NO_x	Engines	190(11)	190(11)(12)	95(13)	190
	Gas turbines	75	75(14)	50	75
Dust	Engines and gas turbines	-	10(15)(16)	-	-

(9) Until 1 January 2025, 590 mg/Nm³ for diesel engines which are part of SIS or MIS
(10) 40 mg/Nm³ in the case of biogas
(11) 225 mg/Nm³ for dual fuel engines in liquid mode.
(12) 225 mg/Nm³ for diesel engines with a total rated thermal input less than or equal to 20 MW with ≤ 1 200 rpm
(13) 190 mg/Nm³ for dual fuel engines in gas mode.
(14) Until 1 January 2025, 550 mg/Nm³ for plants which are part of SIS or MIS.
(15) Until 1 January 2025, 75 mg/Nm³ for diesel engines which are part of SIS or MIS
(16) 20 mg/Nm³ in the case of plants with a total rated thermal input equal to or greater than 1 MW and less than or equal to 5 MW

Standard Rules SR2021 No 6 provides emission limit values for NO_x, CO, SO_2 and total VOCs (including methane). Emission limit values for combustion plant burning biogas are provided in Table 2.3.

Pollutant	Emission Limit (Dry gas at 273.15K, 101.3mb and 5% O_2)	
	ELV	Existing or New
NO_x	500	
CO	1,400	
SO_2	350 162 107	Existing combustion plant until 31/12/2029 Existing combustion plant from 1/1/2030 New medium combustion plant
Total VOCs (including methane)	1,000	

3. METHODOLOGY

3.1 Scope of the Assessment

The scope of the assessment has been determined in the following way:

- Review of air quality data for the area surrounding the site, including data from the Defra Air Quality Information Resource (UK-AIR);
- Desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- Review and modelling of emissions data which has been used as an input to the US AERMOD dispersion model.

The assessment for the proposed facility comprises a review of emission parameters for the combustion plant and dispersion modelling to predict ground-level concentrations of pollutants at sensitive human and habitat receptor locations.

Predicted ground level concentrations are compared with relevant air quality standards for the protection of health and critical levels/ loads for the protection of sensitive ecosystems and vegetation.

3.2 Dispersion Model Parameters

3.2.1 Emissions Parameters

The predicted impact of the proposed facility on local air quality has been undertaken using the US AERMOD (US EPA Version 23132) dispersion model. For the purposes of the modelling assessment, it is assumed that all emission sources would operate at full load, continually throughout the year, ensuring that a worst-case assessment of impacts is presented.

A summary of the input parameters used in the assessment are identified in **Appendix C.**

3.2.2 Meteorological Data

The dispersion modelling has been carried out using five years (2020-2024) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from the meteorological station at Sennybridge (28 km to the west of the site) have been used for the assessment.

Wind roses for each year of meteorological data are presented in **Appendix D.**

3.2.3 Building Downwash / Entrainment

The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to a phenomenon called downwash. This occurs when a building distorts the wind flow, creating zones of increased turbulence. Increased turbulence causes the plume to come to ground earlier than otherwise would be the case and results in higher ground level concentrations closer to the stack.

Downwash effects are only significant where building heights are greater than 30 to 40% of the emission release height. The downwash structures also need to be sufficiently close for their influence to be significant. All potential downwash structures have been included in the model and a summary of building input parameters are provided in **Table 3.1**.

Table 3.1 - Downwash Structures

Description	Height (m)	Length (m)	Width (m)	Angle (°)
Building 1	5	6.8	36	108
Building 2	6	42	34	-61
Building 3	8	24.2	7.8	-67
Building 4	8.5	32.1	10.3	-69
Building 5	5.7	24	28	-73
Building 6	5	33.8	6.8	-61
Building 7	4	18.6	22.1	27
Building 8	6	33	50.9	18
Building 9	4.2	8.5	4.3	18
Tank 1	7.5	Diameter = 12 m		
Tank 2	7.5	Diameter = 12 m		
Tank 3	7.5	Diameter = 12 m		
Tank 4	7.5	Diameter = 14 m		

3.2.4 Nitric Oxide to NO_2 Conversion

Oxides of nitrogen (NO_x) emitted to atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O3).

A conversion ratio of 70% NO_x:NO_2 has been assumed for comparison of predicted concentrations with the long-term objectives for NO_2. A conversion ratio of 35% has been utilised for the assessment of short-term impacts, as recommended by Environment Agency in their Risk Assessment Guidance .

3.3 Significance Criteria

3.3.1 Environmental Permitting

The Environment Agency's Risk Assessment Guidance also provides criteria for assessing the significance of an impact compared with relevant air quality standards and background air quality. A process contribution (PC) is considered potentially significant if:

- The long-term PC > 1% of the long-term air quality standard.
- The short-term PC > 10% of the short-term air quality standard.

At 1% of the long-term air quality standard, the impact of a development is unlikely to be significant compared with background air quality. Both the short- and long-term criteria are also designed to ensure that there is a substantial safety margin to protect public health and the environment.

If the screening criteria are not met, the process contribution should be considered in combination with relevant ambient background pollutant concentrations. The air quality standards are likely to be met if:

- The long-term PC + background concentration < 70% of the air quality standard.

- The short-term PC < 20% (air quality standard – short term background concentration), where the short-term background concentration is assumed to be twice the long-term background concentration.

3.3.2 Habitat Sites

The Environment Agency's Risk Assessment Guidance specifies criteria to enable the potential significance of an impact to be determined. For the process contribution (PC), the impact is deemed not significant if the annual mean PC is less than 1% of the critical level or critical load and the short term PC is less than 10% of the critical level or critical load. If either of these criteria are exceeded, they are not necessarily significant however, it is then necessary to consider the total predicted environmental concentration or deposition (PC plus the background contribution) as discussed above.

For local wildlife sites (SINCs, SLINC's, NNRs, LNRs and ancient woodland), a process contribution (PC) is considered not significant if:

- the long-term PC < 100% of the long-term critical level.
- the short-term PC < 100% of the short-term critical level.

3.4 Sensitive Receptors

Specific receptors have been identified where people are likely to be regularly exposed for prolonged periods of time (e.g. residential areas). The location of the discrete sensitive receptors is presented in Table 3.2 and Figure 3.1.

Table 3.2 - Sensitive Receptors

ID	Receptor	Type	Easting	Northing
D1	Coldbrook	Residential	315095	235628
D2	Coldbrook	Residential	315432	236015
D3	Coldbrook	Residential	315898	236238
D4	Residential to West	Residential	314639	235155
D5	Residential to North-east	Residential	315667	236682
D6	Pontithel	Residential	316466	236671
D7	Lower Porthamel	Residential	316254	235698
D8	Porthamel Cottages	Residential	316457	235651
D9	Porthamel Cottages	Residential	316550	235770
D10	Residential to North-east	Residential	316986	235712
D11	Residential to North-east	Residential	317250	235846
D12	Bradwys - East	Residential	316977	235218
D13	Lodge bungalow	Residential	317265	234472
D14	The Lodge	Residential	317244	234423
D15	Farm to South-east	Residential	317323	233816
D16	Park Bungalow	Residential	316408	233732
D17	Talgarth	Residential	315815	234301
D18	Talgarth	Residential	315563	233885
D19	Talgarth	Residential	315203	234034

D20	Castle Green	Residential	315237	234280
D21	The Cobblers	Residential	314831	234553
D22	Bronllys Castle	Residential	314886	234716
D23	Great Porthamel Farmhouse	Residential	315936	235200
D24	P Jones Residential Property	Residential	315972	235103
D25	Porthamel Mill	Residential	315938	235533

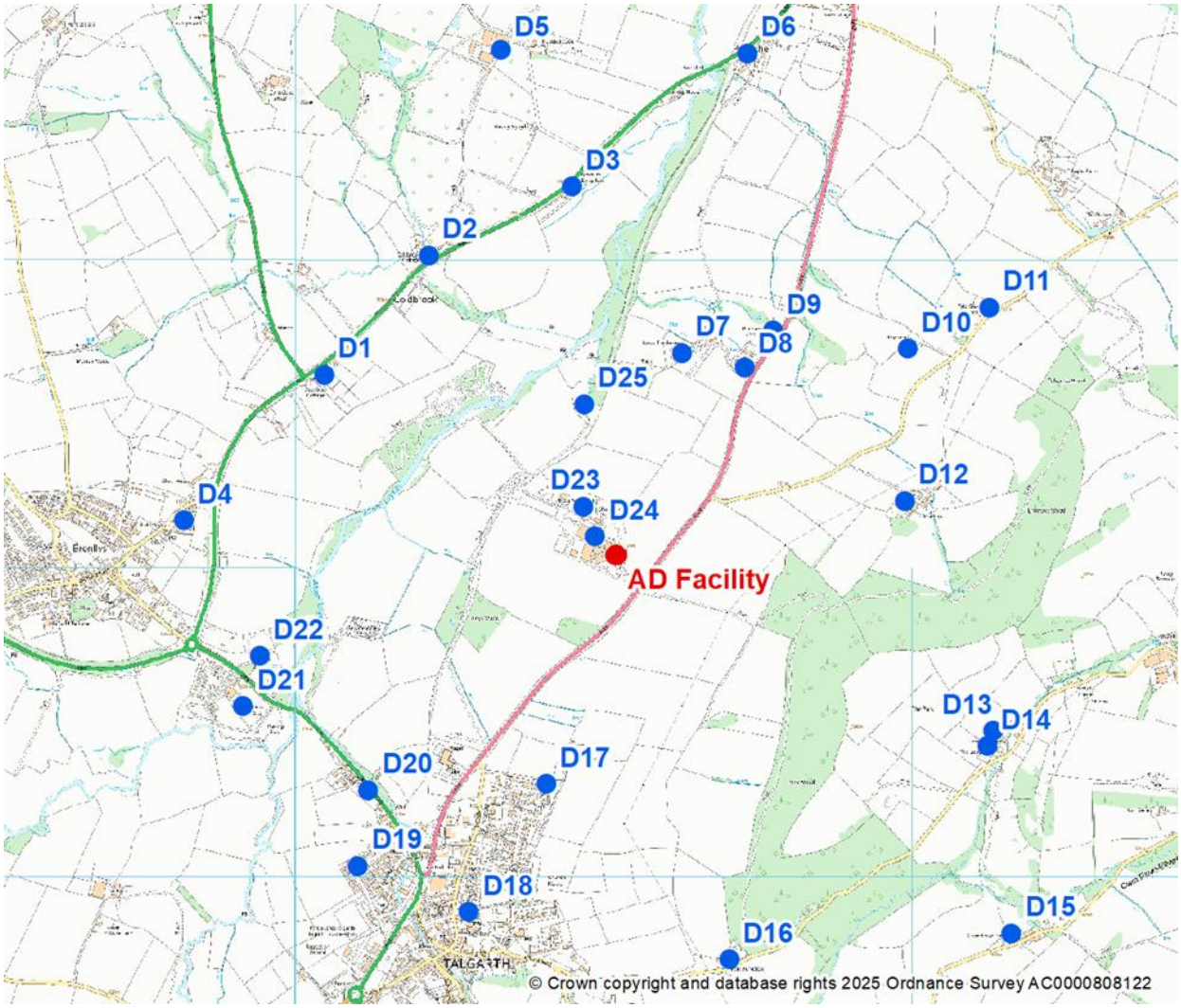

Figure 3.1 - Sensitive Human Health Receptor Locations

Pollutant concentrations have been predicted at both discrete receptor locations and over a 2 km by 2 km Cartesian grid of 20m resolution.

3.5 Habitat Assessment

The Environment Agency's Risk Assessment Guidance states that the impact of emissions to air on vegetation and ecosystems should be assessed for the following habitat sites within 10 km of the source:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive;

- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive; and
- Ramsar Sites designated under the Convention on Wetlands of International Importance.

Within 2 km of the source:

- Sites of Special Scientific Interest (SSSI) established by the 1981 Wildlife and Countryside Act;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Local wildlife sites (LWS) (e.g. Sites of Interest for Nature Conservation, SINC and Sites of Local Interest for Nature Conservation, SLINC); and
- Ancient woodland.

However, the habitat screening for MCP installations is 5 km for European sites and 2 km for SSSI. There are two SSSI within 2 km and one European site within 5 km. However, as a precautionary approach, the criteria provided in the Environment Agency's Risk Assessment Guidance have been used and habitat receptor designations and locations adopted for the assessment are presented in Table 3.3. The location of the habitats present within 2 km is provided in Figure 3.2. Due to the linear nature of the Afon Gwy SAC and Afon Llyni SSSI, these are represented by a number of discrete points to provide an assessment of the worst-case impact at this habitat site.

