APPLICATION FOR AN ENVIRONMENTAL PERMIT VARIATION UNDER THE ENVIRONMENTAL PERMITTING (ENGLAND AND WALES) REGULATIONS 2016 (AS AMENDED)

AIR DISPERSION MODELLING ASSESSMENT

PB LEINER
The Clear Solution

P B GELATINS U.K. LIMITED,
UNIT A6, SEVERN ROAD, TREFOREST INDUSTRIAL ESTATE, PONTYPRIDD, CF37 5SQ

ECL Ref: PBGE.01.10/ADM
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LIST OF AMENDMENTS SINCE THE ISSUE 1 REPORT (OCTOBER 2023)

- Update to Section 1 to state the fuel use of the appliances assessed.
- Update to Table 5 of Section 2.6 to include the Greater Horseshoe Bat (Rhinolophus ferrumequinum) and Lesser Horseshoe Bat (Rhinolophus hipposideros), as well as updates to the descriptions for the interest features previously shown for Cardiff Beech Woods SAC.

AIR DISPERSION MODELLING REPORT OF RELEASES FROM AN INSTALLATION AT TREFOREST INDUSTRIAL ESTATE, PONTYPRIDD

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ACRONYMS / TERMS USED IN THIS REPORT

AAD	Ambient Air Directive
ADMS	Atmospheric Dispersion Modelling System
AQAL	Air Quality Assessment Level
AQA	Air Quality Assessment
AQMAs	Air Quality Management Areas
AQO	Air Quality Objective
AQS	Air Quality Standard
AW	Ancient Woodland
CERC	Cambridge Environmental Research Consultants
CO	Carbon Monoxide
cSAC	Candidate Special Area of Conservation
DEFRA	Department for Environment, Food and Rural Affairs
DT	Diffusion Tube
EA	Environment Agency
ECL	Environmental Compliance Ltd
EPUK	Environmental Protection UK
GLC	Ground Level Concentration
IAQM	Institute of Air Quality Management
LNR	Local Nature Reserves
LWS	Local Wildlife Sites
MAGIC	Multi-Agency Geographic Information for the Countryside
Met	Meteorological
Met data	Meteorological data
Met Office	Meteorological Office
Met station	Meteorological station
Met year	Meteorological year
NNR	National Nature Reserves
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NRW	Natural Resources Wales
PB Gelatins	PB Gelatins U.K. Limited
PC	Process Contribution
PEC	Predicted Environmental Concentration
Ramsar	The Ramsar Convention on Wetlands of International Importance
RCTCBC	Rhondda Cynon Taff County Borough Council
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
The Site	Unit A6 Severn Road, Treforest Industrial Estate, Pontypridd, Rhondda Cynon Taff
WCMY	Worst Case Met Year
WHO	World Health Organisation

UNITS

g/s	Grams per second
K	Kelvin
km	Kilometre
m	Metre
mg/Nm^3	Milligram per normal cubic metre
m/s	Metres per second
MWth	Megawatt Thermal
$\mu g/m^3$	Microgram per cubic metre
X	Easting coordinate
Y	Northing coordinate
Z_0	Surface roughness length (as defined by the modelling software)
%	Percent
%ile	Percentile
°	Degree
°C	Degree Celsius

1. INTRODUCTION

1.1. The Study

1.1.1. Environmental Compliance Ltd ("ECL") were commissioned by PB Gelatins U.K. Limited ("PB Gelatins") to undertake an air quality assessment ("AQA") of combustion gas releases from three emission points associated with their facility at Unit A6 Severn Road, Treforest Industrial Estate, Pontypridd, Rhondda Cynon Taff, CF37 5SQ ("the Site"). It is anticipated this AQA will form part of a permit variation application to be submitted to Natural Resources Wales ("NRW").

1.1.2. A H1 assessment was initially undertaken (a copy of which may be found in Appendix I) – however, following further screening it was demonstrated that there were predicted impacts that were potentially significant (i.e., that could not be screened out in accordance with the applicable guidance[1]).

1.1.3. The emissions points assessed are comprised of a natural gas fuelled boiler (emission point EP21) and two natural gas fuelled space heaters (emission points EP22 and EP23), which will discharge to atmosphere via independent flue stacks.

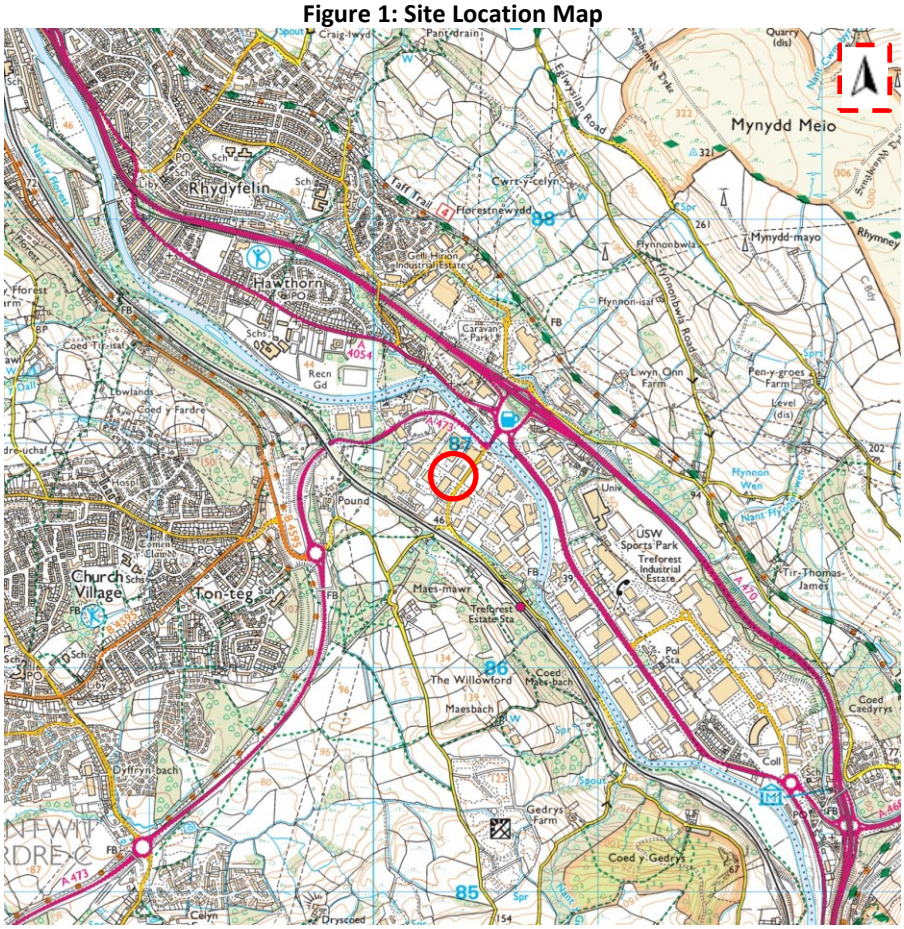
1.1.4. The study has been conducted to determine the impact of oxides of nitrogen ("NO_X") (as nitrogen dioxide ("NO_2")) and carbon monoxide ("CO") on human health for receptors within a 2km radius of the Site. Specified environmental receptors within both a 10km and 2km radius of the discharge stacks have also been assessed, as outlined in the relevant guidance (see Section 2.4).

1.1.5. The study was undertaken using the ADMS modelling package, which is one of the models recognised as being suitable for this type of study.

1.1.6. The approximate location of the emissions points assessed at the Site are circled in red on the site location map, which is presented as Figure 1.

[1] Available online via: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit, accessed August 2023.

Figure 1: Site Location Map



1.2. Objectives of the Study

1.2.1. The objectives of this study are as follows:

- to assess the impact of emissions from the Site on existing local air quality in relation to human and environmental health at a range of potentially sensitive receptors by comparison with relevant Air Quality Standards ("AQSs").

1.3. Scope of the Study

1.3.1. Modelling was carried out using emissions data provided by PB Gelatins or from the technology provider.

The effects of prevailing meteorological conditions, building downwash effects, local terrain and existing ambient air quality were also taken into account.

1.3.2. This report spans a number of guidance documents. The EA online guidance[2] was used for assessing if process contributions ("PCs") are insignificant. The Environmental Protection UK ("EPUK") and the Institute of Air Quality Management ("IAQM") guidance 2017[3] was

[2] Available online via: https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports
[3] Available online via: http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

used where applicable (i.e., where PCs exceeded the assessment criteria outlined in the EA online guidance). It should be noted that NRW approve the use of the EA guidance, in the absence of their own specific guidance for air quality assessments.

1.3.3. It should be noted that the emission points assessed operate up to 2,000 hours per year. Consequently, in accordance with EA guidance[4], long-term predictions can be scaled down based on the number of operational hours per year compared with a full year (i.e., 8,760 hours).

1.3.4. The predicted environmental concentrations ("PECs") - the sum of the pollutant PC and the existing pollutant background concentration from other sources – were also compared to the relevant standards. Results are presented as the maximum predicted GLC and the maximum sensitive receptor GLC.

1.3.5. The maximum predicted pollutant GLCs at the specified human and ecological receptors were also compared to the relevant AQSs (refer to Tables 1 and 2 of Sections 2.3. and 2.4., respectively, for further details).

1.3.6. Rhondda Cynon Taf County Borough Council ("RCTCBC") has declared multiple Air Quality Management Areas ("AQMAs"), all for NO2. Consequently, all AQMAs within 3km of the Site will be considered as part of the assessment, namely::

- Church Village AQMA – declared 13th March 2015: The area encapsulates all roadside properties from 9 Dyffryn Terrace east to 5b Main Road within the township of Church Village;
- Treforest AQMA – declared 29th January 2018: The area encapsulates all roadside properties from 1 Teify House to 69 Cardiff Road, Treforest;
- Broadway AQMA – declared 1st November 2007 (amended 1st November 2009): The area encompasses roadside properties along Broadway, Fothergill Street and Park Street; and
- Nantgarw AQMA – declared 1st November 2007 (amended 1st March 2012): The area encompasses the properties at Graig View along the western edge of the A468.

[4] Available online via: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

2. METHOD STATEMENT

2.1. Choice of Model

2.1.1. The UK-Atmospheric Dispersion Modelling system ("ADMS") model was developed jointly by Cambridge Environmental Research Consultants ("CERC"), Her Majesty's Inspectorate of Pollution (the EA's predecessor body), the Meteorological Office and National Power, with sponsorship from the UK Government and a number of commercial organisations. UK-ADMS is a computer-based model of dispersion from both point and non-point sources in the atmosphere and is one of the modelling packages that are suitable for this type of study. The current version is ADMS 6.0.

2.1.2. ADMS has been validated against a number of data sets in order to assess various configurations of the model such as flat or complex terrain, line/area/volume sources, buildings, dry deposition fluctuations and visible plumes. The model results have been compared to observational data or other model results if available.

