



# Air Quality Assessment: Asgard Renewables, Cardigan

Client: Asgard Renewables

APS\_E1054A\_1

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## Document Control

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## 1. Introduction

- 1.1. This air quality assessment has been prepared by Kalaco, on behalf of Asgard Renewables Ltd., to assess the air emission impacts associated with the anaerobic digestion (AD) facility in Cardigan, West Wales (herein the 'facility'). The facility operates in accordance with an environmental permit issued by National Resources Wales (NRW) (permit number EPR/AB3097FU).
- 1.2. This assessment has been undertaken in response to a request from NRW that a review be carried out into a combined heat and power (CHP) emission limit value (ELV) breach for volatile organic compounds (VOCs) as per the text below:

*“Review your current air quality risk assessment using site specific emissions data to determine the process contribution (PC). You should use the Process Contribution in conjunction with the background concentration to determine the predicted environmental concentration (PEC) and determine whether the non-compliance has resulted in either a short term or long term breach of air quality standards for protecting human health and ecosystems”*

- 1.3. The site has an ELV for VOCs of 1,000 mg/m<sup>3</sup>.
- 1.4. This assessment uses detailed dispersion modelling to determine the air quality impacts at locations of relevant human health exposure, in accordance with NRW's request. However, as airborne VOCs do not currently have relevant impact criteria for protected ecological sites, an assessment of impacts at ecosystems was not necessary.
- 1.5. The assessment has been carried out by Kalaco. It is important air quality assessments are carried out by suitably qualified experts with professional accreditations, such as being a member of the Institute of Air Quality Management (IAQM); further details of the assessment authors are set out in Appendix A1.
- 1.6. The information provided in this assessment is set out in the table below.

Item	Comment
Site description	See Section 2
Location map	See Figure 1
Site plan	See Figure 2
Operating schedule of the Facility	See Appendix A2
List of emissions modelled	See Table 1
Details of modelled scenarios	See Appendix A2
Details of relevant ambient and background concentrations	See Appendix A2
Table of environmental standards for relevant pollutants	See Appendix A3
Model description and justification	See Appendix A2
Table of emission parameters used	See Table 1
Details of modelled domain and receptors	See Appendix A2
Details of meteorological data used (including origin) and justification	See Appendix A2
Details of surface characteristics	See Appendix A2



Item	Comment
Details of terrain treatment	See Appendix A2
Details of building treatment	See Appendix A2
Details of special treatments	See Appendix A2
Analysis of sensitivity	See Appendix A2
Assessment of impacts	See Appendix A3
Model input files	Provided electronically with this report

## 2. The Facility

2.1. The site information is detailed below:

- **Site Name:** Asgard Renewables Ltd
- **Site Address:** Unit 2, Crugmawr Farm, Penparc, Cardigan, Ceredigion, SA43 1QY

- 2.2. The site is a waste processing facility, permitted for AD (including pre-treatment, treatment of digestate and treatment of resulting biogas) of non-hazardous, biodegradable waste types.
- 2.3. The site is permitted to accept and treat up to 36,500 tonnes of waste per year.
- 2.4. Renewable energy is generated using the resulting biogas through two CHP engines and the digestate resulting from the anaerobic digestion process is recovered and used as biofertiliser.
- 2.5. The site is permitted to combust up to 10 tonnes of biogas per day.
- 2.6. The site operates two CHP engines, the operational parameters associated with these are set out in Table 1.

Table 1: Plant Parameters

Parameter	CHP 1	CHP 2
Stack height (m)	8.8	8.8
Stack internal diameter (m)	0.26	0.26
Flue gas exit velocity (m/s)	15.1	15.1
Temperature (degrees C)	100	100
Normalised volume flow rate (Nm <sup>3</sup> /s)	0.84 @5% O <sub>2</sub>	0.84 @5% O <sub>2</sub>
VOC stack concentration (mg/m <sup>3</sup> )	1,000	1,293
VOC emissions rate (g/s)	0.464	0.6
Total operating hours (h/year)	8,760	8,760
Table notes Normalised to 273 K, dry, 101.3 kPa, at stated O <sub>2</sub> content. CHP 1 was modelled at the permitted ELV for VOCs, CHP 2 was modelled at the measured concentration reported in EMT12532 (Element, 2025).		