Table 3.3 - Sensitive Habitat Receptors

Site ID	Receptor	Primary Habitat	Type
H1	Afon Gwy (River Wye) SAC	Raised and blanket bog and dry heaths	SAC
H1	Afon Llynfi SSSI	Otters and some species of fish	SSSI
H2	Pwll-y-wrach SSSI	Broadleaved deciduous woodland	SSSI
H3	Bronlly's Castle SINC	Assumed broadleaved deciduous woodland	LWS
H4	LLangorse Lake SAC	Broadleaved deciduous woodland	SAC
H5	Drostre Bank SAC	Old sessile oak woods	SAC
H6	River Usk SAC	Raised and blanket bogs	SAC

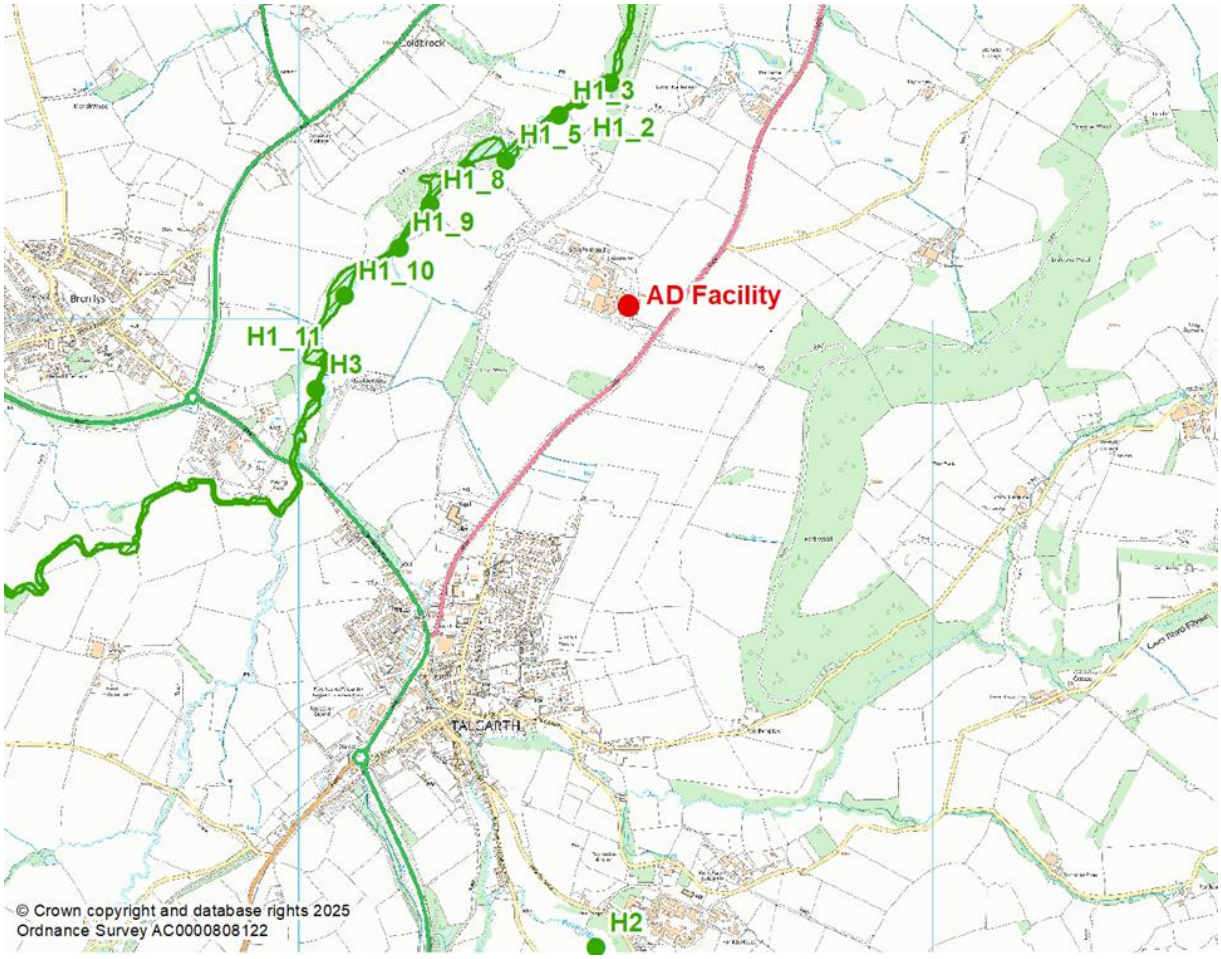

Figure 3.2 - Sensitive Habitat Locations

Background airborne NO_x and SO_2 concentrations and nutrient nitrogen deposition and acidification rates have been obtained from the Air Pollution Information System (APIS) for use in the assessment.

The modelled ground level pollutant concentrations are used to predict deposition rates, using typical deposition velocities. A summary of typical NO_2 and SO_2 dry deposition velocities is presented in Table 3.4.

Table 3.4 - Dry Deposition Velocities (m/s)

Pollutant	Grassland	Woodland
Nitrogen dioxide (NO_2)	0.0015	0.0030
Sulphur dioxide (SO_2)	0.012	0.024

The predicted nitrogen deposition rates assume a 100% NO_x: NO_2 conversion. This represents a worst-case for the assessment since nitric oxide (NO) has a lower deposition velocity than NO_2 and consequently results in lower deposition rates.

Predicted ground level concentrations and acidification/ deposition rates are compared with relevant critical levels and critical loads for the protection of sensitive ecosystems and vegetation (see **Appendix E**).

4. BASELINE CONDITIONS

4.1 Local Air Quality Management

Powys County Council (PCC) carries out frequent review and assessments of air quality within their regulatory area and produces the required Annual Status Report (ASR). The latest ASR was reported in September 2023 and provides air quality monitoring data for 2022[1]. Powys County Council currently does not have any AQMAs.

4.2 Nitrogen Dioxide

Powys County Council did not undertake any automatic monitoring in 2022 but did undertake passive monitoring of NO_2 at eight locations. However, these are located at roadside sites within more urban areas of Newtown, Rhayader and Crickhowell. Therefore, measured concentrations at these locations would not be representative of the site.

4.3 Other Pollutants

Powys County Council do not monitor concentrations of SO_2, CO of VOCs within their administrative area.

4.4 Background Concentrations

As monitoring in the local area is limited and not at locations that would provide representative background concentrations for the site and surroundings, background concentrations of NO_2 have been obtained from the Defra UK Background Air Pollution maps for use in the assessment. These 1 km grid resolution maps are derived from a modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites. The latest background maps for NO_2 were issued in November 2024 and are based on 2021 monitoring data.

The latest background maps for SO_2, CO and VOC concentrations are based on 2001 monitoring data. Therefore, background concentrations of SO_2 and CO are assumed to be at the 2001 concentrations and are representative of the worst-case. For VOCs, it is assumed that all of the non-methane VOCs comprise 1,3-butadiene. It is assumed that 5% of the total VOC emission is non-methane. Mapped concentrations of 1,3-butadiene have been projected to 2003 and these are assumed to be representative of future background concentrations.

A summary of the mapped annual mean background concentrations assumed for the assessment is presented in Table 4.1. These are the maximum mapped background concentrations for the sixteen 1 km^2 grid squares surrounding the site. This represents a worst-case.

[1] Powys County Council 2023 Air Quality Annual Status Report (ASR), September 2023

Table 4.1 - Mapped Annual Mean Background Concentrations for NO_2 and SO_2 (µg/m³)

Pollutant	Annual Mean (µg/m³)	Short-term Concentration (µg/m³)
NO_2	4.3	1-hour 8.6 [(a)]
SO_2	1.9	15-minute 5.1 [(a)(b)] 1-hour 3.8 [(a)] 24-hour 2.2 [(a)(c)]
CO	164	1-hour 328 [(a)] 8-hour 230 [(a)(d)]
1,3-butadiene	0.041	24-hour 0.048 [(a)(c)]

[(a)] 1-hour mean background concentration estimated by multiplying the annual mean by a factor of 2 in accordance with the EA Guidance.
[(b)] 15-minute mean background concentration estimated by multiplying the 1-hour mean by a factor of 1.34 in accordance with the EA Guidance
[(c)] 24-hour mean background concentration estimated by multiplying the 1-hour mean by a factor of 0.59 in accordance with the EA Guidance.
[(d)] 8-hour mean background concentration estimated by multiplying the 1-hour mean by a factor of 0.7 in accordance with the EA Guidance.

5. ASSESSMENT OF IMPACTS

5.1 Introduction

As CHP 1 and CHP 2 are existing and have been operational since 12th March 2012, they will be accounted for to some extent in the background concentration. Therefore, although initial results are presented for all three CHP units operating, additional model results are provided for the new CHP unit alone, this represents the change in the impact as a result of the new CHP unit.

Predicted pollutant concentrations (PC) for the five years of meteorological data are presented as the maximum concentration for the five-year meteorological data set for each of the discrete receptors identified in Section 3.4.

The maximum PC where there is relevant public exposure is added to the estimated background concentration for the area (see Table 4.1) to give the total predicted environmental concentration (PEC) for comparison with the relevant air quality objectives (AQOs).

The significance of the impacts has been assessed in accordance with the Environment Agency's Risk Assessment Guidance.

5.2 Human Health Impact

5.2.1 Nitrogen Dioxide (NO_2) – All Sources

For all three CHP units, the maximum predicted annual mean and 99.8th percentile of 1 hour mean ground level NO_2 concentrations are presented as a percentage of the relevant AQOs in Table 5.1.

Where there is relevant public exposure, maximum predicted annual mean NO_2 concentrations are 3.7 µg/m^3 and are potentially significant (>1% of the AQO). However, the total predicted concentrations are substantially less than 70% of the AQO at all sensitive receptor locations and therefore it is considered that the annual mean AQO would not be exceeded.

Predicted hourly mean concentrations are well below 10% of the AQO at the majority of sensitive receptors and would be assessed as not significant. However, at two receptors locations (D23 and D24) predicted concentrations exceed 10% of the AQO. At D23, the predicted concentration (24.8 µg/m^3) is less than 20% of the difference between the AQO and the background concentration (38.3 µg/m^3) and it is unlikely that the AQO would be exceeded at this location according to the Environment Agency's Risk Assessment Guidance. At D24, the predicted PC is 40.4 µg/m^3 and slightly exceeds 38.3 µg/m^3 but predicted concentrations are representative of the worst-case. For example, it is assumed that all three generators operate continuously at the maximum permissible ELV and predicted concentrations presented are for the worst-case meteorological year. Therefore, it is concluded that the AQO would not be exceeded.

Table 5.1 - Predicted NO_2 Concentrations – All Sources (µg/m^3)

Receptor	Annual Mean		99.8th Percentile of 1-Hour Means	
	PC	PC (% AQO)	PC	PC (% AQO)
D1 Coldbrook	0.15	0.4%	4.0	2.0%
D2 Coldbrook	0.17	0.4%	4.8	2.4%

D3 Coldbrook	0.30	0.7%	5.6	2.8%
D4 Residential to West	0.12	0.3%	3.9	2.0%
D5 Residential to North-east	0.19	0.5%	5.7	2.8%
D6 Pontithel	0.33	0.8%	5.1	2.6%
D7 Lower Porthamel	0.84	2.1%	7.9	4.0%
D8 Porthamel Cottages	0.86	2.1%	9.0	4.5%
D9 Porthamel Cottages	0.66	1.6%	7.6	3.8%
D10 Residential to North-east	0.47	1.2%	6.4	3.2%
D11 Residential to North-east	0.36	0.9%	6.7	3.3%
D12 Bradwys - East	0.47	1.2%	11.4	5.7%
D13 Lodge bungalow	0.05	0.1%	1.3	0.7%
D14 The Lodge	0.05	0.1%	1.3	0.7%
D15 Farm to South-east	0.04	0.1%	1.0	0.5%
D16 Park Bungalow	0.07	0.2%	1.9	1.0%
D17 Talgarth	0.60	1.5%	9.1	4.5%
D18 Talgarth	0.46	1.1%	6.6	3.3%
D19 Talgarth	0.37	0.9%	5.5	2.8%
D20 Castle Green	0.39	1.0%	5.5	2.8%
D21 The Cobblers	0.22	0.5%	4.4	2.2%
D22 Bronllys Castle	0.20	0.5%	4.4	2.2%
D23 Great Porthamel Farmhouse	1.8	4.6%	24.8	12.4%
D24 P Jones Residential Property	3.7	9.1%	40.4	20.2%
D25 Porthamel Mill	0.65	1.6%	8.3	4.1%
AQO (µg/m^3)	40		200	
Maximum PC with relevant exposure	3.7 (9.1%)		40.4 (20.2%)	
Background (µg/m^3)	4.3		8.6	
Maximum PEC with relevant exposure	8.0		49.0	
Maximum PEC (% AQO)	19.9%		24.5%	

Predicted annual mean and 99.8th percentile of hourly mean NO_2 concentrations for the year in which maximum annual mean and hourly mean concentrations are predicted (2020 and 2021, respectively), are presented as contour plots in Figures 5.1 and 5.2. Maximum predicted annual mean concentrations occur to the northeast of the facility over open farmland.

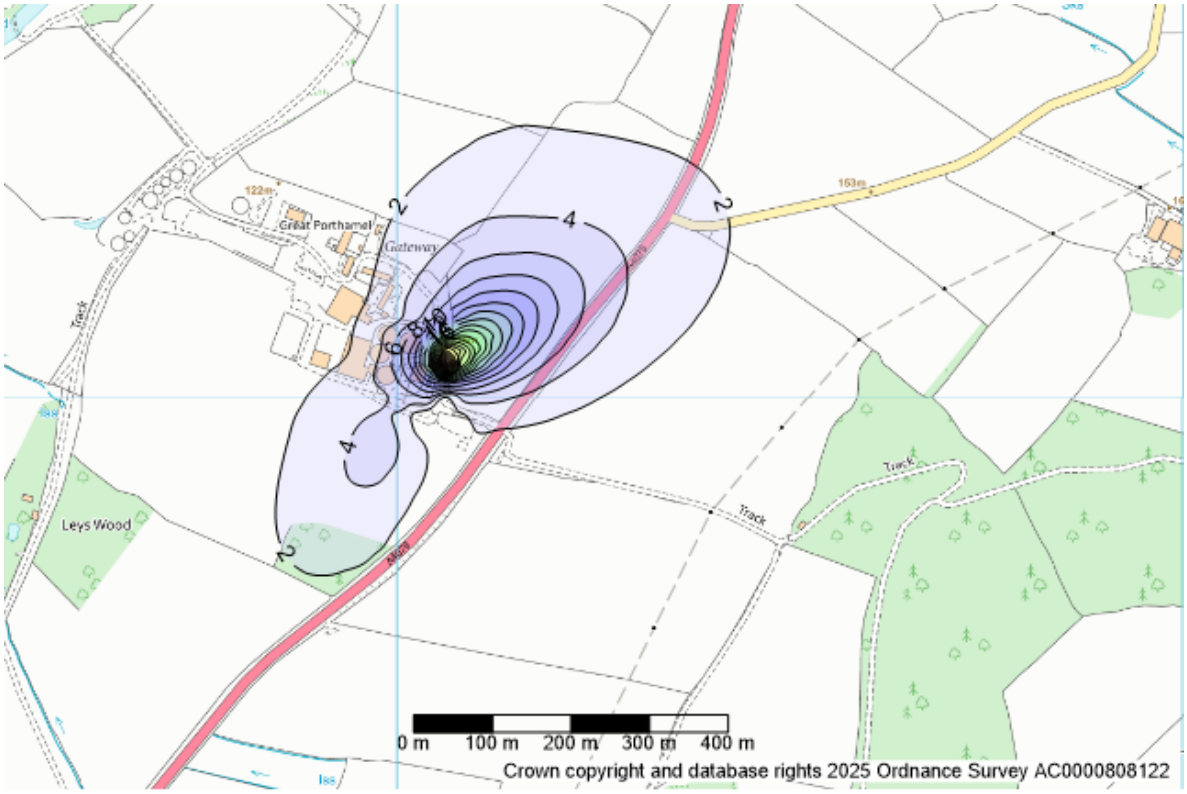

Figure 5.1 - Predicted Annual Mean NO_2 Concentrations – All Sources (µg/m³)