2.1.3. ADMS is a new generation Gaussian plume air dispersion model, which means that the atmospheric boundary layer properties are characterised by two parameters:

- the boundary layer depth, and
- the Monin-Obukhov length,

rather than in terms of the single parameter Pasquill-Gifford class.

2.1.4. Dispersion under convective meteorological conditions uses a skewed Gaussian concentration distribution (shown by validation studies to be a better representation than a symmetrical Gaussian expression).

2.1.5. ADMS is therefore considered to be suitable for use in this assessment.

2.2. Key Assumptions

2.2.1. The study will be undertaken on the basis of a worst-case scenario. Consequently, the following assumptions have been made:

- the maximum anticipated emission concentrations of NO_X (as NO_2) and CO will be released concurrently from all three emission points assessed, on a 24-hourly basis, 365 days of the year; taking shutdowns for planned maintenance into account, the plant will not operate for 365 days;
- the highest predicted pollutant GLCs for the five years of meteorological data for each averaging period (annual mean, hourly, etc.) have been used;
- concentrations of NO_2 in the emissions have been calculated assuming a long-term 70% NO_X to NO_2 conversion rate, and a short-term 35% NO_X to NO_2; and
- maximum predicted GLCs at any location, irrespective of whether a sensitive receptor is characteristic of public exposure, are compared against the relevant AQSs for each pollutant; in addition, the predicted maximum sensitive receptor GLC has also been assessed.

2.3. Sensitive Human Receptors

2.3.1. In addition to predicting concentrations over a 4km-by-4km grid, there are ten specified potentially sensitive human receptors and four AQMAs considered in the assessment. Details of these are provided in Table 1 and a visual representation is provided as Figure 2.

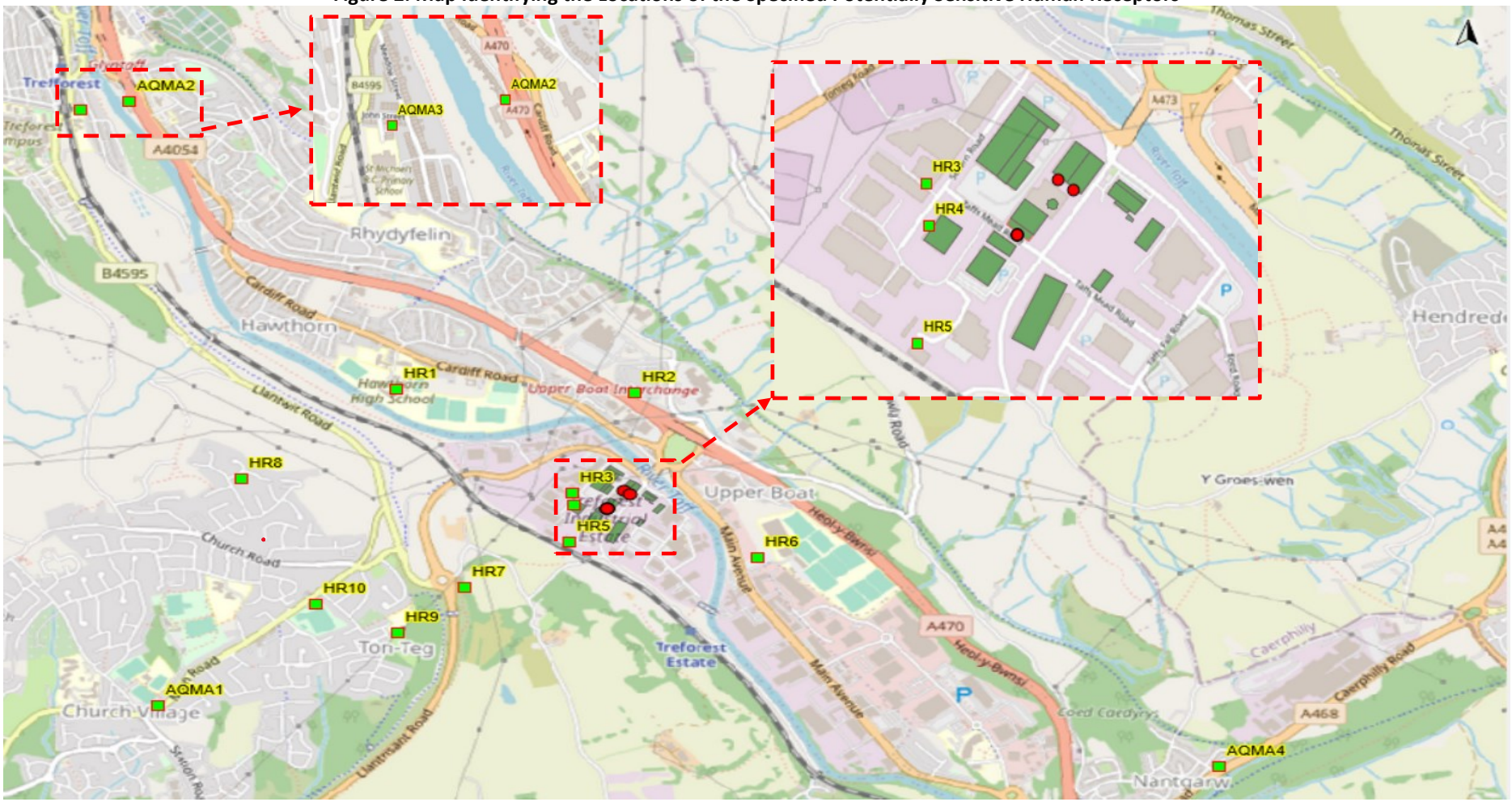
Table 1: Potentially Sensitive Human Receptors

ADMS Ref.	Name	Eastings (X)	Northings (Y)	Distance from Site (m) [(a)]	Heading (degrees)
HR1	Hawthorn High School	309562	187415	971	305
HR2	Pont Pentre Caravan Park	310453	187399	547	10
HR3	Petwise Aquatics	310221	186925	153	295
HR4	Cardiff Engineering and Fabrications	310225	186864	134	272
HR5	Orange Forestry	310208	186693	225	222
HR6	Brynglass House	310196	186619	291	214
HR7	Pound Farm	309816	186743	555	258
HR8	The Dell Play Area	308982	186990	1,383	275
HR9	Ysgol Ty Coch Play Area	309568	186259	993	233
HR10	Tonteg Community Centre	309260	186397	1,193	247
AQMA1	Church Village AQMA	308672	185912	1,935	241
AQMA2	Treforest AQMA	308564	188784	2,631	317
AQMA3	Broadway AQMA	308384	188744	2,729	314
AQMA4	Nantgarw AQMA	312642	85624	2,596	118

Notes to Table 1

(a) Distances are measured as the crow flies from the defined receptor to the Site (approximate coordinates of the boiler stack: (310353 (X) & 186852 (Y)).

Figure 2: Map Identifying the Locations of the Specified Potentially Sensitive Human Receptors



Notes to Figure 2

The red circles are the approximate locations of the emission points considered in the assessment (refer to Section 2.10., for further details);
The neon green squares with the red outline and yellow highlighted annotations are the locations of the potentially sensitive human receptor locations specified in Table 1; and
The darker green shapes (surrounding the emission points) represent the buildings layout considered in the model assessment (refer to Section 2.11., for further details).

2.4. Sensitive Ecological Receptors

2.4.1. In accordance with EA guidance the impact of emissions to air on vegetation and ecosystems from the Site should be assessed for the following sensitive environmental receptors within 10km of the discharge stack(s):

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

2.4.2. In addition, the impact of emissions to air on vegetation and ecosystems from the Site should be assessed for the following sensitive environmental receptors within 2km of the discharge stack(s):

- Sites of Special Scientific Interest ("SSSI") established by the 1981 Wildlife and Countryside Act; and
- local nature sites (ancient woodland ("AW"), local wildlife sites ("LWS") and national and local nature reserves ("NNR" and "LNR")).

2.4.3. The habitats that have been identified based on the search radii outlined above, are presented in Table 2 and a visual representation is provided as Figure 3.

Table 2: Ecological Receptors Considered for the Assessment

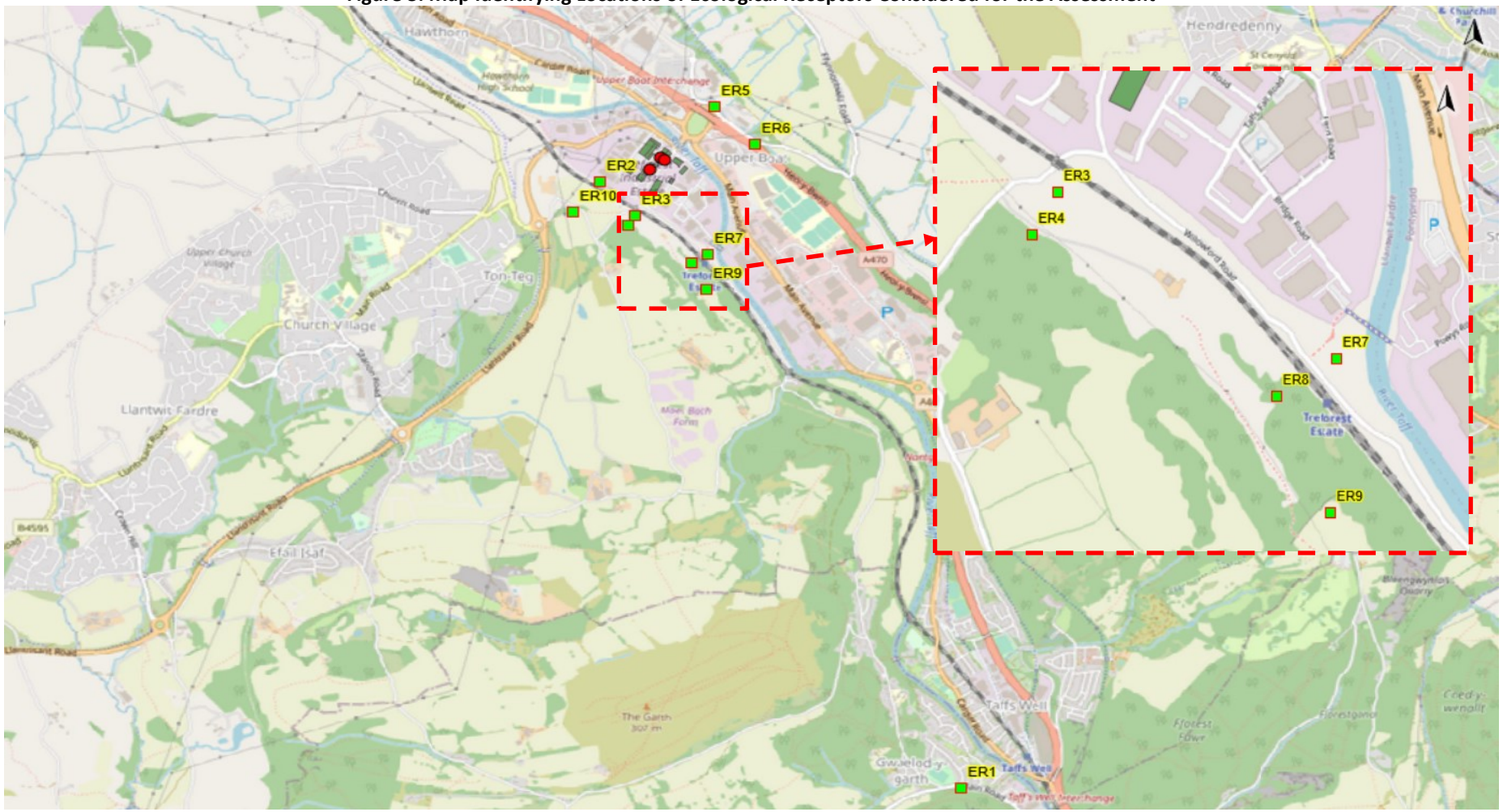
ADMS Ref.	Name [a]	Designation	Eastings (X)	Northings (Y)	Distance (m) [b]	Heading (degrees)
ER1	Cardiff Beech Woods	SAC	312102	183001	4,234	156
ER2	Ancient Semi Natural Woodland – ID: 15748	AW	310080	186778	291	254
ER3	Ancient Semi Natural Woodland – ID: 15746	AW	310271	186568	305	197
ER4	Ancient Semi Natural Woodland – ID: 15745	AW	310233	186507	375	200
ER5	Restored Ancient Woodland Site – ID: 22145	AW	310715	187248	527	43
ER6	Restored Ancient Woodland Site – ID: 22143	AW	310948	187011	608	76
ER7	Ancient Semi Natural Woodland – ID: 15743	AW	310681	186328	622	149
ER8	Ancient Semi Natural Woodland – ID: 8420	AW	310592	186275	630	158
ER9	Ancient Woodland Site of Unknown Category – ID: 50290	AW	310672	186108	815	157
ER10	Ancient Semi Natural Woodland – ID: 11870	AW	309927	186591	509	238