## Emission Limit Values

2.7. The permit (EPR/AB3097FU) has emission limits for VOCs for emission points to air, as set out in Table 2.

Table 2: ELVs for Each Plant in Existing Permit

Plant ID	Type	VOC (mg/Nm <sup>3</sup> )	Conditions
CHP 1	Biogas	1,000	273 K, 101.3 kPa, 5% O <sub>2</sub> content and dry
CHP 2	Biogas	1,000	273 K, 101.3 kPa, 5% O <sub>2</sub> content and dry

Table notes: N/A

## Location

2.8. The location of the facility is shown in Figure 1.

Figure 1: Site Location



Figure notes: Imagery © 2026 Google, Map data © 2026.

2.9. The facility is located within the administrative area of Ceredigion County Council. There are human health receptors within the immediate vicinity of the facility - the nearest residential property is located approximately 150 m to the west of the facility (See Appendix A3 for more information).

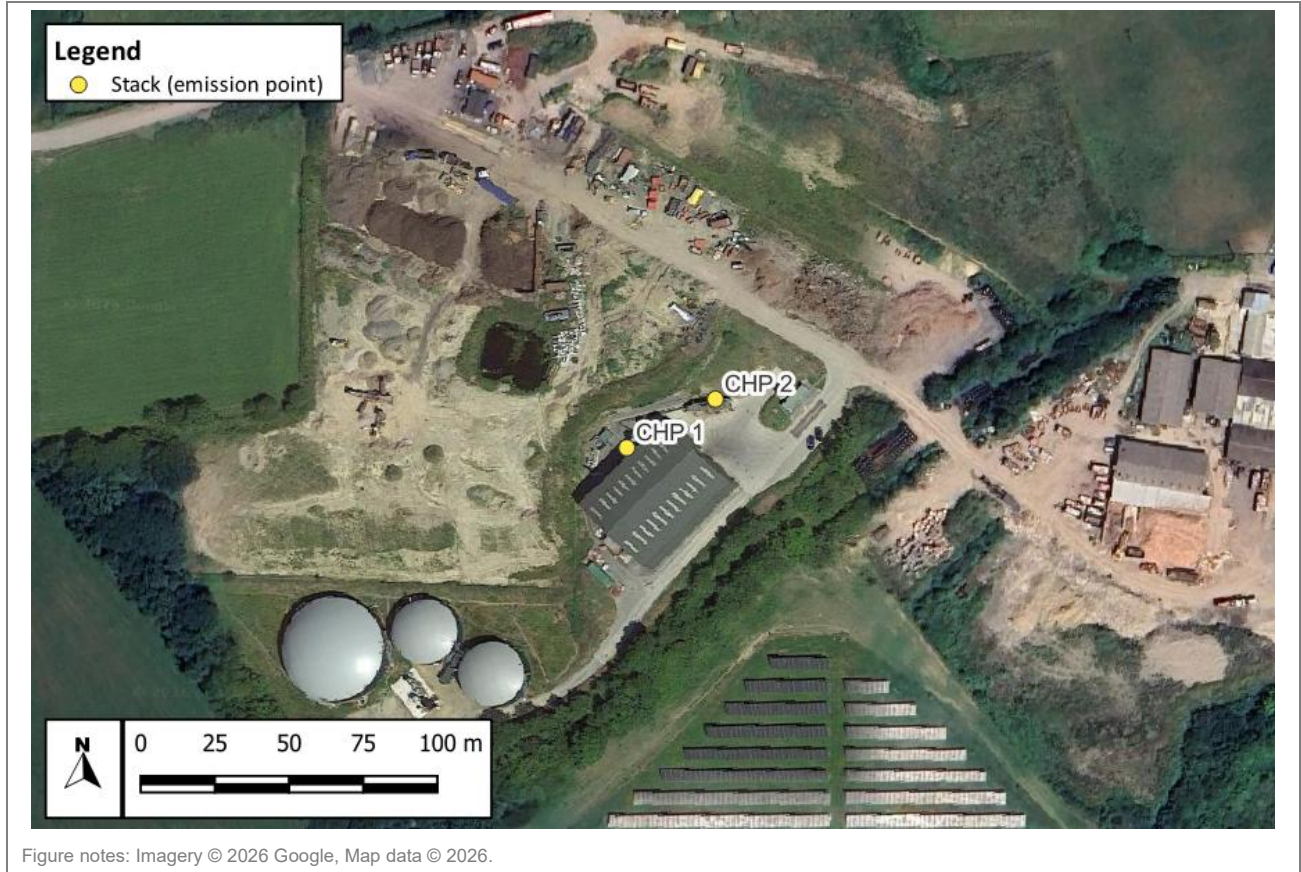
2.10. As NRW does not currently stipulate any relevant impact criteria for airborne VOCs on protected ecological sites, these impacts have not been considered.