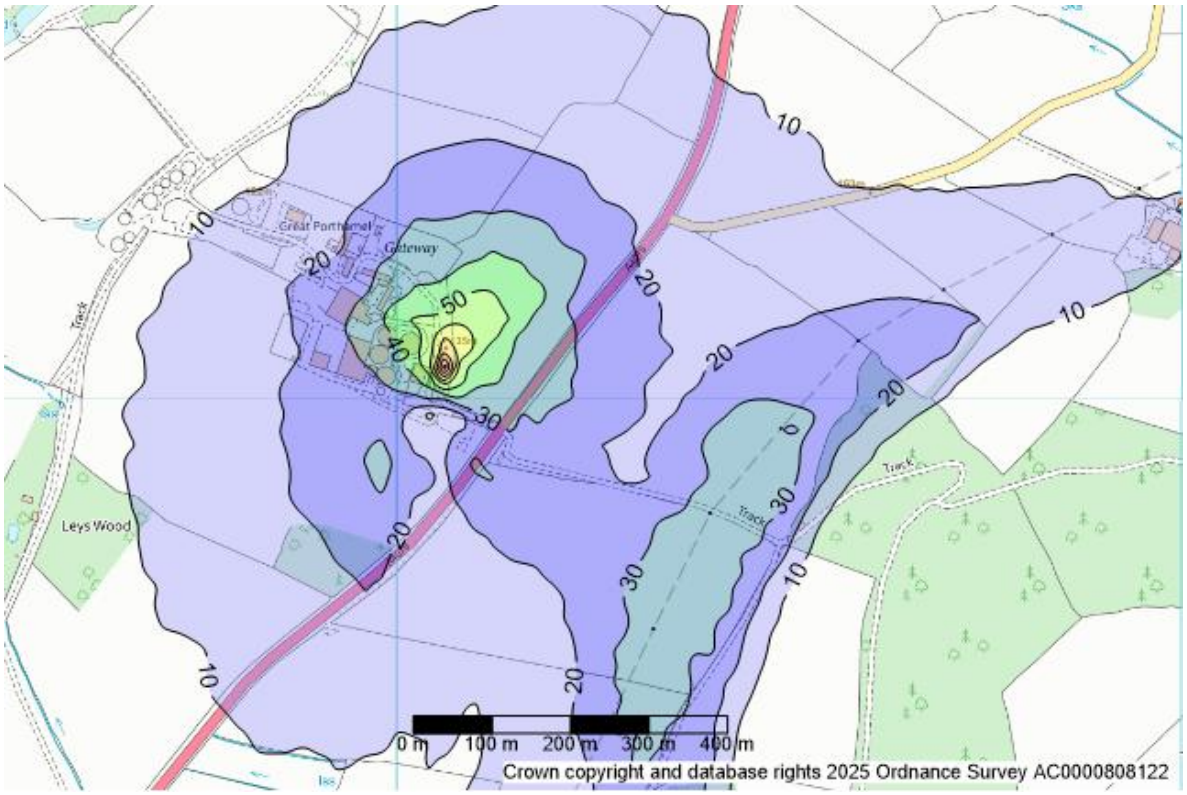

Figure 5.2 - Predicted 99.8th Percentile of 1-Hour Mean NO_2 Concentrations – All Sources (µg/m³)

As for annual mean concentrations, maximum predicted short-term concentrations of NO_2 occur over open farmland.

5.2.2 Carbon Monoxide (CO) – All Sources

For all three CHP units, maximum predicted 8-hour and 1-hour mean ground level CO concentrations are presented as a percentage of the relevant AQO or Environmental Assessment Level (EAL) in Table 5.2.

Table 5.2 - Predicted CO Concentrations – All Sources (µg/m³)

Receptor	8-Hour Mean		1-Hour Mean	
	PC	PC (% AQO)	PC	PC (% AQO)
D1 Coldbrook	18.5	0.2%	51.8	0.2%
D2 Coldbrook	15.2	0.2%	48.9	0.2%
D3 Coldbrook	28.3	0.3%	49.8	0.2%
D4 Residential to West	27.3	0.3%	55.7	0.2%
D5 Residential to North-east	22.9	0.2%	56.5	0.2%
D6 Pontithel	27.3	0.3%	46.0	0.2%
D7 Lower Porthamel	43.3	0.4%	69.4	0.2%
D8 Porthamel Cottages	40.9	0.4%	79.2	0.3%
D9 Porthamel Cottages	32.0	0.3%	66.6	0.2%
D10 Residential to North-east	22.4	0.2%	63.1	0.2%
D11 Residential to North-east	23.1	0.2%	70.3	0.2%
D12 Bradwys - East	59.4	0.6%	344	1.1%
D13 Lodge bungalow	7.9	0.1%	18.0	0.1%
D14 The Lodge	7.8	0.1%	17.7	0.1%
D15 Farm to South-east	7.2	0.1%	19.8	0.1%
D16 Park Bungalow	10.1	0.1%	33.1	0.1%
D17 Talgarth	48.4	0.5%	81.2	0.3%
D18 Talgarth	36.7	0.4%	58.6	0.2%
D19 Talgarth	28.4	0.3%	49.4	0.2%
D20 Castle Green	25.0	0.3%	51.3	0.2%
D21 The Cobblers	22.1	0.2%	50.6	0.2%
D22 Bronllys Castle	21.3	0.2%	51.3	0.2%
D23 Great Porthamel Farmhouse	124	1.2%	237	0.8%
D24 P Jones Residential Property	261	2.6%	354	1.2%
D25 Porthamel Mill	38.9	0.4%	79.4	0.3%
AQO/EAL (µg/m³)	10,000		30,000	
Maximum PC with relevant exposure	261 (2.6%)		354 (1.2%)	
Background (µg/m³)	230		328	
Maximum PEC with relevant exposure)	491		682	
Maximum PEC (% AQO/EAL)	4.9%		2.3%	

The maximum 8-hour and 1-hour mean concentrations are well below the Environment Agency's 10% short-term screening criteria. Therefore, the impact of CO emissions from the proposed facility is considered to be not significant.

5.2.3 Sulphur Dioxide (SO_2) – All Sources

For all three CHP units, predicted SO2 concentrations at the selected receptor locations are presented as a percentage of the respective AQOs in Table 5.3.

Table 5.3 - Predicted SO_2 Concentrations – All Sources (µg/m³)

Receptor	99.2nd Percentile of 24-hour Means		99.7th Percentile of 1-hour Means		99.9th Percentile of 15-minute Means	
	PC	PC (% AQO)			PC	PC (% AQO)
D1 Coldbrook	1.4	1.1%	5.8	1.7%	10.5	4.0%
D2 Coldbrook	1.1	0.9%	6.7	1.9%	11.5	4.3%
D3 Coldbrook	1.8	1.4%	8.5	2.4%	12.1	4.6%
D4 Residential to West	1.4	1.1%	5.6	1.6%	10.5	4.0%
D5 Residential to North-east	1.3	1.0%	8.7	2.5%	14.4	5.4%
D6 Pontithel	1.7	1.4%	7.6	2.2%	12.1	4.5%
D7 Lower Porthamel	3.4	2.8%	11.9	3.4%	17.1	6.4%
D8 Porthamel Cottages	3.3	2.7%	13.9	4.0%	19.8	7.5%
D9 Porthamel Cottages	2.6	2.1%	11.5	3.3%	17.0	6.4%
D10 Residential to North-east	2.0	1.6%	9.8	2.8%	15.5	5.8%
D11 Residential to North-east	1.6	1.3%	10.2	2.9%	18.0	6.8%
D12 Bradwys - East	3.4	2.7%	15.6	4.5%	41.7	15.7%
D13 Lodge bungalow	0.87	0.7%	2.1	0.6%	3.3	1.2%
D14 The Lodge	0.89	0.7%	2.0	0.6%	3.4	1.3%
D15 Farm to South-east	0.41	0.3%	1.6	0.5%	3.0	1.1%
D16 Park Bungalow	0.79	0.6%	3.0	0.9%	5.3	2.0%
D17 Talgarth	4.1	3.3%	13.9	4.0%	19.5	7.3%
D18 Talgarth	3.0	2.4%	10.1	2.9%	14.6	5.5%
D19 Talgarth	2.2	1.8%	8.4	2.4%	12.1	4.6%
D20 Castle Green	2.3	1.8%	8.3	2.4%	12.7	4.8%
D21 The Cobblers	1.3	1.0%	6.8	2.0%	11.6	4.4%
D22 Bronllys Castle	1.4	1.1%	6.4	1.8%	10.8	4.1%
D23 Great Porthamel Farmhouse	14.0	11.2%	42.9	12.3%	62.9	23.6%
D24 P Jones Residential Property	33.4	26.7%	71.1	20.3%	99.6	37.4%
D25 Porthamel Mill	2.7	2.2%	12.6	3.6%	19.2	7.2%
AQO (µg/m³)	125		350		266	
Maximum PC with relevant exposure	33.4 (26.7%)		71.1 (20.3%)		99.6 (37.4%)	

Background (µg/m³)	2.2	3.8	5.1
Maximum PEC with relevant exposure	35.6	74.9	105
Maximum PEC (% AQO)	28.5%	21.4%	39.3%

Predicted concentrations exceed 10% of the AQOs at D23 and D24 for all averaging periods and at D12 for the 15-minute mean. At D24 (all averaging periods) and D23 (15-minute mean), the predicted concentrations are greater than 20% of the difference between the AQO and the background concentration. Therefore, there is a risk that the AQOs would be exceeded according to the Environment Agency's Risk Assessment Guidance. However, predicted concentrations are representative of the worst-case. For example, it is assumed that all three generators operate continuously at the maximum permissible ELV and predicted concentrations presented are for the worst-case meteorological year. Combined with the very low background SO_2 concentrations, it is concluded that the AQO would not be exceeded.

Predicted 99.9th percentile of 15-minute mean SO_2 concentrations for the year in which maximum concentrations are predicted (2021), are presented as a contour plot in Figures 5.3.

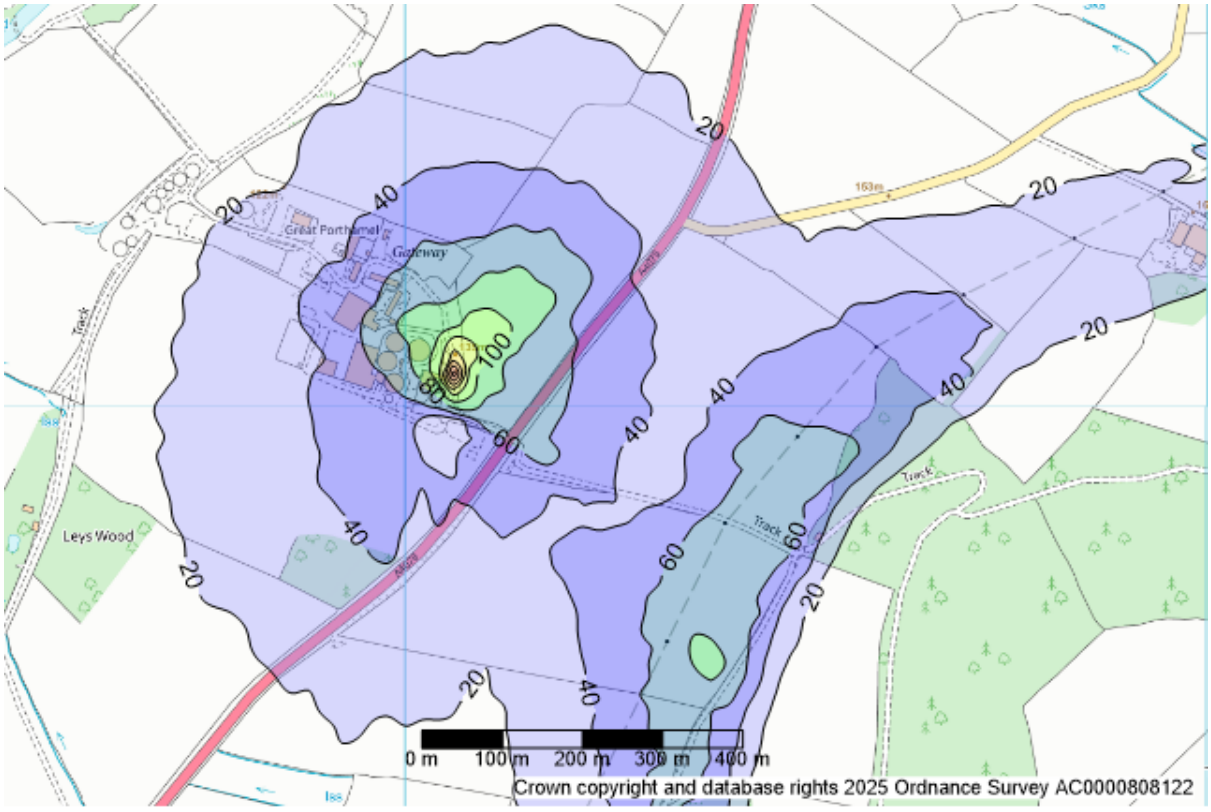

Figure 5.3 - Predicted 99.9th Percentile of SO_2 Concentrations – All Sources (µg/m³)

5.2.4 Total Volatile Organic Compounds (as 1,3-butadiene) – All Sources

For all three CHP units, predicted annual mean and maximum 24-hour mean ground-level 1,3-butadiene concentrations are presented as a percentage of the AQO/EAL in Table 5.4. The predictions assume that 5% of the total VOC emission comprises non-methane volatile organic compounds and that all of this comprises entirely of 1,3-butadiene. This is considered to be worst-case.