Notes to Table 2

(a) The ecological sites included were identified using the Multi-Agency Geographic Information for the Countryside ("MAGIC") portal.

(b) Distances are measured as the crow flies from the approximate nearest point of the boundary of the designated habitat to the Site (approximate coordinates of the boiler stack: (310353 (X) & 186852 (Y)).

Figure 3: Map Identifying Locations of Ecological Receptors Considered for the Assessment



Notes to Figure 3

The red circle represents the approximate location of the emission points considered in the assessment (refer to Section 2.10., for further details);
The neon green squares with the red outline and yellow highlighted annotations represent the locations of the designated ecological sites detailed in Table 2; and
The darker green shapes (surrounding the emission points) represent the buildings layout considered in the modelling assessment (refer to Section 2.11., for further details).

2.5. Air Quality Standards for the Protection of Human Health

2.5.1. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007) details Air Quality Strategy Objectives for a range of pollutants, including a number that are directly relevant to this study, i.e., NO_2 and CO. In addition, the Regulatory Authorities must ensure that the proposals don't exceed Ambient Air Directive ("AAD") limit values.

2.5.2. In this report, the generic term AQS is used to refer to any of the above values. The various AQSs are intended to be used as guidelines for the protection of human health and the management of local air quality. The values relevant to this study are detailed in Table 3.

Table 3: Air Quality Standards for the Protection of Human Health

Pollutant	Averaging Period	AQS ($\mu g/m^3$)	Comments
Nitrogen Dioxide (NO_2)	annual	40	UK Air Quality Objective ("AQO") and Ambient Air Directive ("AAD") Limit
	1-hour	200	UK AQO and AAD Limit, not to be exceeded more than 18 times per annum, equivalent to the 99.79th percentile of 1-hour means
Carbon Monoxide (CO)	8-hour	10,000	UK AQO and AAD Limit

2.6. Air Quality Standards for the Protection of Sensitive Habitat Sites and Ecosystems

2.6.1. For dispersion modelling purposes, the specified habitat coordinates are a precautionary approach, and are those located at the boundary of the protected site approximately closest in distance to the Site. The maximum predicted impact for each of the habitat sites has been identified for comparison with relevant assessment criteria.

Critical Levels

2.6.2. Critical levels are thresholds of airborne pollutant concentrations above which damage may be sustained to sensitive plants and animals. High concentrations of pollutants in ambient air directly cause harm to leaves and needles of forests and other plant communities. Oxidised nitrogen can have both a toxic effect on vegetation and an impact on nutrient nitrogen.

2.6.3. The 2008 Air Quality Directive set limit values for the protection of vegetation and ecosystems and these have been adopted by the Air Quality Strategy, but are not currently set in regulations. The current objectives are summarised in Table 4.

Table 4: Assessment Criteria for the Protection of Sensitive Habitats and Ecosystems

Pollutant	Averaging Period	Critical Level ($\mu g/m^3$)	Comments
Nitrogen Oxides (as NO_2)	annual	30	Air Quality Objective
	daily	75	(a)

Notes to Table 4

(a) World Health Organisation ("WHO") (2000) Air Quality Guidelines for Europe; 2nd Edition. WHO Regional Publications, European Series, No. 91.

Critical Loads

2.6.4. Critical Loads are defined as:
"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"[5].

2.6.5. Critical loads for nutrient nitrogen are set under the Convention on Long-Range Transboundary Air Pollution based on empirical evidence, mainly observations from experiments and gradient studies. Critical loads [6] are assigned to habitat classes of the European Nature Information System [7] in units of kgN/ha/yr.

2.6.6. Predicted NO_x deposition rates in units of $\mu g\ m^{-2}\ s^{-1}$ are converted to units of kg/ha/yr as nitrogen for direct comparison with critical loads as follows:

- kgN/ha/yr = $\mu g/m^2/s \times (14/46)$ [8] $\times$ 315.36[9] (which equates approximately to the conversion factor provided in the AQTAG06 guidance of 95.9).

2.6.7. Exceedance of critical loads for nitrogen deposition can result in significant terrestrial and freshwater impacts due to changes in species composition, reduction in species richness, increase in nitrate leaching, increases in plant production, changes in algal productivity and increases in the rate of succession[10].

2.6.8. In the UK, an empirical approach is applied to critical loads for acidity for non-woodland habitats; and the simple mass balance equation is applied to both managed and unmanaged woodland habitats. For freshwater ecosystems, national critical load maps are currently based on the First-order Acidity Balance model. All these methods provide critical loads for systems at steady state[6] in units of keq/ha/yr.

[5] From http://www.unece.org/env/lrtap/WorkingGroups/wge/definitions.htm
[6] From http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm
[7] See http://eunis.eea.europa.eu/ for details
[8] Ratio of atomic weight of nitrogen to molecular weight of nitrogen dioxide
[9] Conversion factor from □g/m² to kg/ha.
[10] From http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm#_Toc279788052

2.6.9. The unit kiloequivalent (keq) is the molar equivalent of potential acidity resulting from sulphur or oxidised and reduced nitrogen. Predicted acid deposition rates in units of $\mu g/m^2/s$ are converted to units of keq/ha/yr) as hydrogen for direct comparison with critical loads as follows for NO_x:

- nitrogen from NO_x (keq) =([NO_x] $\mu g/m^2/s \times (14/46) \times 315.36) \div 14$[11] (which equates approximately to the conversion factor provided in the AQTAG06 guidance of 6.86).

2.6.10. Exceedance of the critical loads for acid deposition can result in significant terrestrial and freshwater impacts due to leaching and subsequent increase in availability of potentially toxic metal ions.

2.6.11. Table 5 lists the site-specific critical loads for nutrient nitrogen deposition and acid deposition respectively. Features are as indicated on the Air Pollution Information System ("APIS") website for SACs, SPAs and SSSIs. Where a primary feature identified in the citation was not listed on the APIS website, an equivalent feature was used to derive critical loads as indicated in the Habitats Table on the APIS website [(12)].

[11] 14kg nitrogen/ha/yr = 1keq nitrogen/ha/yr
[12] http://www.apis.ac.uk/habitat_table.html

Table 5: Critical Loads for Deposition

ADMS Ref.	Site Name and Designation	Habitat Interest & Feature	Nutrient Nitrogen Deposition		Acid Deposition		
			Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	CL Min N (keq/ha/yr)	CL Max N (keq/ha/yr)	CL Max S (keq/ha/yr)
ER1	Cardiff Beech Woods – SAC	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) - Alder woodland on floodplains	Not sensitive to eutrophication		No information provided on APIS		
		Asperulo-Fagetum beech forests - Beech forests on neutral rich soils	10	15	0.142	1.428	1.286
		Caves not open to the public	Not sensitive to eutrophication		No information provided on APIS		
		Tilio-Acerion forests of slopes, screes and ravines - Mixed woodland on base - rich soils associated with rocky slopes	15	20	0.142	1.428	1.286
		Cottus gobio - European Bullhead	No comparable habitat with established critical load estimate available		No information provided on APIS		
		Rhinolophus ferrumequinum - Greater horseshoe bat	10	15	0.142	1.428	1.286
		Rhinolophus hipposideros - Lesser horseshoe bat	10	15	0.142	1.428	1.286
ER2	ID: 15748 – AW	Broadleaved, mixed and yew woodland	10	20	0.142	2.115	1.973
ER3	ID: 15746 – AW		10	20	0.142	2.115	1.973

Table 5: Critical Loads for Deposition (cont.)

ADMS Ref.	Site Name and Designation	Habitat Interest & Feature	Nutrient Nitrogen Deposition		Acid Deposition		
			Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	CL Min N (keq/ha/yr)	CL Max N (keq/ha/yr)	CL Max S (keq/ha/yr)
ER4	ID: 15745 – AW	Broadleaved, mixed and yew woodland	10	20	0.142	2.115	1.973
ER5	ID: 22145 – AW		10	20	0.357	3.363	3.006
ER6	ID: 22143 – AW		10	20	0.357	3.363	3.006
ER7	ID: 15743 – AW		10	20	0.142	2.115	1.973
ER8	ID: 8420 – AW		10	20	0.142	2.115	1.973
ER9	ID: 50290 – AW		10	20	0.142	2.115	1.973
ER10	ID: 11870 – AW		10	20	0.357	3.343	2.986

2.7. Habitat Site Specific Baseline Concentrations and Deposition Rates

Airborne NO_X Concentrations

2.7.1. A summary of site-specific baseline concentrations of NO_X, as provided by APIS, is presented in Table 6. Background concentrations for each ecological receptor have been obtained at the same point as listed in Table 2.