## Site Plans

2.11. The layout of the facility, including the locations of the CHP emission points (i.e. stacks), is shown in Figure 2.

Figure 2: Stack Locations



## 3. Assessment of the Impact on Locations of Human Exposure

3.1. The air emission impacts associated with the operation of the facility have been assessed in relation to long-term air quality assessment levels (AQAL) at locations of human health exposure in the study area. The locations of the nearest receptors to the facility are set out in Table 3.

Table 3: Human Health Receptor Locations

Receptor	x	y
1	220599	247276
2	220649	247381
3	220224	247596
4	220199	247596

Table notes: N/A

3.2. Because benzene is the only VOC with a published AQAL, it was used as a proxy for all VOCs. The modelling assumed that 5% of the VOC emissions were benzene as a conservative assumption.

3.3. The approach has been to model two scenarios, considering both the presence and absence of buildings. Each scenario included five years of meteorological data. The results were post-processed, and the maximum process contribution (PC) value from any dispersion model run was identified.



- 3.4. The percentage of the PC relative to the AQAL was calculated in accordance with the NRW guidance (NRW, 2025). Where the maximum PC was below 1% for annual mean impacts the risk of an impact was screened out, requiring no further consideration. If the percentage exceeded the relevant threshold at locations of relevant human health exposure, the predicted environmental concentration (PEC) was calculated at the receptor location (determined by combining the maximum modelled PC from the facility with the baseline pollutant concentration). The total concentration was then screened against the relevant AQAL. If the PEC did not screen out as insignificant, further detailed assessment was required.
- 3.5. A summary of the impacts in relation to the air quality at location of human exposure are set out in Table 4. The predicted PCs and PECs at the worst-case receptor are provided in Appendix A3.

Table 4: Human Health Impact Descriptors

Pollutant	Annual Mean
VOCs	PC not discounted; relevant receptor PC not discounted; PEC insignificant.
Table notes: N/A	

- 3.6. The impacts of annual mean VOCs are insignificant at the worst-case locations assessed.
- 3.7. Details of the modelling study are set out in Appendix A2 and the full human health impact assessment is set out in Appendix A3.

## 4. Conclusions

- 4.1. The air quality impacts resulting from a VOC ELV breach of the CHP engine have been assessed at the request of NRW at the Asgard Renewables facility in Ceredigion.
- 4.2. Operational air quality effects on locations of human health exposure without additional mitigation are judged to be insignificant.
- 4.3. Overall, based on the results of the assessment, the air quality effects are compliant with all regulatory standards and the breach of the VOC ELV from a CHP engine is not resulting in significant impacts at locations of human health exposure.

## 5. Glossary

<b>AD</b>	Anaerobic Digestion
<b>AQAL</b>	Air Quality Assessment Level
<b>AQO</b>	Air Quality Objective
<b>EA</b>	Environment Agency
<b>EAL</b>	Environment Assessment Level
<b>ELV</b>	Emission Limit Value
<b>EPR</b>	Environmental Permitting Regulations
<b>Exceedance</b>	A period of time (defined for each standard) where the concentration is higher than that set out in the Standard
<b>IAQM</b>	Institute of Air Quality Management
<b>NRW</b>	Natural Resources Wales
<b>NWP</b>	Numerical Weather Prediction