Table 5.4 - Predicted 1,3-Butadiene Concentrations – All Sources (µg/m³)

Receptor	Annual Mean		24-hour Mean	
	PC	PC (% AQO)	PC	PC (% AQO)
D1 Coldbrook	0.021	1.0%	0.31	14%
D2 Coldbrook	0.025	1.1%	0.32	14%
D3 Coldbrook	0.042	1.9%	0.41	18%
D4 Residential to West	0.018	0.8%	0.38	17%
D5 Residential to North-east	0.028	1.2%	0.29	13%
D6 Pontithel	0.047	2.1%	0.44	20%
D7 Lower Porthamel	0.12	5.3%	0.70	31%
D8 Porthamel Cottages	0.12	5.4%	0.75	33%
D9 Porthamel Cottages	0.094	4.2%	0.63	28%
D10 Residential to North-east	0.067	3.0%	0.39	17%
D11 Residential to North-east	0.051	2.3%	0.35	16%
D12 Bradwys - East	0.068	3.0%	1.1	50%
D13 Lodge bungalow	0.007	0.3%	0.23	10%
D14 The Lodge	0.007	0.3%	0.24	11%
D15 Farm to South-east	0.006	0.3%	0.10	5%
D16 Park Bungalow	0.009	0.4%	0.16	7%
D17 Talgarth	0.086	3.8%	0.89	39%
D18 Talgarth	0.066	2.9%	0.66	29%
D19 Talgarth	0.053	2.3%	0.58	26%
D20 Castle Green	0.055	2.4%	0.47	21%
D21 The Cobblers	0.031	1.4%	0.37	16%
D22 Bronllys Castle	0.028	1.2%	0.39	17%
D23 Great Porthamel Farmhouse	0.26	11.7%	3.3	148%
D24 P Jones Residential Property	0.52	23.2%	6.5	290%
D25 Porthamel Mill	0.093	4.1%	0.56	25%
AQO/EAL	2.25		2.25	
Maximum PC with relevant exposure	0.52 (23.2%)		6.5 (290%)	
Background	0.041		0.048	
Maximum PEC with relevant exposure	0.56		6.6	
Maximum PEC (% AQO/EAL)	25.0%		292%	

Where there is relevant public exposure, maximum predicted annual mean ground level 1,3-butadiene concentrations exceed 1% of the AQO at some receptors but the PECs are well below 70% of the AQO and it is unlikely that this would be exceeded. Predicted 24-hour mean concentrations exceed the EAL at two locations. However, predicted concentrations are representative of a worst-case. For example, it is assumed that all three CHP units operate continuously at the maximum permissible ELV, 5% of the total VOC emissions (which includes methane) is 1,3-butadiene and predicted concentrations presented are for the worst-case

meteorological year. Taking into consideration these worst-case assumptions, it is concluded that the AQO would not be exceeded. Predicted annual mean and maximum 24-hour mean concentrations are presented as contour plots in Figure 5.4 and Figure 5.5, respectively.

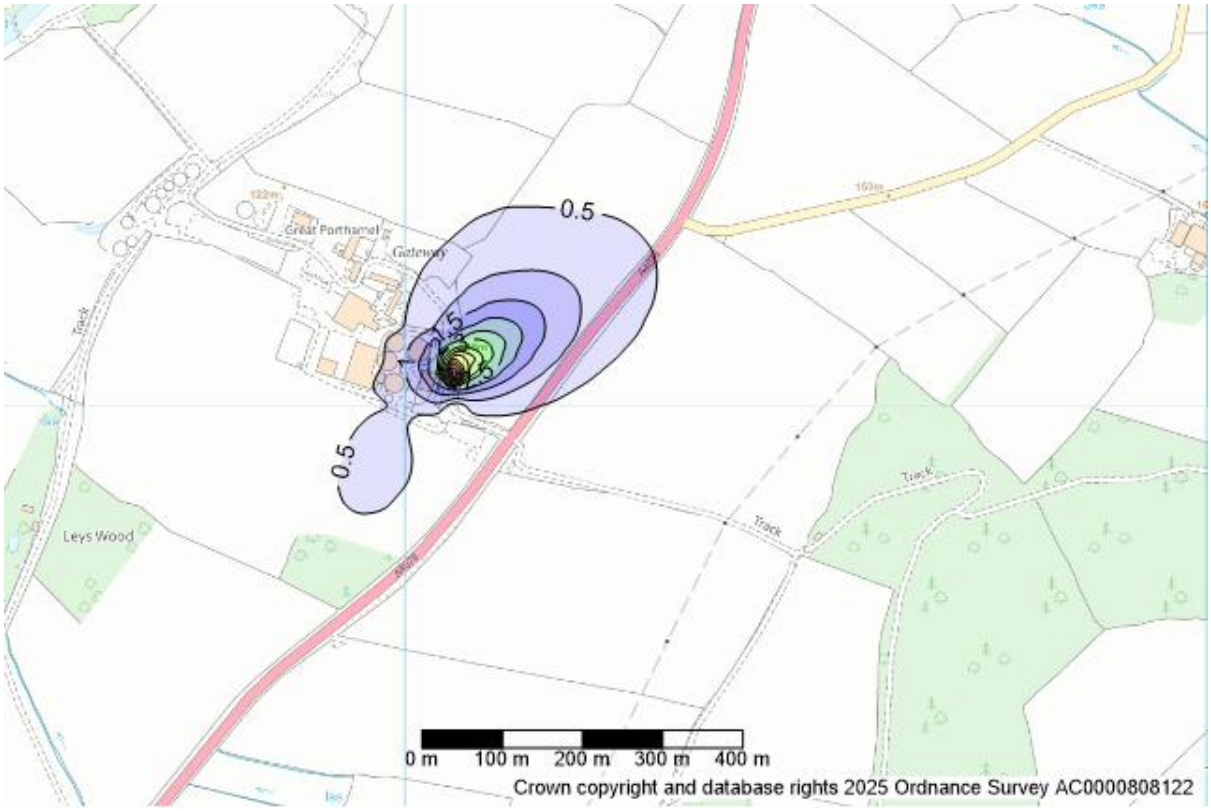

Figure 5.4 - Predicted Annual Mean 1,3-Butadiene Concentrations – All Sources (µg/m³)

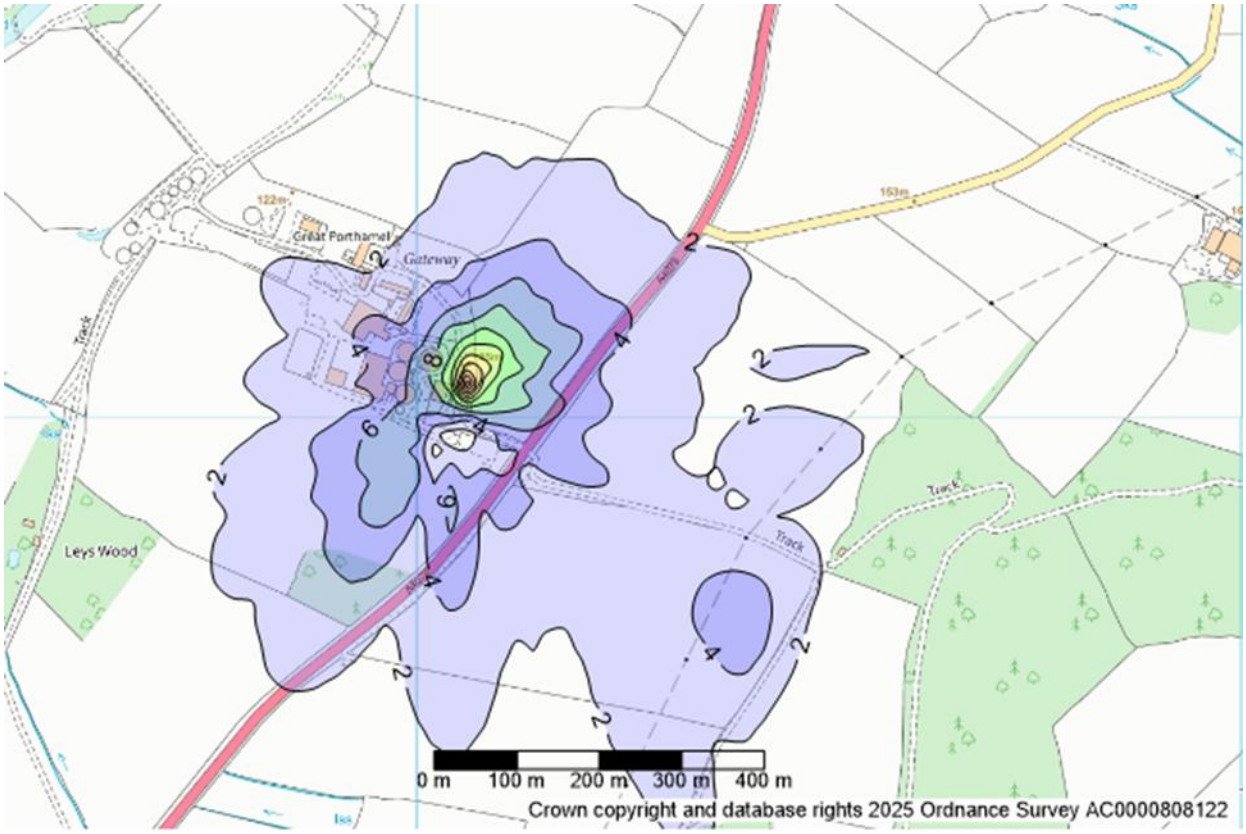

Figure 5.5 - Predicted Maximum 24-hour Mean 1,3-Butadiene Concentrations – All Sources (µg/m³)

5.2.5 Nitrogen Dioxide (NO_2) – New CHP Alone

For the new CHP unit, the maximum predicted annual mean and 99.8th percentile of 1-hour mean ground level NO_2 concentrations are presented as a percentage of the relevant AQOs in Table 5.5.

Table 5.5 - Predicted NO_2 Concentrations – New CHP Alone (µg/m³)

Receptor	Annual Mean		99.8th Percentile of 1-Hour Means	
	PC	PC (% AQO)	PC	PC (% AQO)
D1 Coldbrook	0.043	0.1%	1.2	0.6%
D2 Coldbrook	0.050	0.1%	1.6	0.8%
D3 Coldbrook	0.087	0.2%	1.6	0.8%
D4 Residential to West	0.036	0.1%	1.2	0.6%
D5 Residential to North-east	0.055	0.1%	1.6	0.8%
D6 Pontithel	0.094	0.2%	1.5	0.7%
D7 Lower Porthamel	0.24	0.6%	2.7	1.4%
D8 Porthamel Cottages	0.23	0.6%	3.0	1.5%
D9 Porthamel Cottages	0.18	0.4%	2.3	1.2%
D10 Residential to North-east	0.12	0.3%	2.0	1.0%
D11 Residential to North-east	0.092	0.2%	1.9	1.0%
D12 Bradwys - East	0.12	0.3%	2.7	1.4%

D13 Lodge bungalow	0.013	0.0%	0.4	0.2%
D14 The Lodge	0.013	0.0%	0.4	0.2%
D15 Farm to South-east	0.010	0.0%	0.3	0.1%
D16 Park Bungalow	0.016	0.0%	0.5	0.2%
D17 Talgarth	0.20	0.5%	3.1	1.6%
D18 Talgarth	0.14	0.4%	2.1	1.0%
D19 Talgarth	0.11	0.3%	1.7	0.8%
D20 Castle Green	0.11	0.3%	1.8	0.9%
D21 The Cobblers	0.060	0.1%	1.3	0.6%
D22 Bronllys Castle	0.054	0.1%	1.3	0.6%
D23 Great Porthamel Farmhouse	0.37	0.9%	4.2	2.1%
D24 P Jones Residential Property	0.73	1.8%	7.1	3.6%
D25 Porthamel Mill	0.18	0.5%	2.8	1.4%
AQO (µg/m^3)	40		200	
Maximum PC with relevant exposure	0.73 (1.8%)		7.1 (3.6%)	
Background (µg/m^3)	4.3		8.6	
Maximum PEC with relevant exposure	5.0		15.7	
Maximum PEC (% AQO)	12.6%		7.9%	

Where there is relevant public exposure, maximum predicted annual mean NO_2 concentrations are 0.73 µg/m^3 and are potentially significant (>1% of the AQO). However, the total predicted concentrations are substantially less than 70% of the AQO at all sensitive receptor locations and therefore it is considered that the annual mean AQO would be met.

Predicted hourly mean concentrations are well below 10% of the AQO at all sensitive receptors and would be assessed as not significant.

Predicted annual mean and 99.8th percentile of hourly mean NO_2 concentrations for the year in which maximum annual mean and hourly mean concentrations are predicted (2020 and 2021, respectively), are presented as contour plots in Figures 5.6 and 5.7. Maximum predicted annual mean concentrations occur to the northeast of the facility over open farmland.