Table 6: Baseline Concentrations of NO_X

ADMS Receptor Reference	Description & Designation	NO_X Background Concentration [a] ($\mu g/m^3$)	
		Annual Mean	24 Hour [b] Mean
ER1	Cardiff Beech Woods – SAC	14.73	17.38
ER2	ID: 15748 – AW	13.49	15.92
ER3	ID: 15746 – AW	13.49	15.92
ER4	ID: 15745 – AW	13.49	15.92
ER5	ID: 22145 – AW	15.54	18.34
ER6	ID: 22143 – AW	15.54	18.34
ER7	ID: 15743 – AW	13.49	15.92
ER8	ID: 8420 – AW	13.49	15.92
ER9	ID: 50290 – AW	13.49	15.92
ER10	ID: 11870 – AW	12.15	14.34

Notes to Table 6

(a) Background concentrations for the relevant ecological habitats have been taken from the APIS website for the closest grid square to the site (midyear: 2020).

(b) The 24-hour mean baseline concentration is twice the annual mean multiplied by a factor of 0.59, in accordance with the H1 guidance.

Nutrient Nitrogen and Acid Deposition

2.7.2. A summary of site-specific baseline nutrient nitrogen and acid deposition rates, as provided by APIS, is presented in Table 7. Again, the specific deposition rates for each ecological receptor have been obtained from the same point as listed in Table 2, i.e., the closest grid square to the point of the site used in the assessment.

Table 7: Background Nutrient Nitrogen and Acid Deposition Grid Averages

ADMS Receptor Reference	Description & Designation	Nutrient Nitrogen Background (kgN/ha/yr) [a]	Acid Deposition Background (keq/ha/yr) [a]
ER1	Cardiff Beech Woods – SAC	12.33	1.05
ER2	ID: 15748 – AW	11.49	0.98
ER3	ID: 15746 – AW	11.49	0.98
ER4	ID: 15745 – AW	11.49	0.98
ER5	ID: 22145 – AW	11.44	0.98
ER6	ID: 22143 – AW	11.44	0.98
ER7	ID: 15743 – AW	11.49	0.98
ER8	ID: 8420 – AW	11.49	0.98
ER9	ID: 50290 – AW	11.49	0.98
ER10	ID: 11870 – AW	11.34	0.97

Notes to Table 7

(a) Background concentrations, for both nutrient nitrogen and acid deposition, for the relevant ecological habitats have been taken from the APIS website (midyear: 2020) for the grid average.

2.8. Deposition Parameters - Sensitive Habitats

2.8.1. Deposition of nitrogen and acids was also included in the assessment. The pollutant deposition rates are presented in Table 8. These parameters are detailed in AQTAG06. Since woodland sites have a greater surface area, higher deposition velocities are adopted for these sites.

Table 8: Acid/Nitrogen Deposition Parameters [13]

Pollutant	Dry Deposition Velocity for Grassland (m/s)	Dry Deposition Velocity for Woodland (m/s)
Oxides of Nitrogen (as NO_2)	0.0015	0.003

2.9. Background Air Quality

2.9.1. For the purposes of this assessment the most representative background concentration to the point being assessed (i.e., the maximum GLC or sensitive receptor location) will be used, where necessary, to calculate the PECs. The source, location and concentration of the background air quality data used will be specified in the appropriate results section of this report.

[13] As detailed in AQTAG06.

2.10. Stack Emission Parameters and Emission Limit Values

2.10.1. The stack emission parameters and the coordinates used in the study are presented in Table 9, for the boiler and two space heaters considered in this assessment.

Table 9: Stack Emission Parameters

Parameter	Boiler EP21 [(a)]	Space Heater EP22 [(a)]	Space Heater EP23 [(a)]
Rated Thermal Input (MWth)	0.995	0.19	0.19
Stack Height (m)	7	3	3
Stack Exit Diameter (m)	0.300	0.175	0.175
Volumetric Flow Rate (Actual) (m^3/s)	0.671	0.165	0.165
Stack Velocity (Actual) (m/s)	9.49	6.87	6.87
Stack Gas Discharge Temperature (°C)	205	115	115
Stack Centre Coordinates	310353 (X) 186852 (Y)	310413 (X) 186932 (Y)	310435 (X) 186917 (Y)
Normalised Volumetric Flow Rate (Nm^3/s)	0.38 [(b)]	0.12 [(b)]	0.12 [(b)]

Notes to Table 9
(a) Stack emission parameters provided or confirmed by PB Gelatins or their technology suppliers.
(b) Referenced to 273K, 1atm.

2.10.2. The emission concentration assumed for each pollutant and the pollutant mass emission rate for the study are presented in Table 10.

Table 10: Pollutant Emission Rates

Pollutant	Emission Concentration [(a)] (mg/Nm^3)	Boiler EP21 (g/s)	Space Heater EP22 (g/s)	Space Heater EP23 (g/s)
NO_X (as NO_2)	143.8	0.0551	N/A	N/A
	29.72	N/A	0.00346	0.00346
CO	7.26	0.00278	N/A	N/A
	35.8	N/A	0.00416	0.00416

Notes to Table 10
(a) Concentrations provided or confirmed by PB Gelatins or their technology suppliers. Referenced to 273K, 1atm.

2.11. Building Parameters

2.11.1. The building parameters utilised for the study are detailed in Table 11 and a visual representation is provided as Figure 4.

Table 11: Building Parameters

Building	X [a]	Y [a]	Angle (°)[b]	Height (m) [c]	Length (m) [c]	Width (m) [c]
Building001	310357.10	186859.26	127	7.8	40.5	11.0
Building002	310370.74	186877.27	127	7.8	41.0	34.0
Building003	310431.95	186957.08	37	10.0	56.0	26.0
Building004	310452.81	186941.51	37	10.0	56.0	26.0
Building005	310356.73	186938.49	37	6.0	43.0	17.0
Building006	310360.37	186972.42	37	6.0	102.0	18.0
Building007	310338.28	186989.17	37	6.0	102.0	37.2
Building008	310384.32	187026.47	127	8.0	66.0	13.0
Building009	310518.62	186914.45	127	6.0	50.0	7.0
Building010	310510.64	186903.79	127	10.0	50.0	20.0
Building011	610505.14	186891.97	127	4.0	24.0	5.3
Building012	310517.00	186875.00	127	5.0	10.0	5.5
Building013	310545.42	186851.23	37	8.0	43.5	20.3
Building014	310476.65	186783.68	37	7.0	30.5	15.5
Building015	610385.21	186739.14	27	9.0	105.0	35.0
Building016	310404.00	186896.00	0	7.0	15.0	15.0
Building017	310330.31	186838.03	125	10.0	40.0	17.5
Building018	310307.29	186806.03	35	10.0	45.0	38.0
Building019	310244.63	186852.02	35	10.0	45.0	36.5

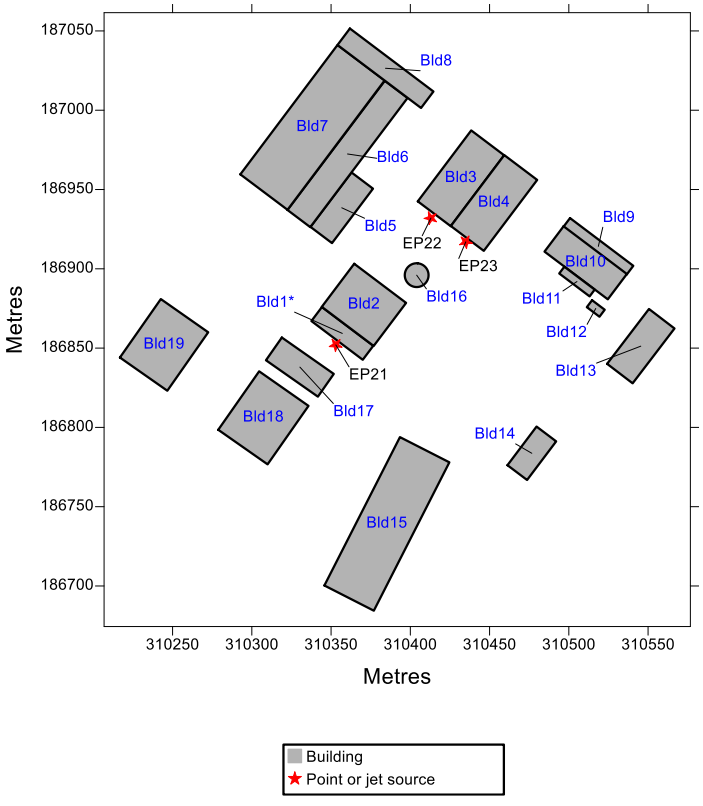
Notes to Table 11

(a) X(m), Y(m) denote the grid reference coordinates of the centre of the building.

(b) Angle denotes the angle between north and the side designated as length in the ADMS model.

(c) Building dimensions were obtained using Site drawings and LiDAR data.

Figure 4: Buildings Layout



2.12. Meteorological ("Met") Data

2.12.1. ADMS has a meteorological pre-processing capability, which calculates the required boundary layer parameters from a variety of data. Meteorological data ("met data") can be utilised in its sequentially analysed form, which estimates the pattern of dispersion through 10° sectors from the source or as raw data.

2.12.2. The nearest suitable met data available from the Meteorological Office ("Met Office") is from St Athan. This site is located approximately 21 km south-southwest of the Site. Consequently, the assessment utilises five years (2018 – 2022) of hourly sequentially analysed data in sectors of 10° from this weather station.

2.12.3. Wind roses for the data are presented in Figure 5; these show that the prevailing winds are predominantly westerly with observable easterly components.

2.12.4. Over the five years of meteorological data used (43,824 hours), ADMS reported that 1,442 hours contained inadequate data, 42 hours were calm and 451 hours were non-calm met data lines with a wind speed less than the minimum value (0.75 m/s). These represent 3.29%, 0.10% and 1.03% of the data, respectively.