<b>Objective</b>	Air quality objective
<b>OBS</b>	Observed Meteorological Data
<b>PC</b>	Process Contribution
<b>PEC</b>	Predicted Environmental Concentration
<b>µg/m<sup>3</sup></b>	Microgrammes per cubic metre

## 6. References

- Defra. (2022). Local Air Quality Management Technical Guidance (TG22). Retrieved from <https://laqm.defra.gov.uk/technical-guidance/>*
- Defra. (2025). UK Pollutant Release and Transfer Register (PRTR) data sets [accessed on 07.03.2025]. Retrieved from <https://www.gov.uk/guidance/uk-pollutant-release-and-transfer-register-prtr-data-sets>*
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- Environment Agency. (2025). Gov.uk. Retrieved from Guidance: Specified generator: apply for an environmental permit: <https://www.gov.uk/guidance/specified-generator-apply-for-an-environmental-permit>*
- Kristensen and Jensen. (n.d.). Emissions factors for gas fired CHP units <25 MW.*
- NRW. (2025). Air emissions risk assessment for your environmental permit. Retrieved from <https://naturalresources.wales/permits-and-permissions/installations/guidance-on-complying-with-an-environmental-permit-for-an-installation/?lang=en>*



## A1. Professional Experience

### Kieran Laxen, MEng (Hons) MEnvSc MIAQM

Kieran is a director and the founder of Kalaco. He has 17 years' experience of air quality and during this time has worked on hundreds of projects, including port schemes, road schemes, residential and commercial developments, industrial processes, energy from waste sites, and infrastructure projects. He has extensive experience of ambient air quality monitoring and dispersion modelling for planning and permit applications. Kieran is the Institute of Air Quality Management Vice Chair and is leading the development of professional guidance documents on dispersion modelling, greenhouse gas assessment and air quality assessment for planning. He developed KALACO's meteorological data services, processing Met Office data and creating numerical weather prediction (NWP) data.

### Paul Outen BSc (Hons) MEnvSc MIAQM

Paul is an Associate Director of Kalaco and has over 16 years' experience in the field of air quality and odour consultancy, with extensive experience in the assessment of air quality and odours from a wide range of industries across the UK, Europe and China. He is experienced in undertaking all types of air quality assessments for both planning and permitting purposes. Paul has successfully acted as an expert witness at public hearings and inquiries.

### Ash Cocco BSc (Hons) AMEnvSc AMIAQM

Ash is a Consultant at Kalaco with several years of experience in air quality and odour consultancy. He has expertise in the measurement and assessment of emissions to air across a wide range of UK industries, including wastewater treatment, food production, and manufacturing. Ash has also provided technical support to site operators. He is experienced in delivering air quality and odour assessments for both planning and environmental permitting purposes.



## A2. Dispersion Modelling Approach

### Introduction

- A2.1. Details of the dispersion modelling are presented in this appendix.
- A2.2. Concentrations of VOCs have been predicted for two scenarios, considering both the presence and absence of buildings. Contributions from the facility to ambient concentrations have been modelled and combined with the predicted background concentrations as required.

### The Model

- A2.3. The Atmospheric Dispersion Modelling System (**ADMS**) suite of tools developed and validated by Cambridge Environmental Research Consultants (**CERC**) has been used to estimate concentrations across the local area. ADMS is used extensively in the UK for regulatory compliance purposes and Local Air Quality Management (**LAQM**) and is accepted as an appropriate tool by local authorities and NRW. Version 6.0.0.1 ADMS model has been used for modelling combustion plant emissions.