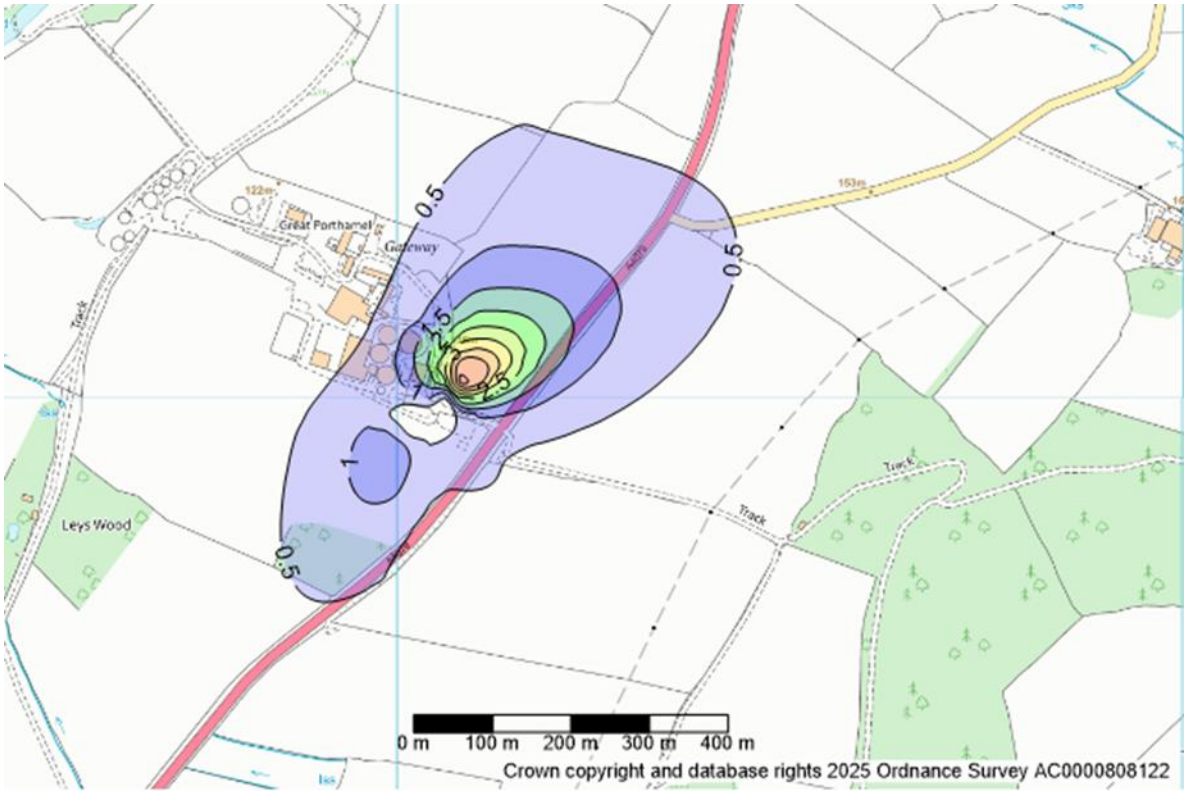

Figure 5.6 - Predicted Annual Mean NO_2 Concentrations – New CHP Alone (µg/m³)

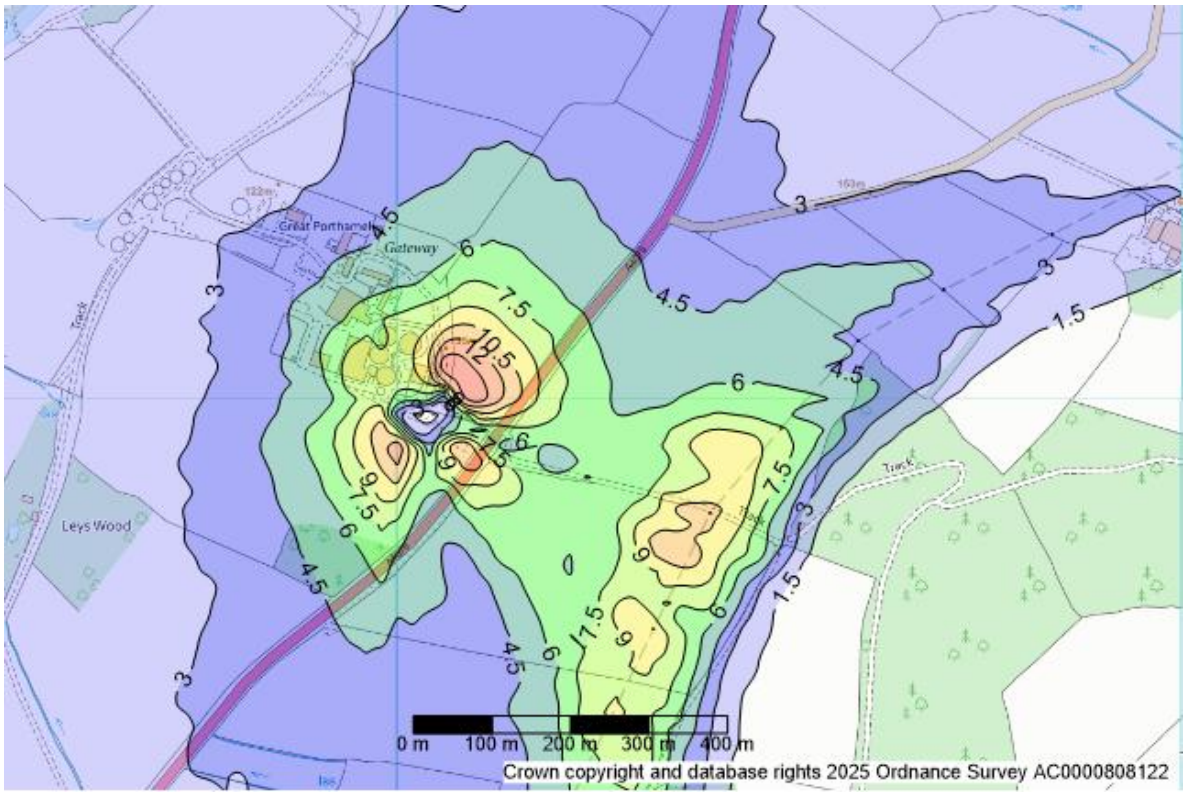

Figure 5.7 - Predicted 99.8th Percentile of 1-Hour Mean NO_2 Concentrations – New CHP Alone (µg/m³)

As for annual mean concentrations, maximum predicted short-term concentrations of NO_2 occur over open farmland.

5.2.6 Carbon Monoxide (CO) – New CHP Alone

For the new CHP unit, maximum predicted 8-hour and 1-hour mean ground level CO concentrations are presented as a percentage of the relevant AQO or Environmental Assessment Level (EAL) in Table 5.6.

Table 5.6 - Predicted CO Concentrations – New CHP Alone (µg/m³)

Receptor	8-Hour Mean		1-Hour Mean	
	PC	PC (% AQO)	PC	PC (% AQO)
D1 Coldbrook	5.0	0.0%	16.6	0.1%
D2 Coldbrook	5.3	0.1%	16.0	0.1%
D3 Coldbrook	8.9	0.1%	15.9	0.1%
D4 Residential to West	7.4	0.1%	17.3	0.1%
D5 Residential to North-east	6.9	0.1%	17.1	0.1%
D6 Pontithel	8.2	0.1%	13.7	0.0%
D7 Lower Porthamel	13.7	0.1%	23.3	0.1%
D8 Porthamel Cottages	11.8	0.1%	26.1	0.1%
D9 Porthamel Cottages	9.7	0.1%	20.9	0.1%
D10 Residential to North-east	7.5	0.1%	19.4	0.1%
D11 Residential to North-east	7.6	0.1%	20.1	0.1%
D12 Bradwys - East	13.4	0.1%	76.7	0.3%
D13 Lodge bungalow	2.2	0.0%	4.5	0.0%
D14 The Lodge	2.1	0.0%	4.5	0.0%
D15 Farm to South-east	1.9	0.0%	5.3	0.0%
D16 Park Bungalow	2.6	0.0%	8.2	0.0%
D17 Talgarth	16.5	0.2%	27.1	0.1%
D18 Talgarth	10.4	0.1%	18.0	0.1%
D19 Talgarth	8.5	0.1%	15.7	0.1%
D20 Castle Green	7.2	0.1%	16.5	0.1%
D21 The Cobblers	6.5	0.1%	15.9	0.1%
D22 Bronllys Castle	5.9	0.1%	16.1	0.1%
D23 Great Porthamel Farmhouse	22.2	0.2%	38.8	0.1%
D24 P Jones Residential Property	44.1	0.4%	63.7	0.2%
D25 Porthamel Mill	13.6	0.1%	25.7	0.1%
AQO/EAL (µg/m³)	10,000		30,000	
Maximum PC with relevant exposure	44.1 (0.4%)		63.7 (0.2%)	
Background (µg/m³)	230		328	
Maximum PEC with relevant exposure)	274		392	
Maximum PEC (% AQO/EAL)	2.7%		1.3%	

The maximum 8-hour and 1-hour concentrations are well below the Environment Agency's 10% short-term screening criteria. Therefore, the impact of CO emissions from the proposed new CHP unit is considered to be not significant.

5.2.7 Sulphur Dioxide (SO_2) – New CHP Alone

For the new CHP unit, predicted SO_2 concentrations at the selected receptor locations are presented as a percentage of the respective AQOs in Table 5.7.

Table 5.7 - Predicted SO_2 Concentrations – New CHP Alone (µg/m³)

Receptor	99.2nd Percentile of 24-hour Means		99.7th Percentile of 1-hour Means		99.9th Percentile of 15-minute Means	
	PC	PC (% AQO)			PC	PC (% AQO)
D1 Coldbrook	0.15	0.1%	0.66	0.2%	1.3	0.5%
D2 Coldbrook	0.13	0.1%	0.83	0.2%	1.5	0.6%
D3 Coldbrook	0.21	0.2%	0.98	0.3%	1.5	0.6%
D4 Residential to West	0.13	0.1%	0.65	0.2%	1.1	0.4%
D5 Residential to North-east	0.16	0.1%	0.96	0.3%	1.7	0.6%
D6 Pontithel	0.20	0.2%	0.86	0.2%	1.3	0.5%
D7 Lower Porthamel	0.39	0.3%	1.6	0.5%	2.3	0.9%
D8 Porthamel Cottages	0.36	0.3%	1.7	0.5%	2.5	1.0%
D9 Porthamel Cottages	0.29	0.2%	1.4	0.4%	2.0	0.8%
D10 Residential to North-east	0.19	0.2%	1.1	0.3%	1.8	0.7%
D11 Residential to North-east	0.18	0.1%	1.1	0.3%	1.9	0.7%
D12 Bradwys - East	0.30	0.2%	1.4	0.4%	3.0	1.1%
D13 Lodge bungalow	0.083	0.1%	0.22	0.1%	0.32	0.1%
D14 The Lodge	0.086	0.1%	0.21	0.1%	0.33	0.1%
D15 Farm to South-east	0.039	0.0%	0.15	0.0%	0.28	0.1%
D16 Park Bungalow	0.075	0.1%	0.29	0.1%	0.46	0.2%
D17 Talgarth	0.52	0.4%	1.9	0.5%	2.6	1.0%
D18 Talgarth	0.33	0.3%	1.3	0.4%	1.8	0.7%
D19 Talgarth	0.22	0.2%	0.97	0.3%	1.5	0.6%
D20 Castle Green	0.25	0.2%	1.0	0.3%	1.6	0.6%
D21 The Cobblers	0.14	0.1%	0.73	0.2%	1.3	0.5%
D22 Bronllys Castle	0.14	0.1%	0.70	0.2%	1.5	0.5%
D23 Great Porthamel Farmhouse	0.90	0.7%	2.5	0.7%	3.7	1.4%
D24 P Jones Residential Property	1.9	1.5%	4.3	1.2%	6.3	2.4%
D25 Porthamel Mill	0.35	0.3%	1.6	0.5%	2.4	0.9%
AQO (µg/m³)	125		350		266	
Maximum PC with relevant exposure	1.9 (1.5%)		4.3 (1.2%)		6.3 (2.4%)	

Background (µg/m³)	2.2	3.8	5.1
Maximum PEC with relevant exposure	4.1	8.1	11.4
Maximum PEC (% AQO)	3.2%	2.3%	4.3%

Predicted concentrations are well below 10% of the AQOs at all receptors and all averaging periods and would be assessed as not significant.

Predicted 99.9th percentile of 15-minute mean SO_2 concentrations for the year in which maximum concentrations are predicted (2021), are presented as a contour plot in Figures 5.8.