Figure 5: Wind Roses

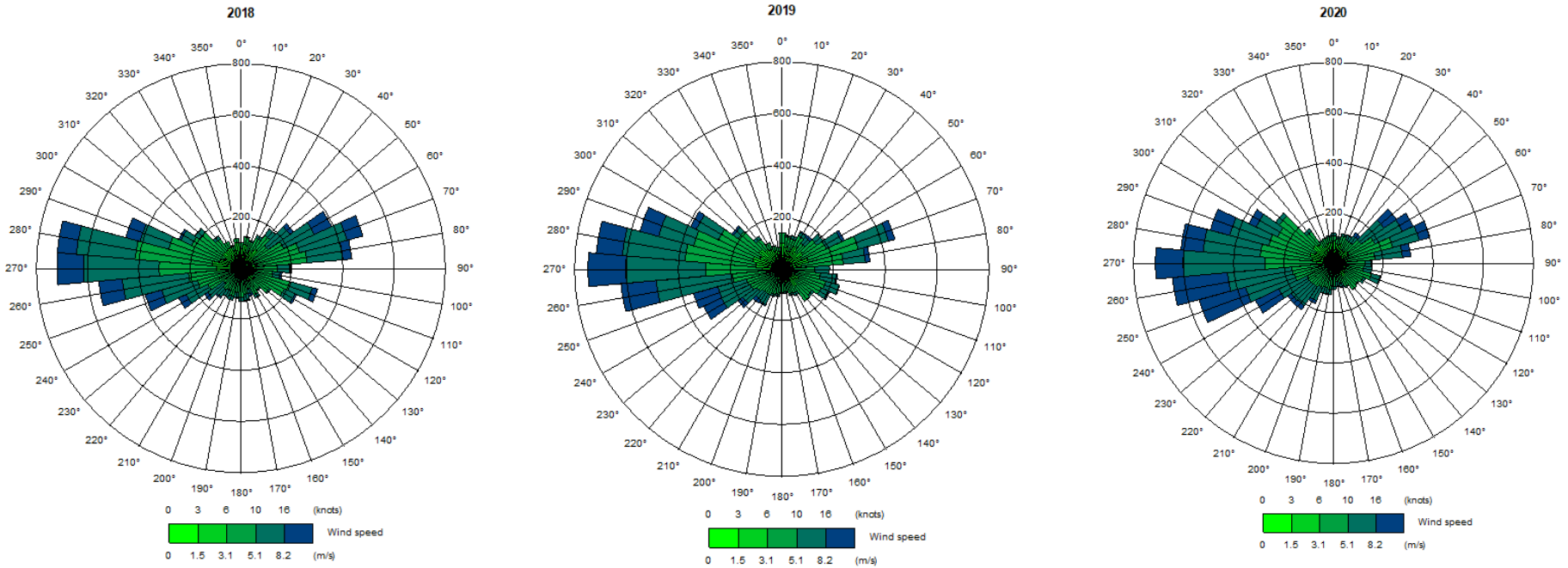
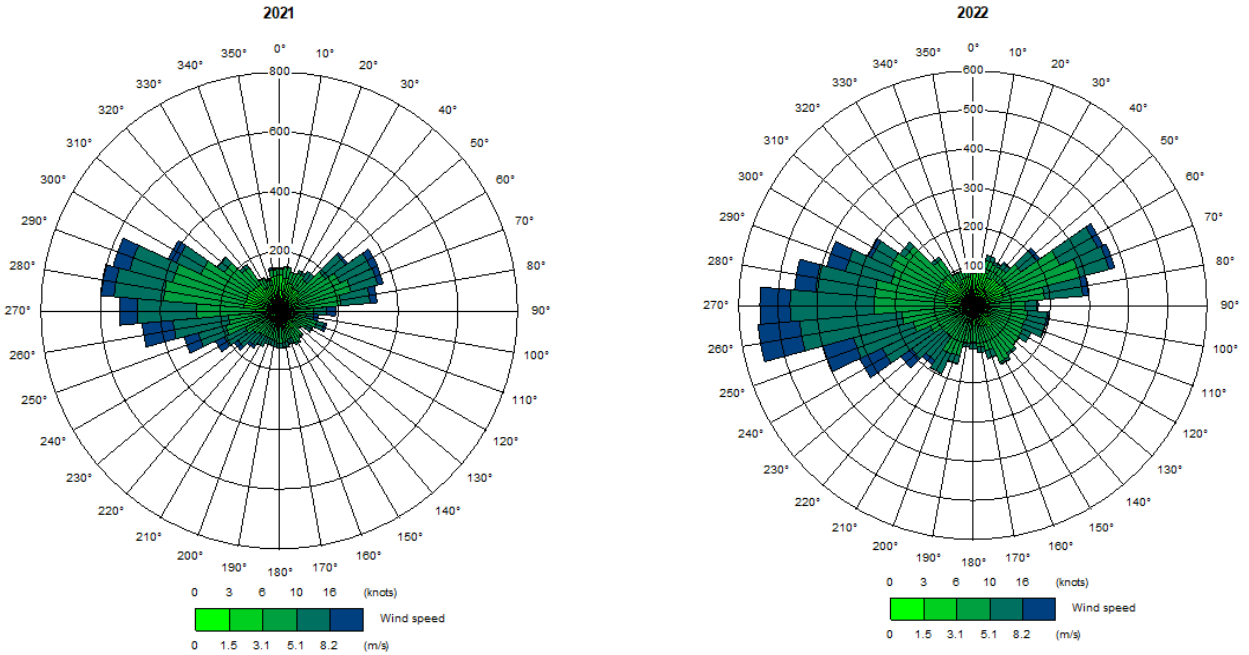


Figure 5: Wind Roses (cont.)



2.13. Surface Albedo

2.13.1. The surface albedo is the ratio of reflected to incident shortwave solar radiation at the surface of the earth[14]. ADMS allows the user to set this value between 0 and 1. A value of 0.40-0.95 would be considered representative of snow-covered ground where a large proportion of the light is reflected, soils from 0.05-0.40, agricultural crops 0.18-0.25, and grass would be 0.16 – 0.26 depending on length[15]. A value of 0.23 is an average value for non-snow-covered surfaces and is the default value used in the model. This value is considered appropriate for the setting of both the dispersion site and the met measurement sites.

2.14. Priestley-Taylor Parameter

2.14.1. The Priestly Taylor parameter is a parameter representing the surface moisture available for evaporation[14]. This parameter must be set between 0 and 3 where 0 would be classed as dry bare earth, 0.45 as dry grassland, 1 as moist grassland and a value of 3 is suggested for a saturated forest surrounded by forest[16]. The default value of 1 was considered to be appropriate for the setting of the dispersion and the met measurement sites and the surrounding areas.

2.15. Minimum Monin-Obukhov Length

2.15.1. The Monin-Obukhov length provides a measure of the stability of the atmosphere. For example, in urban areas the air is affected by heat generated from buildings and traffic which prevents the atmosphere from becoming stable. In rural areas the atmosphere would be more stable. The minimum Monin-Obukhov length can be set between 1 and 200m. Typical values would be[14]:

- large conurbations >1 million = 100m;
- cities and large towns = 30m;
- mixed urban/industrial = 30m;
- small towns <50,000 = 10m; and
- rural areas = 1m.

2.15.2. Although the surrounding areas appear to be largely rural, in the interest of a conservative assessment a value of 30m was considered to be appropriate for the setting of the dispersion site and a value of 10m for the met measurement site.

2.16. Terrain Data

2.16.1. ADMS has a terrain pre-processing capability, which calculates the required boundary layer parameters from a variety of data. The terrain file was created by compiling the data from the relevant Ordnance Survey tiles and using an ADMS terrain grid resolution of 64 x 64.

[14] ADMS5 User Guide, CERC, V6,March 2023
[15] TR Oke, Buondary Layer Climates, 2nd Edition 1987
[16] J P Lhomme, A Theorestivl Basis for the Priestley-Taylor Coefficient, February 1997.

2.16.2. Terrain data was used for an area 9 km by 9 km west. The terrain data used was of sufficient size to ensure that it would encompass all potentially sensitive human and ecological receptors.

2.17. Roughness Length

2.17.1. The surface nature of the terrain is defined in terms of Roughness Length (Z_o). The roughness length is dependent on the type of terrain and its physical properties. The ADMS model gives values to various types of terrain, for example, agricultural areas are classed as 0.2-0.3m, parkland and open suburbia is classed as 0.5m and cities and woodlands are classed as 1.0m.

2.17.2. A surface roughness length of 0.5m was used for the 'dispersion site' (indicative of parkland and open suburbia) and a value of 0.3m was used for the 'met. measurement site' (indicative of agricultural areas (max)).

2.18. Model Output Parameters

2.18.1. The ADMS model calculates the likely pollutant GLCs at locations within a definable grid system pre-determined by a user. Output grids may be determined in terms of a Cartesian or Polar co-ordinate system. For the purpose of this study the Cartesian system was used.

2.18.2. A Cartesian grid is constructed with reference to an initial origin, which is taken to be the bottom left corner of the grid. The lines of the grid are inserted at regular pre-defined increments in both northerly and easterly directions. Pollutant GLCs are calculated at the intersection of these grid lines; they are calculated in this manner primarily to aid in the generation of pollutant contours.

2.18.3. For assessing the maximum point of impact, a grid resolution of 4km x 4km was utilised in order to capture values of the predicted pollutant GLCs arising from the model. The grid coordinates were X = 308353 to 312353 and Y = 184852 to 188852, with 101 nodes along each axis i.e., a grid spacing of 40m.

2.18.4. For assessing the impact of emissions on human health and ecological sites the grid references of each were included as specified points within the ADMS model. This was carried out with a specified points file being created for the potentially sensitive human receptor and ecological locations (as outlined in Tables 1 and 2 of Sections 2.3. and 2.4., respectively).

2.19. Scenarios Modelled

2.19.1. The following scenarios were modelled:

- impact assessment at the maximum point of impact;
- impact assessment at potentially sensitive human receptor locations; and
- impact assessment at potentially sensitive ecological sites – inclusive of deposition rates.

2.20. Assessment of Significance of Impact Guidelines – Maximum GLC and Human Receptors

2.20.1. Both the EA online guidance (as approved by NRW) and IAQM guidance has been used for the purposes of significance assessment, and this guidance details the guidelines upon which the assessment of the significance of impact can be established.

2.20.2. In the first instance, the EA online guidance indicates that PCs can be considered insignificant if:

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

2.20.3. As outlined in the EA online guidance, there are no criteria to determine whether:

- PCs are significant; and
- PECs are insignificant or significant.

Consequently, significance will be judged based on the site-specific circumstances and on the EPUK and IAQM methodology as described in Sections 2.20.4 – 2.20.10.

Long-Term Impacts

2.20.4. If the PCs exceed the long-term criteria outlined in the EA online guidance, the potential long-term effects on human receptors from the operation of the emission points will be assessed in accordance with the latest guidance produced by EPUK and IAQM in January 2017.

2.20.5. The guidance provides a basis for a consistent approach that could be used by all parties to professionally judge the overall significance of the air quality effects based on the severity of air quality impacts.

2.20.6. The following rationale is used in determining the severity of the air quality impacts at individual human receptors:

- the effects are provided as a percentage of the air quality acceptance level ("AQAL");
- the absolute concentrations are also considered in terms of the AQAL and are divided into categories for long-term concentrations. The categories are based on the sensitivity of the individual receptor in terms of harmful potential. The degree of potential to change increases as absolute concentrations are close to or above the AQAL;
- severity of the effect is described as qualitative descriptors; negligible, slight, moderate or substantial by taking into account in combination the harm potential and air quality effect. This means that a small increase at a receptor which is already close to or above the AQAL will have higher severity compared to a relatively large change at a receptor which is significantly below the AQAL, >75% AQAL;
- the effects can be adverse when the air quality concentration increases or beneficial when the concentration decreases as a result of development; and
- the judgement of overall significance of the effects is then based on severity of effects on all the individual receptors considered.

2.20.7. The impact descriptors for individual receptors are presented in Table 12.

Table 12: Impact Descriptors for Individual Receptors – Long-Term Concentrations

Long-term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	1	2-5	6-10	>10
≤75% of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
≥ 110% of AQAL	Moderate	Substantial	Substantial	Substantial

Short-Term Impacts

2.20.8. As stated in EPUK / IAQM guidance, January 2017 (Land-Use Planning & Development Control: Planning for Air Quality') in Section 6.36, Page 27: *"For any point source, some consideration must also be given to the impacts resulting from short term, peak concentrations of those pollutants that can affect health through inhalation. The Environment Agency uses a threshold criterion of 10% of the short term AQAL as a screening criterion for the maximum short-term impact. This is a reasonable value to take and this guidance also adopts this as a basis for defining an impact that is sufficiently small in magnitude to be regarded as having an insignificant effect. Background concentrations are less important in determining the severity of impact for short term concentrations, not least because the peak concentrations attributable to the source and the background are not additive."*

2.20.9. Short-term concentrations in the context laid out in the IAQM guidance are those averaged over periods of an hour or less. These exposures would be regarded as acute and occur when a plume from an elevated source affects airborne concentrations experienced by a receptor over an hour or less.

2.20.10. The IAQM guidance offers the following severity of impact descriptors for peak short-term concentrations from an elevated source:

- 11-20% of the relevant AQAL – the magnitude can be regarded as 'small';
- 21-50% of the relevant AQAL – the magnitude can be regarded as 'medium'; and
- 51% or more of the relevant AQAL – the magnitude can be regarded as 'large'.

It is argued that this approach is intended to be a streamlined and pragmatic assessment procedure that avoids undue complexity.

2.21. Assessment of Significance of Impact Guidelines – Ecological Receptors

2.21.1. EA Operational Instruction 67_12[17] (as approved by NRW) states that a detailed assessment is required where modelling predicts that the long-term PC is greater than:

- 1% for European sites and SSSIs; or
- 100% for NNR, LNR, LWS and AW.

And the PEC is greater than:

- 70% for European sites and SSSIs; or
- 100% for NNR, LNR, LWS and AW.

2.21.2. For short-term emissions, further assessment is required at European site and SSSI's where the PC is greater than 10% of the critical level.

2.21.3. Following detailed assessment, if the PEC is less than 100% of the appropriate environmental criterion, then it can be assumed there will be no adverse effect for European Sites and SSSI's.

2.21.4. For NNR, LNR, LWS or AW, if the PC is less than 100% of the appropriate environmental criterion, then it can be assumed there will be no significant pollution.

2.22. NO_x to NO_2 Conversion Rates

2.22.1. EA online guidance states that emissions of NO_x should be recorded as NO_2 as follows:

- for the long-term PCs and PECs, assume 100% of the emissions of NO_x convert to NO_2; and
- for the short-term PCs and PECs assume 50% of the emissions of NO_x convert to NO_2.

2.22.2. However, further to detailed discussion with the EA and National Resources Wales ("NRW") on previous studies, a long-term 70% NO to NO_2 conversion rate, and a short-term 35% NO to NO_2 as required by guidance on NO_x and NO_2 Conversion Ratios as referenced in AQTAG06 *Technical guidance on detailed modelling approach for an appropriate assessment* (April 2010) should be used in all detailed modelling assessments. The conversion rates as provided in Section 2.22.1. should only be used for screening assessment.

[17] EA Operational Instruction 67_12 Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation, V2, 27.3.15

3. ASSESSMENT OF AIR QUALITY IMPACTS

3.1. Human Health Impacts

3.1.1. The predicted PCs for each of the pollutants considered in the assessment, at the maximum point of impact, have been extracted and are presented in Table 13. The maximum predicted PCs are also compared to their respective AQSs.

3.1.2. Maximum concentrations are considered insignificant if the long-term prediction is less than 1% of the long-term AQS, and, for short-term predictions, a concentration less than 10% of the short-term AQS can be considered insignificant (see Section 2.20. of this document). In Table 13, any PCs that are above these significance criteria are indicated in bold type.

Table 13: Comparison of Maximum PCs with Air Quality Standards

Pollutant	WCMY (2018-2022)	Max PC (µg/m^3)	Location of Max PC		AQS (µg/m^3)	PC as % of AQS
			X Coord.	Y Coord.		
NO_2 (annual)	2018	**1.44** [(a)]	310353	186852	40	**3.59%**
NO_2 (1 hour, 99.79th percentile)	2018	**32.5**	310393	186852	200	**16.26%**
CO (8 hour, 100th percentile)	2022	55.5	310393	186932	10,000	0.56%

Notes to Table 13
(a) An annual reduction factor of 0.228 (2000/8760) has been applied to scale down the long-term predicted PCs (see Section 1.3).
*Worst Case Met Year ("WCMY")

3.1.3. It can be seen from the data in Table 13 that, with the exception of CO, the remaining pollutants are potentially significant and therefore require further assessment.

3.1.4. For short-term emissions of NO_2, the potentially significant PCs (as shown in Table 13) have been further assessed against the IAQM severity of impact descriptors detailed in Section 2.20.10. For the stack height assessed the magnitude of impact for short-term NO_2 can be regarded as 'small'.

3.1.5. For the potentially significant long-term emissions of NO_2 shown in Table 13, PECs must be determined. PECs are calculated by adding the long-term process contribution to the long-term ambient background concentration.

3.1.6. RCTCBC undertake automatic and non-automatic (passive) diffusion tube ("DT") monitoring for NO_2 throughout the council. However, there are no monitoring sites in RCTCBC within

approximately 2km of the Site. NO_2 data is also available from the Department for Environment, Food and Rural Affairs ("DEFRA"), with the nearest mapped modelled concentrations to Site displayed in Table 14 for the year 2022.

3.1.7.

Table 14: Nearest Background DEFRA Data to Site – Annual Mean NO_2

ECL Ref.	UK Grid Code	NO_2 Conc. ($\mu g/m^3$) [(a)]	(X) [(a)]	(Y) [(a)]	Distance from Site (m) [(b)]	Heading (degrees)
DEFRA1	767600	10.04	309500	187500	1,071	307
DEFRA2	767601	11.83	310500	187500	655	12
DEFRA3	768290	9.65	309500	186500	931	247
DEFRA4	768291	10.53	310500	186500	387	159

Notes to Table 14

(a) Information obtained from DEFRA's background pollution maps, available from: https://uk-air.defra.gov.uk/data/pcm-data.

(b) Distances are measured as the crow flies from the background source to on-site grid reference: ST 10353 86852.

3.1.8. When calculating PECs, it is important to consider the location of the maximum GLC in order to assign an appropriate background concentration. The location of the maximum GLCs (PCs) for all met years for long-term NO_2 are displayed in Table 13. Figure 6 demonstrates the location of the nearest background sources in relation to the maximum GLCs for long-term NO_2.

Figure 6: Nearest Background Sources of NO_2

Notes to Figure 6

The red pin is the indicative location of the boiler emission point assessed and also the location of the long-term (annual) NO_2 maximum GLC and;
The annotated pink icons are the nearest sources of DEFRA modelled background NO_2 concentrations (see Table 14).

3.1.9. It can be seen from Figure 6 that the location of the maximum long-term NO_2 PC is closest in proximity to the DEFRA4 modelled background concentration. Furthermore, the maximum GLC location occurs on-site where the potential for public exposure is therefore likely to be low (i.e., on land with restricted access).

3.1.10. However, the highest background NO_2 concentration of the four DEFRA locations considered is at location DEFRA2, with a concentration of 11.83 µg/m^3. Consequently, the background NO_2 concentration from DEFRA2 has been utilised for the purposes of the PEC assessment to represent a worst-case-scenario and should therefore help ensure the PEC assessment is conservative.

3.1.11. The PEC assessment is presented in Table 15, with the PECs compared with the relevant long-term AQS and the significance categorised adopting the IAQM guidance and impact descriptors shown in Table 12 of Section 2.20.

Table 15: Comparison of Maximum PCs and Maximum PECs with AQS for Long-term NO_2

Pollutant	WCMY (2018 – 2022)	Max PC (µg/m³)	AQS (µg/m³)	PC as % of AQS	Location of Max PC		Annual Background NO_2 Concentration (µg/m³)	Max PEC (µg/m³)	PEC as % of AQS	IAQM Significance
					X Coord.	Y Coord.				
NO_2 (annual)	2018	**1.44** [(a)]	40	**3.59%**	310353	186852	11.83 [(b)]	13.3	33%	Negligible

Notes to Table 15

(a) An annual reduction factor of 0.228 (2000/8760) has been applied to scale down the long-term predicted PCs (see Section 1.3).

(b) Background NO_2 concentration taken from DEFRA2 (2022 data) – refer to Table 14 for details.

3.1.12. It can be seen from the data in Table 15, that the PEC of the long-term NO_2 emissions arising from the emission points assessed can be considered 'negligible'.

3.1.13. Furthermore, it should be noted that, when using the EA online guidance for screening assessments for emissions to air, further detailed modelling is not required if PECs are less than 70% of the long-term AQS. Although not directly applicable to the detailed modelling stage, it is worth noting that the PECs of long-term NO_2 would be considered not significant, based on the screening criteria.

3.2. Isopleths

3.2.1. The isopleths for long-term NO_2, short-term NO_2 and CO are presented as Figures 7 to 9 for the worst case met year.