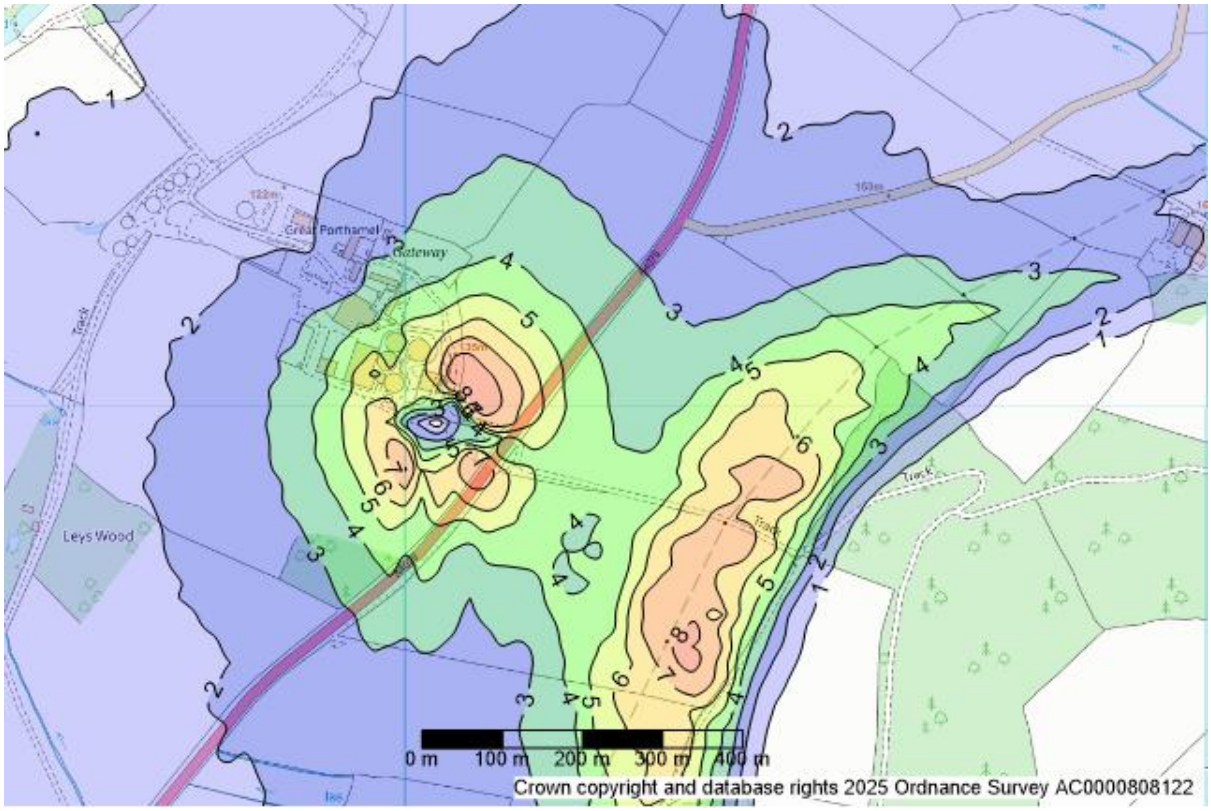

Figure 5.8 - Predicted 99.9th Percentile of SO_2 Concentrations – New CHP Alone (µg/m³)

5.2.8 Total Volatile Organic Compounds (as 1,3-butadiene) – New CHP Alone

For the new CHP unit, predicted annual mean and maximum 24-hour mean ground level 1,3-butadiene concentrations are presented as a percentage of the AQO/EAL in Table 5.8. The predictions assume that 5% of the total VOC emission comprises non-methane volatile organic compounds and that all of this comprises entirely of 1,3-butadiene. This is considered to be worst-case.

Table 5.8 - Predicted 1,3-Butadiene Concentrations – New CHP Alone (µg/m³)

Receptor	Annual Mean		24-hour Mean	
	PC	PC (% AQO)	PC	PC (% AQO)
D1 Coldbrook	0.006	0.3%	0.08	3.5%
D2 Coldbrook	0.007	0.3%	0.09	4.1%
D3 Coldbrook	0.012	0.6%	0.13	5.7%

D4 Residential to West	0.005	0.2%	0.10	4.4%
D5 Residential to North-east	0.008	0.3%	0.09	3.8%
D6 Pontithel	0.013	0.6%	0.13	6.0%
D7 Lower Porthamel	0.035	1.5%	0.23	10.4%
D8 Porthamel Cottages	0.033	1.5%	0.23	10.1%
D9 Porthamel Cottages	0.025	1.1%	0.19	8.3%
D10 Residential to North-east	0.017	0.8%	0.12	5.3%
D11 Residential to North-east	0.013	0.6%	0.10	4.6%
D12 Bradwys - East	0.017	0.8%	0.25	11.2%
D13 Lodge bungalow	0.002	0.1%	0.06	2.8%
D14 The Lodge	0.002	0.1%	0.07	2.9%
D15 Farm to South-east	0.001	0.1%	0.03	1.2%
D16 Park Bungalow	0.002	0.1%	0.04	1.9%
D17 Talgarth	0.028	1.3%	0.29	12.8%
D18 Talgarth	0.020	0.9%	0.20	8.9%
D19 Talgarth	0.015	0.7%	0.19	8.6%
D20 Castle Green	0.016	0.7%	0.12	5.5%
D21 The Cobblers	0.009	0.4%	0.10	4.3%
D22 Bronllys Castle	0.008	0.3%	0.10	4.4%
D23 Great Porthamel Farmhouse	0.053	2.4%	0.58	26.0%
D24 P Jones Residential Property	0.105	4.7%	0.99	44.1%
D25 Porthamel Mill	0.026	1.2%	0.19	8.4%
AQO/EAL	2.25		2.25	
Maximum PC with relevant exposure	0.105 (4.7%)		0.99 (44.1%)	
Background	0.041		0.048	
Maximum PEC with relevant exposure	0.146		1.0	
Maximum PEC (% AQO/EAL)	6.5%		46.3%	

Where there is relevant public exposure, maximum predicted annual mean ground level 1,3-butadiene concentrations exceed 1% of the AQO at some receptors but the PECs are well below 70% of the AQO and it is unlikely that this would be exceeded. Predicted 24-hour mean concentrations exceed 10% of the EAL at six locations. However, as discussed in Section 5.2.4, predicted concentrations are representative of a worst-case. Taking into consideration these worst-case assumptions, it is concluded that the AQO would not be exceeded. Predicted annual mean and maximum 24-hour mean concentrations are presented as contour plots in Figure 5.9 and Figure 5.10, respectively.

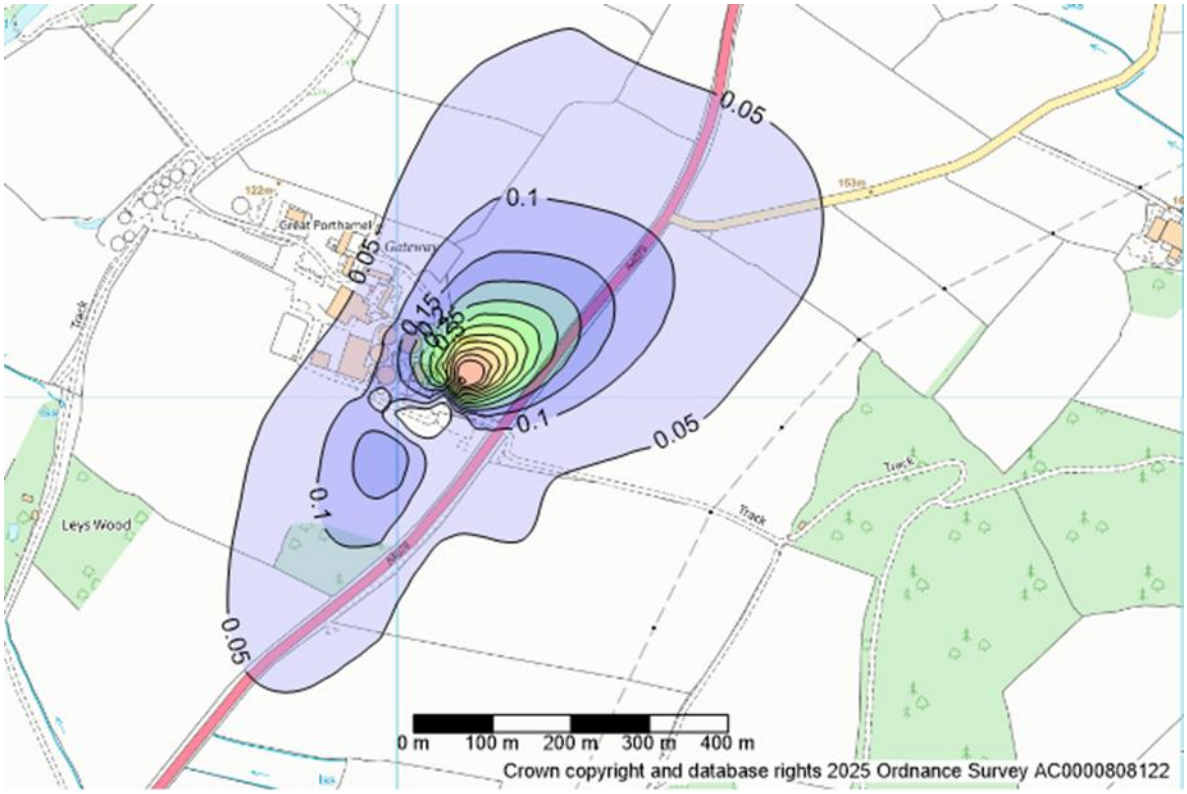

Figure 5.9 - Predicted Annual Mean 1,3-Butadiene Concentrations – New CHP Alone (µg/m³)

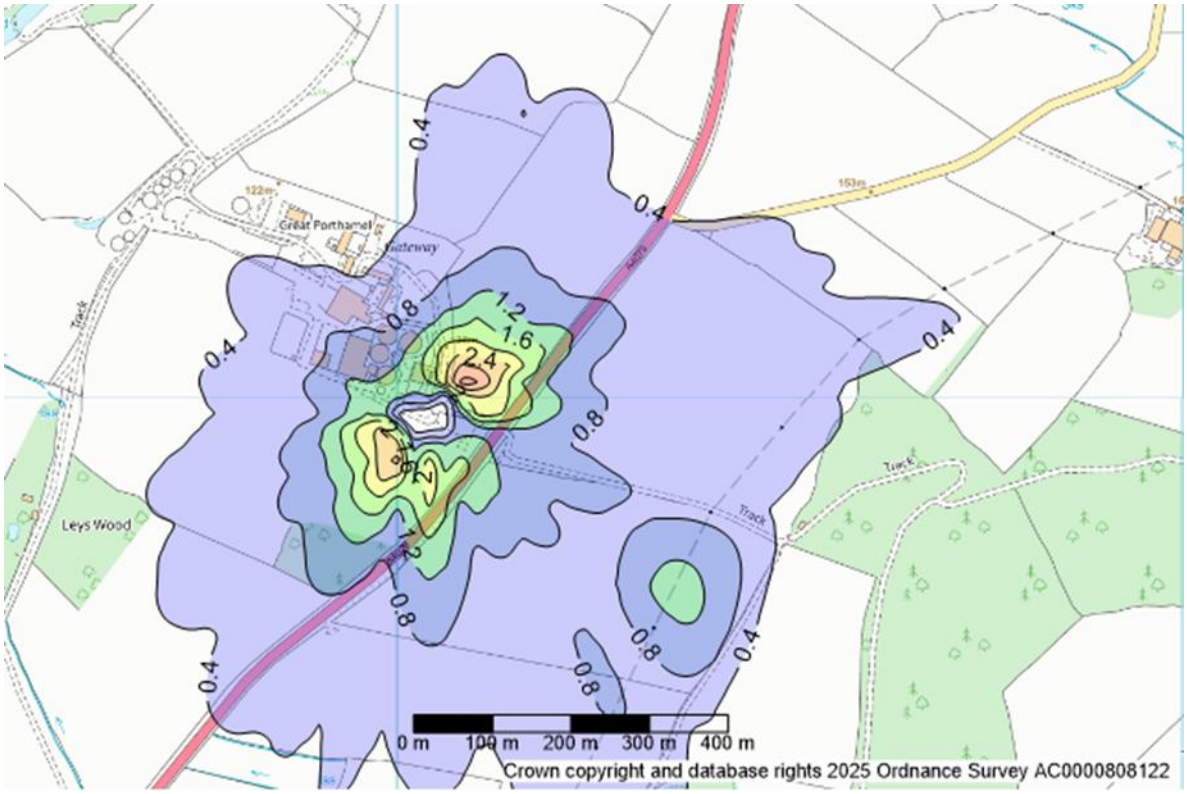

Figure 5.10 - Predicted Maximum 24-hour Mean 1,3-Butadiene Concentrations – New CHP Alone (µg/m³)

5.3 Habitat Impact

5.3.1 Airborne Concentrations of NO_x – All Sources

For all sources, the predicted maximum ground level concentrations of NO_x at the identified habitat sites are compared with the relevant critical levels in Table 5.9.

Table 5.9 - Predicted Maximum NO_x Concentrations as a Percentage of the Critical Levels – All Sources

Habitat Site	Annual Mean		24-Hour Mean	
	PC (µg/m³)	PC %age	PC (µg/m³)	PC %age
Afon Llynfi SSSI/River Wye SAC	0.76	2.5%	6.7	9.0%
Pwll-y-wrach SSSI	0.47	1.6%	4.3	5.7%
Bronlly's Castle SINC	0.31	1.0%	4.3	5.7%
LLangorse Lake SAC	0.08	0.3%	1.4	1.8%
Drostre Bank SAC	0.02	0.1%	0.22	0.3%
River Usk SAC	0.03	0.1%	0.77	1.0%
Critical Level (µg/m³)	30		75	

At the River Wye Sac and Pwll-y-wrach SSSI, predicted annual mean concentrations of NO_x exceed 1% of the critical level and are potentially significant. However, the background NO_x concentrations at these two sites are less than 5 µg/m³ and the PEC would be less than 70% of the critical level and it is unlikely that this would be exceeded. At all other habitats, the annual mean PC is less than or equal to 1% of the critical level and would be assessed as not significant.

At all habitats, the maximum 24-hour mean concentrations of NO_x due to emissions from the facility are less than 10% of the critical level of 75 µg/m³ and would be assessed as not significant.

5.3.2 Sulphur Dioxide (SO_2) – All Sources

For all sources, predicted maximum ground level concentrations of SO_2 at the identified habitat sites are compared with the relevant critical level in Table 5.10. The most stringent critical level of 10 µg/m³ has been adopted for all habitat sites.

Table 5.10 - Predicted Maximum SO_2 Concentrations as a Percentage of the Critical Levels – All Sources

Habitat Site	Annual Mean	
	PC (µg/m³)	PC %age
Afon Llynfi SSSI/River Wye SAC	0.43	4.3%
Pwll-y-wrach SSSI	0.26	2.6%
Bronlly's Castle SINC	0.18	1.8%
LLangorse Lake SAC	0.05	0.5%
Drostre Bank SAC	0.01	0.1%
River Usk SAC	0.02	0.2%
Critical Level (µg/m³)	10 - 20	

At the River Wye Sac and Pwll-y-wrach SSSI, predicted annual mean concentrations of SO_2 exceed 1% of the critical level and are potentially significant. However, the background SO_2 concentrations at these two sites are less than 1 µg/m^3 and the PEC would be less than 70% of the critical level and it is unlikely that this would be exceeded. At all other habitats, the annual mean PC is less than or equal to 1% of the critical level (less than 100% for the LWS) and would be assessed as not significant.