Figure 7: Isopleth for Long-Term NO2, Met Year 2018

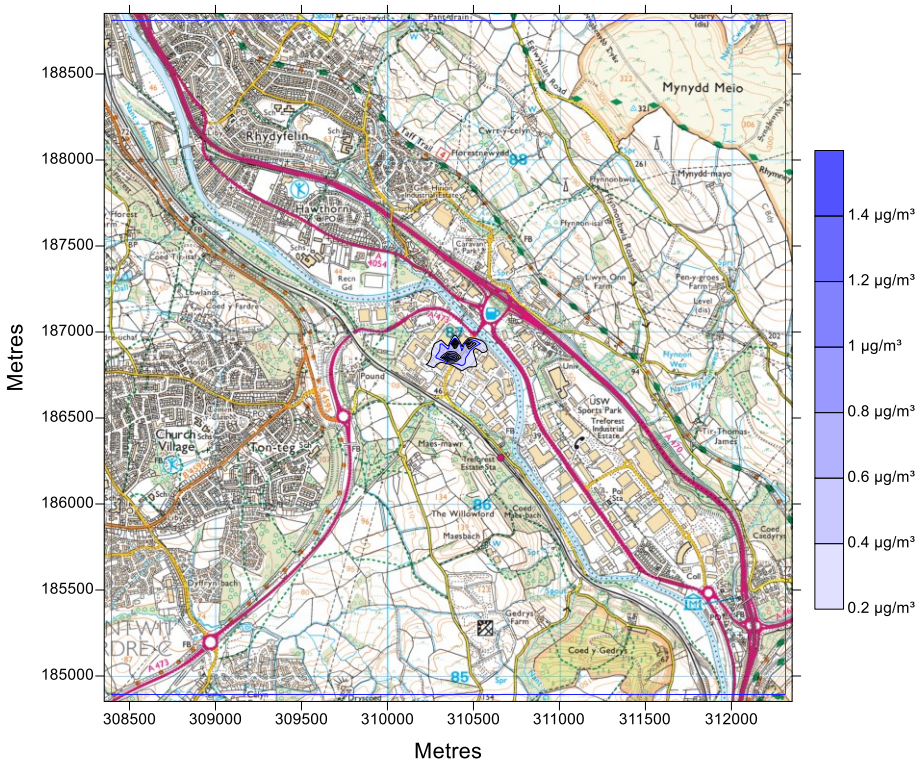


Figure 8: Isopleth for Short-Term NO2, Met Year 2018

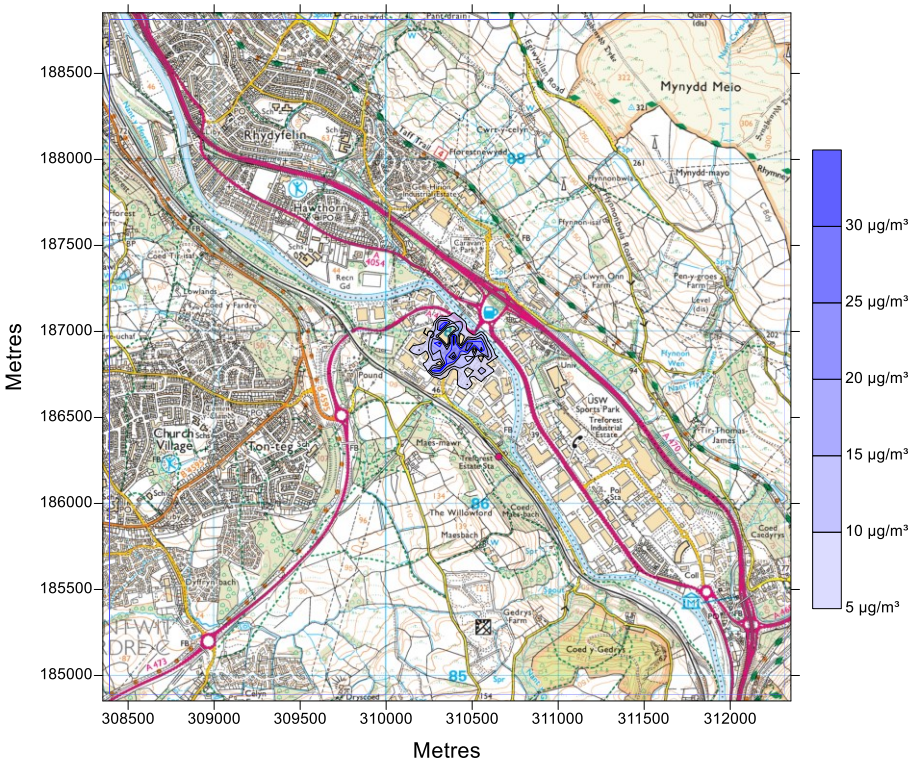
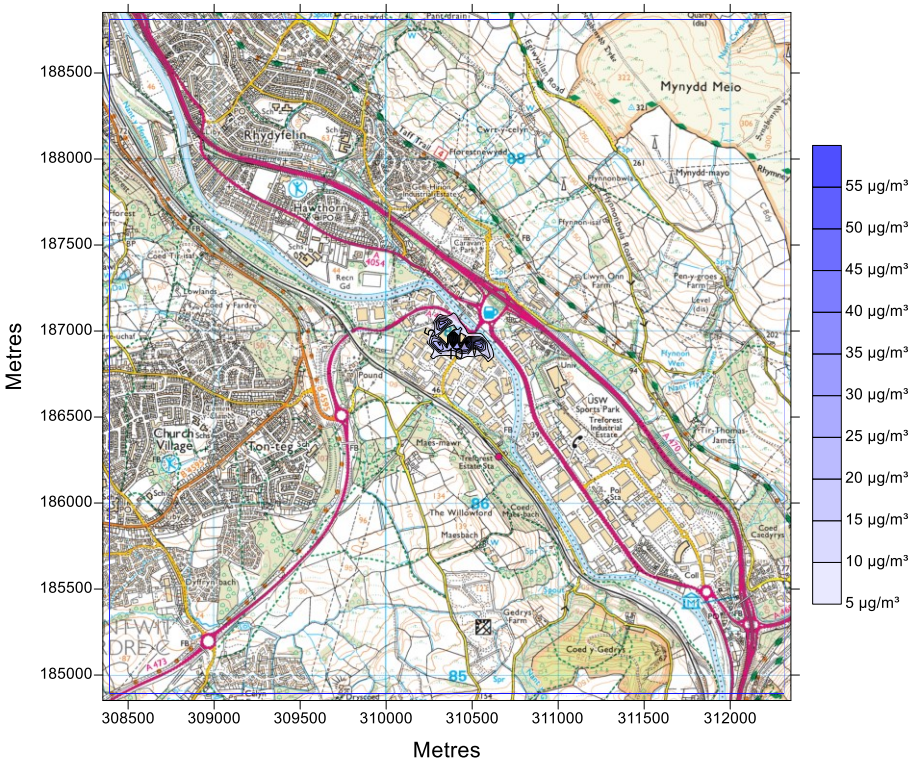


Figure 9: Isopleth for CO, Met Year 2022



4. ASSESSMENT OF AIR QUALITY IMPACTS AT POTENTIALLY SENSITIVE HUMAN RECEPTOR LOCATIONS

4.1. Human Health Impacts

4.1.1. This part of the assessment considers emissions from the Site for emissions of NO_X as NO_2 and CO at potentially sensitive human receptor locations.

4.1.2. The PCs from the Site for each potentially sensitive receptor considered, for the worst case met year for each pollutant and averaging period, are presented in Table 16.

4.1.3. In Table 16, any PCs that are above the significance criteria (outlined in Section 2.20.) are indicated in bold type.

Table 16: Comparison of Maximum PCs with AQS at Potentially Sensitive Receptor Locations

Pollutant		NO_2 [(a)] (annual mean)	NO_2 (99.79th %ile)	CO (8-hour 100th %ile)
AQS (µg/m³)		40	200	10,000
Maximum PC (µg/m³)		0.173	11.7	5.14
Max PC as % of AQS		0.43%	5.86%	0.05%
HR1	Hawthorn High School	0.00531	0.487	0.192
HR2	Pont Pentre Caravan Park	0.00545	0.913	0.235
HR3	Petwise Aquatics	0.109	5.58	2.20
HR4	Cardiff Engineering and Fabrications	0.173	11.7	5.14
HR5	Orange Forestry	0.0378	2.76	0.558
HR6	Brynglas House	0.0292	1.00	0.476
HR7	Pound Farm	0.0104	0.687	0.180
HR8	The Dell Play Area	0.00149	0.219	0.0605
HR9	Ysgol Ty Coch Play Area	0.00569	0.448	0.106
HR10	Tonteg Community Centre	0.00487	0.298	0.0879
AQMA1	Church Village AQMA	0.00233	0.161	0.0493
AQMA2	Treforest AQMA	0.00123	0.132	0.0438
AQMA3	Broadway AQMA	0.00113	0.139	0.0419
AQMA4	Nantgarw AQMA	0.00206	0.241	0.0389

Notes to Table 16
(a) An annual reduction factor of 0.228 (2000/8760) has been applied to scale down the long-term predicted PCs (see Section 1.3).

4.1.4. It can be seen from the results in Table 16 that all pollutants screen out for all the potentially sensitive human and AQMA receptor locations considered. Consequently, no further assessment is required.

5. ASSESSMENT OF AIR QUALITY IMPACTS AT POTENTIALLY SENSITIVE ECOLOGICAL RECEPTOR LOCATIONS

5.1. Comparison of Maximum Predicted Ground Level Concentrations with Critical Levels for the Protection of Vegetation and Ecosystems – NO_X

5.1.1. This part of the assessment considers emissions from the Site for emissions of NO_X at potentially sensitive ecological receptor locations.

5.1.2. A summary of the results of the maximum predicted GLCs of oxides of nitrogen, at the identified sensitive ecological sites, are presented in Table 17. In accordance with the EA guidance, and as stated in Section 2.21., the significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsar sites and SSSIs. As also outlined in Section 2.21., the 100% criteria for long and short-term predictions has been used for local nature sites. Any potentially significant impacts have been indicated in bold.

Table 17: Comparison of Maximum Predicted NO_x PCs with Critical Levels at Sensitive Ecological Sites

ADMS Ref. & Designation	Long Term PC [(a)] (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Short Term PC (µg/m³)	Short Term Critical Level (CL) (µg/m³)	Short Term PC as a % of the CL (µg/m³)	WCMY	
							Long-Term PC	Short-Term PC
ER1 (SAC)	0.000461	30	0.002%	0.0201	75	0.03%	2021	2020
ER2 (AW)	0.0714		0.24%	1.70		2.27%	2022	2022
ER3 (AW)	0.0302		0.10%	1.20		1.60%	2021	2020
ER4 (AW)	0.0213		0.07%	0.847		1.13%	2021	2020
ER5 (AW)	0.00786		0.03%	2.40		3.20%	2022	2021
ER6 (AW)	0.00982		0.03%	0.717		0.96%	2020	2021
ER7 (AW)	0.0203		0.07%	0.660		0.88%	2021	2022
ER8 (AW)	0.0106		0.04%	0.385		0.51%	2021	2021
ER9 (AW)	0.00673		0.02%	0.242		0.32%	2021	2022
ER10 (AW)	0.0230		0.08%	0.892		1.19%	2021	2019

Notes to Table 17

(a) An annual reduction factor of 0.228 (2000/8760) has been applied to scale down the long-term predicted PCs (see Section 1.3.)

5.1.3. It can be seen from the data in Table 17 that for all sensitive ecological sites, the worst-case long-term and short-term NO_X PCs are lower than 1% and 10%, respectively, of the critical level. Consequently, no further assessment is required.

6. ASSESSMENT OF AIR QUALITY IMPACTS - IMPACT ON HABITAT SITES – DEPOSITION

6.1. Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads

6.1.1. A summary of maximum predicted nutrient nitrogen deposition rates at the relevant identified habitat sites are presented in Table 18. It should be noted that, for ER1, the habitat with the lowest lower and lowest upper critical load has been selected.

6.1.2. Where the nitrogen deposition rate is potentially significant - i.e., greater than 1% of the maximum critical load, it will be highlighted in bold.

Table 18: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites

ADMS Ref.	Site Details	Habitat Interest	Critical Load (kgN/Ha/yr)		Nutrient Nitrogen Deposition Rate (kgN/Ha/yr) [(a) (b)]	PC as % of Critical Load	
			Lower	Upper		Lower	Upper
ER1	Cardiff Beech Woods – SAC	Broadleaved, mixed and yew woodland	10	15	0.0000929	0.001%	0.0006%
ER2	ID: 15748 – AW		10	20	0.0144	0.14%	0.07%
ER3	ID: 15746 – AW		10	20	0.00607	0.06%	0.03%
ER4	ID: 15745 – AW		10	20	0.00429	0.04%	0.02%
ER5	ID: 22145 – AW		10	20	0.00158	0.02%	0.01%
ER6	ID: 22143 – AW		10	20	0.00198	0.02%	0.01%
ER7	ID: 15743 – AW		10	20	0.00410	0.04%	0.02%
ER8	ID: 8420 – AW		10	20	0.00213	0.02%	0.01%
ER9	ID: 50290 – AW		10	20	0.00135	0.01%	0.01%
ER10	ID: 11870 – AW		10	20	0.00463	0.05%	0.02%

Note to Table 18

(a) Total PC is derived from the sum of the contribution from nitrogen deposition (dry deposition only) and the woodland deposition rate was used for all receptors (refer to Table 8 in Section 2.8. for deposition parameters).

(b) An annual reduction factor of 0.228 (2000/8760) has been applied to scale down the long-term predicted PCs (see Section 1.3.)

6.1.3. It can be seen from the data in Table 18, that the maximum nutrient nitrogen deposition rates are all less than 1% of the relevant critical load and are therefore not significant at all of the habitat sites assessed.

6.2. Comparison of Maximum Predicted Acid Deposition Rates with Critical Loads

6.2.1. A summary of maximum predicted acid deposition rates at the relevant identified habitat sites are presented in Table 19. It should be noted that, for ER1, the habitat with the lowest maximum critical load has been selected.

6.2.2. Where the acid deposition rate is potentially significant (i.e., greater than 1% of the maximum critical load) it will be highlighted in bold.

Table 19: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at Sensitive Habitat Sites

ECL Habitat Ref.	Habitat Name & Designation	Acid Deposition (kEq/ha/yr) [a] [b]	CL Min N (kEq/ha/yr)	CL Max N (kEq/ha/yr)	CL Max S (kEq/ha/yr)	PEC N (kEq/ha/yr) [c]	PC as % of the Maximum Critical Load	PEC as % of CL where PEC N > CL min N
ER1	Cardiff Beech Woods – SAC	0.00000664	0.142	1.428	1.286	1.05	0.0005%	74%
ER2	ID: 15748 – AW	0.00103	0.142	2.115	1.973	0.981	0.05%	46%
ER3	ID: 15746 – AW	0.000434	0.142	2.115	1.973	0.980	0.02%	46%
ER4	ID: 15745 – AW	0.000307	0.142	2.115	1.973	0.980	0.01%	46%
ER5	ID: 22145 – AW	0.000113	0.357	3.363	3.006	0.980	0.003%	29%
ER6	ID: 22143 – AW	0.000141	0.357	3.363	3.006	0.980	0.004%	29%
ER7	ID: 15743 – AW	0.000293	0.142	2.115	1.973	0.980	0.01%	46%
ER8	ID: 8420 – AW	0.000152	0.142	2.115	1.973	0.98	0.01%	46%
ER9	ID: 50290 – AW	0.0000969	0.142	2.115	1.973	0.980	0.005%	46%
ER10	ID: 11870 – AW	0.000331	0.357	3.343	2.986	0.970	0.01%	29%

Note to Table 19

(a) Total PC is derived from the sum of the contribution from nitrogen deposition (dry deposition only) and the woodland deposition rate was used for all receptors (refer to Table 8 in Section 2.8. for deposition parameters).

(b) An annual reduction factor of 0.228 (2000/8760) has been applied to scale down the long-term predicted PCs (see Section 1.3.).

(c) Refer to Section 2.7., for the site-specific acid background concentrations.

6.2.3. The data in Table 19 shows that the maximum predicted acid deposition rate as a result of emissions from the Site is less than 1% of the critical load for all sites and, therefore, is insignificant. Furthermore, the PECs are all less than 100% of the critical load. Consequently, no further assessment is required.

7. CONCLUSIONS

7.1.1. Detailed air quality modelling, using the ADMS dispersion model, has been undertaken to predict the impacts associated with stack emissions arising from a boiler and two space heater stacks at PB Gelatins, Pontypridd.

7.1.2. As a worst-case, it has been assumed that the emission points considered will operate concurrently and emit to atmosphere twenty-four hours a day, 365 days of the year. This represents a conservative assessment of the impact – particularly when accounting for seasonal variations to the demand placed on each individual appliance and shut down periods to undertake maintenance.

7.1.3. The PCs at the maximum point of impact have demonstrated, following further assessment (where applicable), that:

- long-term NO_2 emissions can be categorised as 'negligible';
- short-term NO_2 emissions can be categorised as 'small'; and
- CO emissions can be considered insignificant.

7.1.4. The PCs at the specified potentially sensitive human receptor and AQMA locations have demonstrated that the emissions of all pollutants assessed screen out as insignificant.

7.1.5. For the habitat sites considered, it has been demonstrated that the NO_X emissions from the Site are unlikely to result in a breach of the relevant Critical Levels or Critical Loads or are unlikely to have an adverse effect on local habitat sites.

7.1.6. In summary, therefore, it can be concluded that emissions arising from the concurrent operation of the boiler and two space heaters at the Site, will not have a detrimental impact on local air quality, human health or the sensitive habitat sites considered as part of this assessment.

APPENDIX I
H1 – AIR EMISSIONS RISK ASSESSMENT

ECL Ref: PBGE.01.10/ADM
Date: September 2024
Version: Issue 1a

PB Gelatins U.K. Limited - H1 Assessment of Emissions to Air

Calculation of Effective Stack Height			
	EP21	EP22	EP23
	Boiler Flue - Liming Facility	Space Heater Flue - New Farm Building	Space Heater Flue - Millennium Farm Building
(H) (m):	7.80	10.00	10.00
(Uact) (m):	7	3	3
*(Ueff) (m):	-1.33	-11.62	-11.62

*Refer to note [a] under the Notes to H1 Calculation

H = Building Height, Uact = Stack Height, Ueff = Effective Stack Height

Acronyms / Abbreviations	
AAD = Ambient Air Directive	ELV = Emission Limit Value
AMS = Automatic Monitoring Site	LT = Long-term
AQS = Air Quality Standard	NO_X = Oxides of Nitrogen
CO = Carbon Monoxide	NO_2 = Nitrogen Dioxide
DEFRA = Department for Environment, Food and Rural Affairs	PC = Process Contribution
EA = Environment Agency	PEC = Predicted Environmental Concentration
EAL = Environmental Assessment Level	ST = Short-term

Stage one screening:

Stack	Pollutant	Stack Height	ELV or Emission Concentration (mg/m^3) [b]	Volumetric Flow Rate (Nm^3/s) [b]	Discharge Rate (g/s)	Effective Stack Height (m)	Dispersion Factor ($\mu g/m^3/g/s$) LT	Dispersion Factor ($\mu g/m^3/g/s$) ST	PC ($\mu g/m^3$) LT	PC ($\mu g/m^3$) ST [c]	Total PC [d] ($\mu g/m^3$) LT [e]	Total PC [d] ($\mu g/m^3$) ST	AAD AQS or EAL ($\mu g/m^3$) LT	AAD AQS or EAL ($\mu g/m^3$) ST	PC as % of AQS or EAL LT	PC as % of AQS or EAL ST	PC Significant? [f] (>1%) LT	PC Significant? [f] (>10%) ST
EP21		7	143.8	0.38	0.0551	0	148	3900	8.2	107								
EP22	NO_X as NO_2	3	29.72	0.12	0.00346	0	148	3900	0.512	6.74	2.10	121	40	200	5%	60%	Yes	Yes
EP23		3	29.72	0.12	0.00346	0	148	3900	0.512	6.74								
EP21		7	7.26	0.38	0.00278	0	148	3900	0.412	7.60								
EP22	CO	3	35.8	0.12	0.00416	0	148	3900	0.616	11.4	0.375	30.3	350	10000	0.11%	0.30%	No	No
EP23		3	35.8	0.12	0.00416	0	148	3900	0.616	11.4								

Stage two screening for significant PCs:

Pollutant	Background ($\mu g/m^3$) LT [g]	PEC ($\mu g/m^3$) LT [h]	PEC as a % of LT AQS	PEC Significant? (>70%) [i] Long-term	ST AQS minus 2x LT Background	ST PC as % of ST AQS minus 2x LT background	Stage two screening ST PC Significant? [i]
NO_X as NO_2	11.83	13.9	34.81%	No	176	68.59%	Yes

Notes to H1 Calculation:

The EA's *Air emissions risk assessment for your environmental permit* was the guidance used to carry out the assessment.

[a] The guidance states to treat the effective height of release as 0 metres when the emission is actually released at a point that is less than 3 metres above the ground or building on which the stack is located or if it is more than 3 metres above the ground or building but less than the height of the tallest building within a distance that's 5 times 'L' ('L') being the lowest of either the building height or the greatest width between two points at the same height of the building).

[b] Emissions data provided or confirmed by PB Gelatins or their technology suppliers.

[c] The guidance states that, where the ST environmental standard is measured using a different time period to an hourly average (i.e., CO in this instance), the PC must be multiplied by the relevant conversion factors (i.e., a conversion factor of 0.7 to convert to an 8 hour average). For the ST PCs of NO_X, in line with the guidance it should be assumed that only 50% of emissions of NO_X convert to NO_2 in the environment (with it assumed 100% of NO_X converts to NO_2 for the LT PCs).

[d] The guidance states when a substance is released from more than one point, you must add up the substance's PC from each source to get the total PC for the substance.

[e] The guidance states that, when your site does not operate all the time, annual average figures can be adjusted down to account for the period in which the process is not operating. Consequently, in line with EA guidance, a reduction factor of 0.228 has been applied to the LT PCs for EP21, EP22 and EP23.

[f] The guidance states that, if the LT PC is greater than 1% of the LT environmental standard and / or the ST PC is greater than 10% of the ST environmental standard, then further screening is required (i.e., the calculation of PECs).

[g] Background data taken from DEFRA modelled background maps (2022 data) for the closest point to site with the highest concentration (NGR: ST 10500 87500).

[h] The sum of the long-term PC and the background concentration.

[i] In accordance with the guidance, detailed modelling is required if the long-term PEC is greater than 70% of the long-term environmental standard and / or the short-term PC is greater than 20% of the short-term environmental standard minus twice the long-term background concentration.