5.3.3 Eutrophication – All Sources

For all sources, predicted maximum nutrient nitrogen deposition rates arising from emissions of NO_x from the proposed facility are presented in Table 5.11. The process contributions (PC) are compared with the relevant critical loads (CL) and combined with the relevant background concentrations (refer to **Appendix E**).

Table 5.11 - Predicted Eutrophication Rates – All Sources (kgN/ha/a)

Habitat Site	PC (kgN/ha/a)	Lowest CL (kgN/ha/a)	PC (% CL)
Afon Llynfi SSSI/River Wye SAC	0.11	5	2.2%
Pwll-y-wrach SSSI	0.13	10	1.3%
Bronlly's Castle SINC	0.090	10	0.9%
LLangorse Lake SAC	0.024	10	0.2%
Drostre Bank SAC	0.0054	10	0.1%
River Usk SAC	0.0049	5	0.1%

At the River Wye Sac and Pwll-y-wrach SSSI, predicted annual mean nutrient nitrogen deposition rates exceed 1% of the respective critical loads and are potentially significant. Furthermore, background nutrient nitrogen deposition rates at these two sites are substantially in excess (around a factor of three) higher than the critical loads. However, the two existing CHP units have been operational since 12th March 2012 and will be accounted for in the background deposition rate. The change in nutrient nitrogen deposition due to the new CHP unit is assessed in Section 5.3.7.

5.3.4 Acidification – All Sources

For all sources, predicted maximum acid deposition rates predicted for the five years of meteorological data are presented in Table 5.12. The process contributions (PC) are compared with the relevant critical loads provided in **Appendix E**. The percentage of the critical load has been calculated using the Critical Function Tool on the APIS website.

Table 5.12 - Predicted Acid Deposition Rates – All Sources (keq/ha/a)

Habitat Site	PC (keq/ha/a)	Critical Load (keq/ha/a)	PC (% CL)
Afon Llynfi SSSI/River Wye SAC	0.058	0.487	11.9%
Pwll-y-wrach SSSI	0.072	2.214	3.2%
Bronlly's Castle SINC	0.048	2.214	2.2%
LLangorse Lake SAC	0.013	2.434	0.5%
Drostre Bank SAC	0.0030	2.306	0.1%
River Usk SAC	0.0027	0.601	0.5%

At the River Wye Sac and Pwll-y-wrach SSSI, predicted annual mean acidification rates exceed 1% of the respective critical loads and are potentially significant. Furthermore, background acidification rates at these two sites are substantially in excess (around a factor of 2.5) higher than the critical loads. However, the two existing CHP units have been operational since 12th March 2012 and will be accounted for in the background deposition rate. The change in acidification due to the new CHP unit is assessed in Section 5.3.8.

5.3.5 Airborne Concentrations of NO_x – New CHP Alone

For the new CHP unit, the predicted maximum ground level concentrations of NO_x at the identified habitat sites are compared with the relevant critical levels in Table 5.13.

Table 5.13 - Predicted Maximum NO_x Concentrations as a Percentage of the Critical Levels – New CHP Alone

Habitat Site	Annual Mean		24-Hour Mean	
	PC (µg/m³)	PC %age	PC (µg/m³)	PC %age
Afon Llynfi SSSI/River Wye SAC	0.22	0.7%	2.1	2.7%
Pwll-y-wrach SSSI	0.14	0.5%	1.3	1.7%
Bronlly's Castle SINC	0.086	0.3%	1.1	1.5%
LLangorse Lake SAC	0.021	0.1%	0.35	0.5%
Drostre Bank SAC	0.0047	0.0%	0.055	0.1%
River Usk SAC	0.0079	0.0%	0.16	0.2%
Critical Level (µg/m³)	30		75	

At all habitats, the annual mean PC is less than 1% of the critical level and would be assessed as not significant. At all habitats, the maximum 24-hour mean concentrations of NO_x due to emissions from the facility are less than 10% of the critical level of 75 µg/m³ and would also be assessed as not significant.

5.3.6 Sulphur Dioxide (SO_2) – New CHP Alone

For the new CHP unit, predicted maximum ground level concentrations of SO_2 at the identified habitat sites are compared with the relevant critical level in Table 5.14. The most stringent critical level of 10 µg/m³ has been adopted for all habitat sites.

Table 5.14 - Predicted Maximum SO_2 Concentrations as a Percentage of the Critical Levels – New CHP Alone

Habitat Site	Annual Mean	
	PC (µg/m³)	PC %age
Afon Llynfi SSSI/River Wye SAC	0.047	0.5%
Pwll-y-wrach SSSI	0.029	0.3%
Bronlly's Castle SINC	0.018	0.2%
LLangorse Lake SAC	0.0045	0.0%
Drostre Bank SAC	0.0010	0.0%
River Usk SAC	0.0017	0.0%
Critical Level (µg/m³)	10 - 20	

At all habitats, the annual mean PC is less than 1% of the critical level (less than 100% for the LWS) and would be assessed as not significant.

5.3.7 Eutrophication – New CHP Alone

For the new CHP unit, predicted maximum nutrient nitrogen deposition rates arising from emissions of NO_x from the proposed CHP unit are presented in Table 5.15. The process contributions (PC) are compared with the relevant critical loads (CL) and combined with the relevant background concentrations (refer to **Appendix E**).

Table 5.15 - Predicted Eutrophication Rates – New CHP Alone (kgN/ha/a)

Habitat Site	PC (kgN/ha/a)	Lowest CL (kgN/ha/a)	PC (% CL)
Afon Llynfi SSSI/River Wye SAC	0.031	5	0.6%
Pwll-y-wrach SSSI	0.039	10	0.4%
Bronlly's Castle SINC	0.025	10	0.2%
LLangorse Lake SAC	0.0061	10	0.1%
Drostre Bank SAC	0.0013	10	0.0%
River Usk SAC	0.0011	5	0.0%

At all habitat sites, predicted annual mean nutrient nitrogen deposition rates are less than 1% of the respective critical loads and would be assessed as not significant.

5.3.8 Acidification – New CHP Alone

For the new CHP unit, predicted maximum acid deposition rates predicted for the five years of meteorological data are presented in Table 5.16.

Table 5.16 - Predicted Acid Deposition Rates – New CHP Alone (keq/ha/a)

Habitat Site	PC (keq/ha/a)	Critical Load (keq/ha/a)	PC (% CL)
Afon Llynfi SSSI/River Wye SAC	0.0077	0.487	1.6%
Pwll-y-wrach SSSI	0.0096	2.214	0.4%
Bronlly's Castle SINC	0.0061	2.214	0.3%
LLangorse Lake SAC	0.0015	2.434	0.1%
Drostre Bank SAC	0.00033	2.306	0.0%
River Usk SAC	0.00028	0.601	0.0%

At the River Wye SAC and Pwll-y-wrach SSSI, predicted annual mean acidification rates exceed 1% of the respective critical loads and are potentially significant. Furthermore, background acidification rates at these two sites are substantially in excess (around a factor of 2.5) higher than the critical loads. However, this is representative of the worst-case (highest impact within the habitat site, worst-case meteorological conditions and with the new CHP unit operating continuously at the maximum permissible ELV for NO_x and SO_2). In reality, it is considered unlikely that the impact of emissions from the new CHP would exceed 1% of the critical load.

6. CONCLUSIONS

An assessment has been carried out to determine the local air quality impacts associated with emissions from a proposed new Combined Heat and Power (CHP) plant at an Anaerobic Digestion (AD) plant to the north of Talgarth, Brecon in Powys. The AD facility currently has two CHP units utilising biogas as a fuel but is looking to operate a third unit in addition to other activities at the installation.

Detailed air quality modelling using the US AERMOD dispersion model has been undertaken to predict the impacts associated with the stack emissions from all three CHP units and the change in impact as a result of emissions from the new CHP unit. The assessment has considered the emissions of the oxides of nitrogen, carbon monoxide, sulphur dioxide and total organic compounds.

The maximum impact of pollutant emissions from the site at sensitive receptors is considered not significant on the basis of the Environment Agency criteria (as adopted by NRW) and professional judgement taking into account the worst-case assumptions that have been adopted for the assessment and the change in impact as a result of the new CHP unit.

The impact of emissions from the new CHP unit on international, national and local habitat sites was also determined and assessed as not significant compared with existing background conditions and relevant critical levels and critical loads, taking into consideration the worst-case assumptions that have been adopted for the assessment.

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APPENDIX A AIR QUALITY TERMINOLOGY

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
Defra	Department for Environment, Food and Rural Affairs.
EAL	Environmental Assessment Level
Exceedance	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NOx	Nitrogen oxides.
O3	Ozone.
Percentile	The percentage of results below a given value.
PM10	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (109) units of air, there is one unit of pollutant present.
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (106) units of air, there is one unit of pollutant present.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
µg/m^3 micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1ug/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).

Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.

APPENDIX B AIR QUALITY STANDARDS AND OBJECTIVES

Pollutant	Averaging Period	EAL / AQS (μg/m^3)	Comments
Nitrogen dioxide (NO_2)	annual	40	UK AQO
	1-hour	200	UK AQO, not to be exceeded more than 18 times per annum, equivalent to the 99.8th percentile of 1-hour means
Sulphur dioxide (SO_2)	24-hour	125	UK AQO, not to be exceeded more than 3 times per annum, equivalent to the 99.2nd percentile of 24-hour means
	1-hour	350	UK AQO, not to be exceeded more than 24 times per annum, equivalent to the 99.7th percentile of 1-hour means
	15-minute	266	UK AQO, not to be exceeded more than 18 times per annum, equivalent to the 99.8th percentile of 1-hour means
Carbon monoxide (CO)	8-hour	10,000	UK AQO
	1-hour	30,000	Short-term EAL
Total organic compounds (as 1,3-butadiene)	annual	2.25	UK AQO
	24-hour	2.25	Short-term EAL

APPENDIX C DISPERSION MODEL INPUT PARAMETERS

Appendix C1 – Emission Parameters – Existing CHP 1

Parameter	CHP 1 (a)	
Stack Height (m)	9.7	
Effective Stack diameter (m)	0.3	
Temperature of release (°C)	171	
Actual flow rate (Am^3/s)	1.24	
Oxygen content (%v/v dry)	8.3	
Moisture content (%v/v)	12.3	
Normalised Flow Rate (Nm^3/s) (b)	0.53	
Emission velocity at stack exit (m/s)	17.5	
Emissions (mg/Nm^3)	**mg/Nm^3(b)**	**g/s**
NO_x	500	0.265
SO_2	350	0.185
CO	1,400	0.741
VOCs (including methane) VOCs (excluding methane, assumed)	1,000 50	0.529 0.027

(a) Data obtained from the January 2024 extractive monitoring report which provided the highest flow rate for the four years 2022 and 2025

(b) At 5% O_2, 273.15K, 101.3 kPa, dry

Appendix C2 - Emission Parameters – Existing CHP 2

Parameter	CHP 2 (a)	
Stack Height (m)	8.0	
Effective Stack diameter (m)	0.3	
Temperature of release (°C)	165.5 (b)	
Actual flow rate (Am^3/s)	1.86 (c)	
Oxygen content (%v/v dry)	8.4	
Moisture content (%v/v)	14.0	
Normalised Flow Rate (Nm^3/s) (d)	0.78	
Emission velocity at stack exit (m/s)	26.3	
Emissions (mg/Nm^3)	**mg/Nm^3(d)**	**g/s**
NOx	500	0.391
SO_2	350	0.274
CO	1,400	1.095
VOCs (including methane) VOCs (excluding methane, assumed)	1,000 50	0.782 0.039

(a) Except for temperature, data obtained from the January 2023 extractive monitoring report which provided the highest flow rate for the four years 2022 and 2025

(b) Sample port is prior to the heat exchanger and measured temperatures do not reflect the exhaust gas at exit to atmosphere, average temperature for CHP1 for the four monitoring periods adopted for CHP 2

(c) At 165.5˚C

(d) At 5% O_2, 273.15K, 101.3 kPa, dry

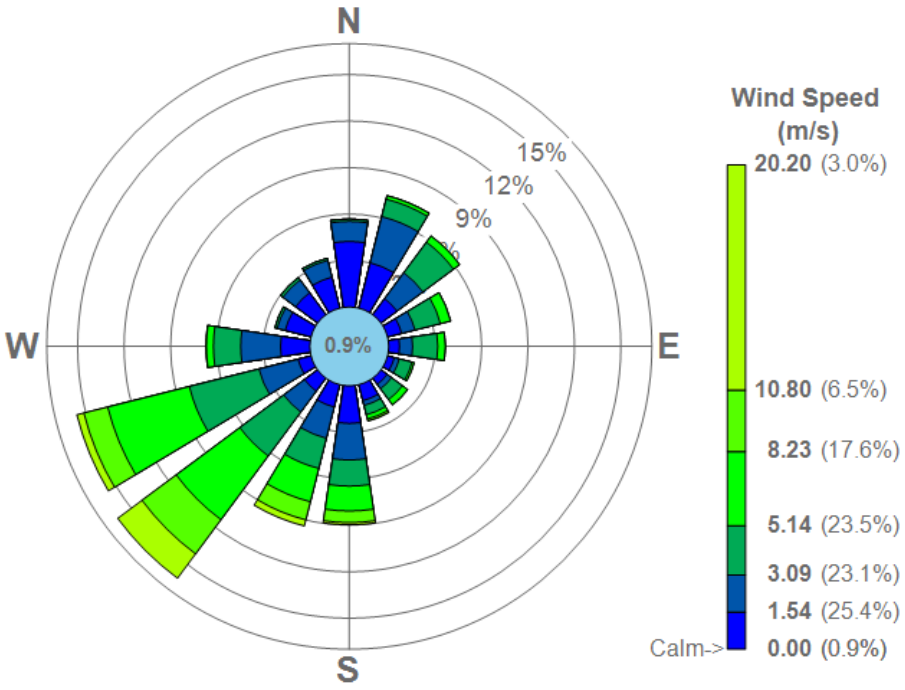
Appendix C3 – Emission Parameters – New CHP 3

Parameter	CHP 3 (a)	
Stack Height (m)	8.0	
Effective Stack diameter (m)	0.25	
Temperature of release (°C)	165.5 (b)	
Actual flow rate (Am^3/s)	0.98 (c)	
Oxygen content (%v/v dry)	8.5 (d)	
Moisture content (%v/v)	13.1	
Normalised Flow Rate (Nm^3/s) (e)	1.11	
Emission velocity at stack exit (m/s)	19.9	
Emissions (mg/Nm^3)	**mg/Nm^3(e)**	**g/s**
NO_x	500	0.206
SO_2	107	0.044
CO	1,400	0.577
VOCs (including methane) VOCs (excluding methane, assumed)	1,000 50	0.412 0.021

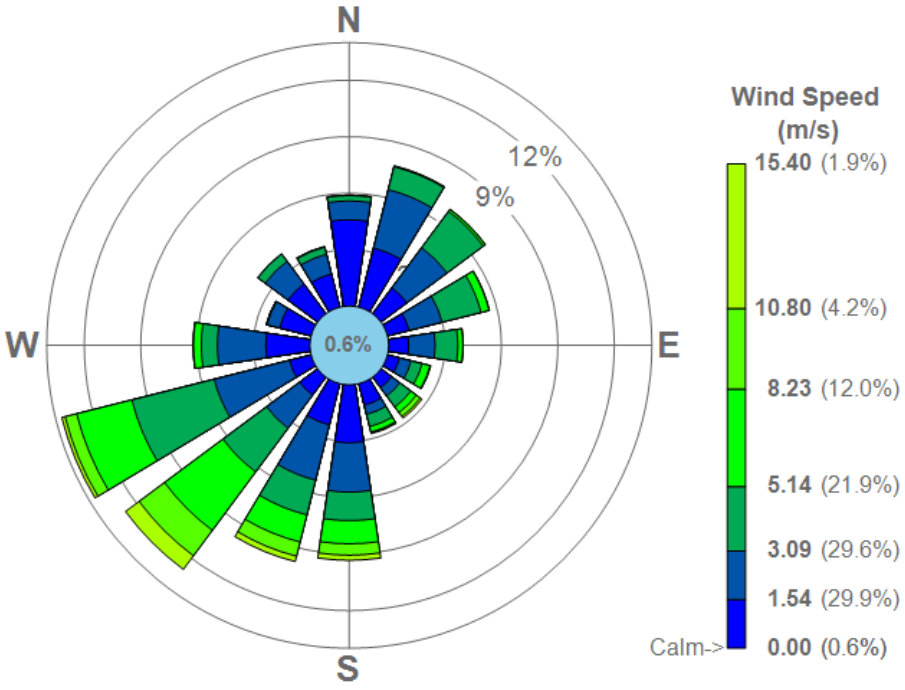
(a) Data taken from manufacturer's technical specification except for temperature
(b) Average temperature for CHP1 for the four monitoring periods adopted for CHP 3
(c) At 165.5˚C
(d) Average of the measured data for CHP 1 and CHP 2 for the four years
(e) At 5% O_2, 273.15K, 101.3 kPa, dry

APPENDIX D WIND ROSES FOR SENNYBRIDGE

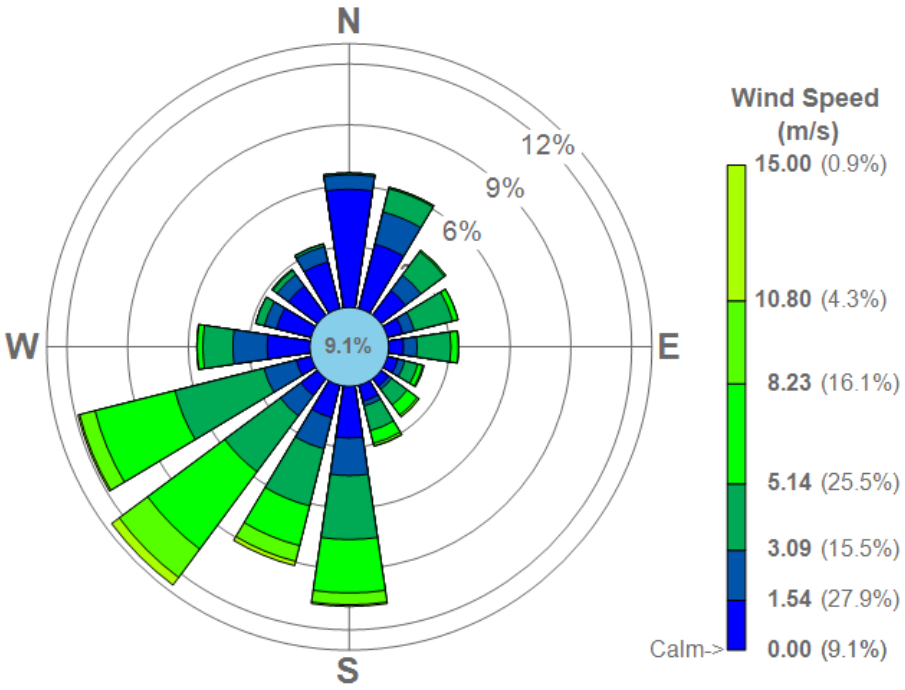
2020


N
E
S
W
15%
12%
9%
0.9%
Wind Speed
(m/s)
20.20 (3.0%)
10.80 (6.5%)
8.23 (17.6%)
5.14 (23.5%)
3.09 (23.1%)
1.54 (25.4%)
Calm-> 0.00 (0.9%)

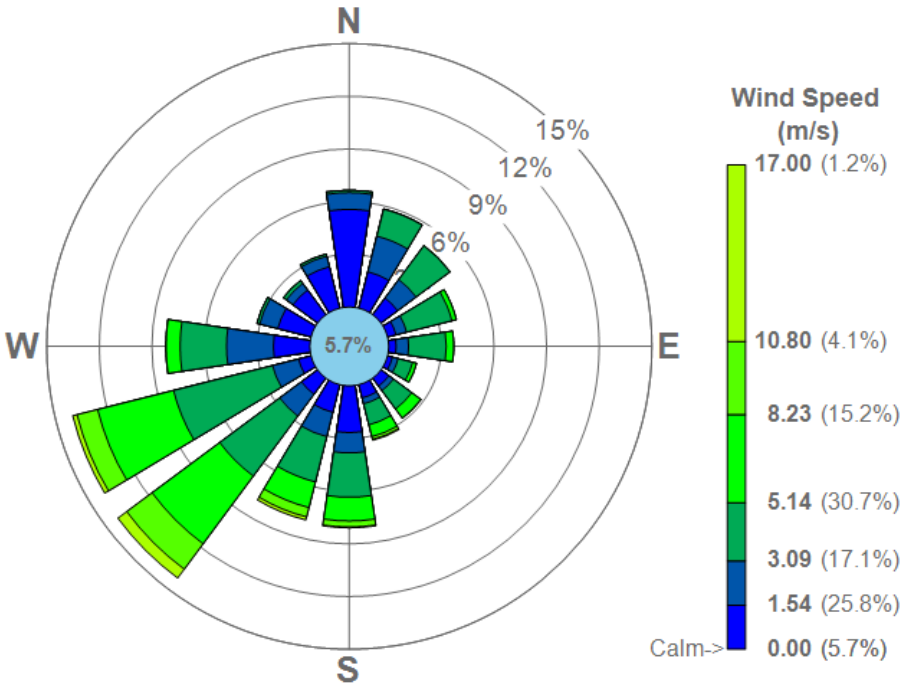
2021


N
E
S
W
12%
9%
0.6%
Wind Speed
(m/s)
15.40 (1.9%)
10.80 (4.2%)
8.23 (12.0%)
5.14 (21.9%)
3.09 (29.6%)
1.54 (29.9%)
Calm-> 0.00 (0.6%)

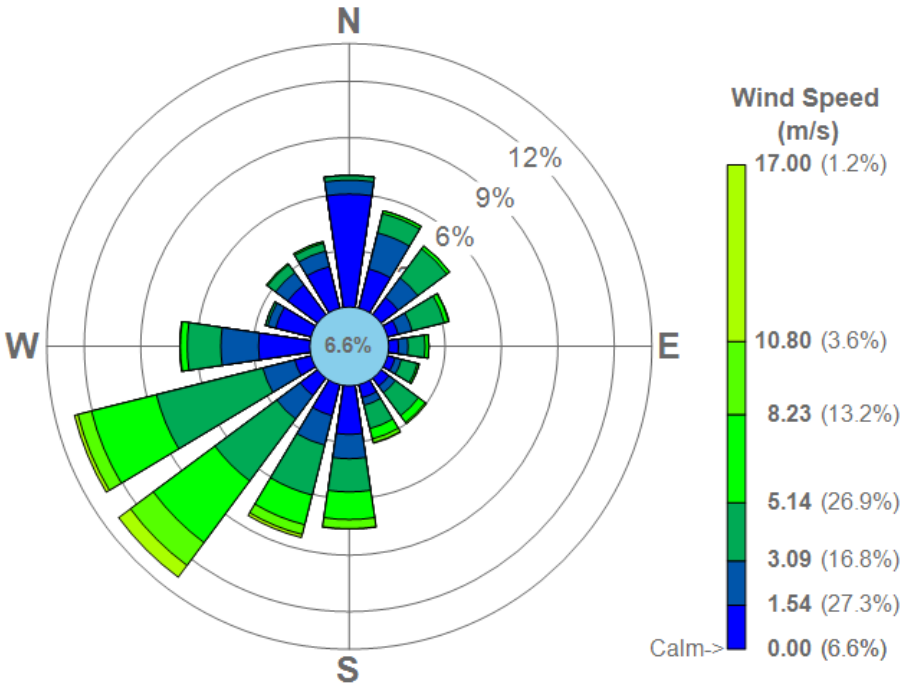
2022


N
E
S
W
12%
9%
6%
9.1%
Wind Speed
(m/s)
15.00 (0.9%)
10.80 (4.3%)
8.23 (16.1%)
5.14 (25.5%)
3.09 (15.5%)
1.54 (27.9%)
Calm-> 0.00 (9.1%)

2023


N
E
S
W
15%
12%
9%
6%
5.7%
Wind Speed
(m/s)
17.00 (1.2%)
10.80 (4.1%)
8.23 (15.2%)
5.14 (30.7%)
3.09 (17.1%)
1.54 (25.8%)
Calm-> 0.00 (5.7%)

2024


N
E
S
W
12%
9%
6%
6.6%
Wind Speed
(m/s)
17.00 (1.2%)
10.80 (3.6%)
8.23 (13.2%)
5.14 (26.9%)
3.09 (16.8%)
1.54 (27.3%)
0.00 (6.6%)
Calm->

APPENDIX E ENVIRONMENTAL ASSESSMENT LEVELS FOR THE PROTECTION OF VEGETATION AND ECOSYSTEMS

Critical Levels

Critical levels are thresholds of airborne pollutant concentrations above which damage may be sustained to sensitive plants and animals.

The critical levels for the protection of vegetation and ecosystems (as defined by the EU Directive 2008/50/EC and the 2010 UK Air Quality Standards Regulations) that are relevant to the assessment are summarised in Table E1.

Table E1 - Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	Averaging Period	Concentration (µg/m^3)
Oxides of nitrogen (NO_x)	Annual Mean	30
	24-Hour Mean	75
Sulphur dioxide (SO_2)	Annual Mean / Winter Mean (31st Oct to 1st Mar)	10 (sensitive habitats with lichen and bryophytes)
		20 (all other habitats)

Critical Loads

Critical loads refer to the threshold beyond which deposition of pollutants to water or land results in measurable damage to vegetation and habitats. This takes the form of either gravitational settling of particulate matter (dry deposition) or wet deposition, where atmospheric pollutants dissolve in water vapour and then precipitate to the ground (e.g. as rain, snow, fog etc.).

Critical loads for eutrophication (nutrient nitrogen deposition) and background nutrient nitrogen deposition rates have been obtained from APIS and are summarised in Table E2 for the identified habitat sites. The locally designated sites are assumed to be broadleaved deciduous woodlands.

Table E2 - Critical Loads for Eutrophication

Habitat Site	Critical Load Class	Critical Load (kg N/ha/a)	Background N Deposition (kg N/ha/a)
Afon Llynfi SSSI/River Wye SAC	Raised and blanket bogs	5 – 10	15.84
Pwll-y-wrach SSSI	Broadleaved deciduous woodland	10 - 20	27.18
Bronlly's Castle SINC	Broadleaved deciduous woodland	10 – 15	26.83
LLangorse Lake SAC	Broadleaved deciduous woodland	10 – 15	26.23
Drostre Bank SAC	Old sessile oak woods	10 – 15	27.00
River Usk SAC	Raised and blanket bogs	5 - 10	19.43

For acid deposition, the critical load of a habitat site is largely determined by the underlying geology and soils. The critical load of acidification is defined by a critical load function (CLF), which describes the relationship between the relative contributions of sulphur (S) and nitrogen (N) to the total acidification.

The critical load function is defined by the following parameters:

- CLmaxS, the maximum critical load of acidity for S, assuming there is no N deposition;
- CLminN, is the critical load of acidity due to nitrogen removal processes in the soil only (i.e. independent of deposition); and
- CLmaxN, is the maximum critical load of acidity for N, assuming there is no S deposition.

Critical loads and background acid deposition rates have been obtained from APIS and are summarised in Table E3 for the identified habitat sites.

Table E3 - Critical Loads for Acid Deposition (keq/ha/a)

Habitat Site	Critical Load – Max N (keq/ha/a)	Background Acidification (keq/ha/a)
Afon Llynfi SSSI/River Wye SAC	0.487	1.20
Pwll-y-wrach SSSI	2.214	2.06
Bronlly's Castle SINC	2.214	2.03
LLangorse Lake SAC	2.434	1.99
Drostre Bank SAC	2.306	2.04
River Usk SAC	0.601	1.48