### Modelled Receptors

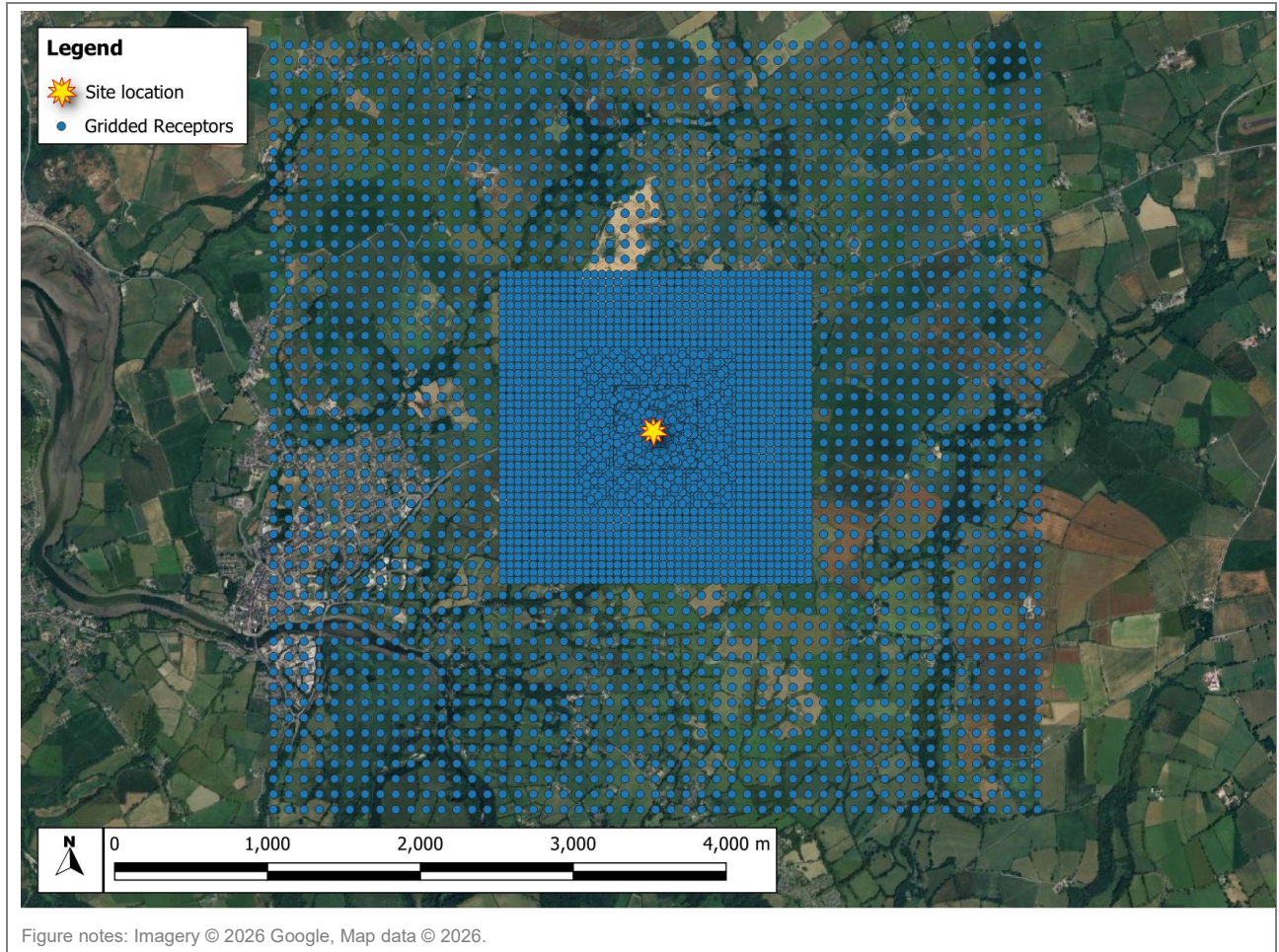
- A2.4. The model output locations are often referred to as receptors, although they may not represent locations of relevant exposure. For ease, this study uses the phrase receptor to represent the modelled receptor location.

### Gridded Modelled Locations

- A2.5. Pollutant concentrations have been predicted across a nested grid of receptors covering a 5 km x 5 km area surrounding the facility. The receptor grid has been modelled at a height of 1.5 m above ground level. The extent of this modelled grid defines the 'study area'. The study area is considered appropriate to consider the impacts on human-health receptors.
- A2.6. The nested cartesian grid has the spacing of:
- 5x5 m within 250 m of the emissions stacks;
  - 25x25 m within 500 m of the emissions stacks;
  - 50x50 m within 1 km of the emissions stacks; and
  - 100x100 m within 2.5 km of the emissions stacks.
- A2.7. These gridded receptor locations are shown in Figure A1.



Figure A1: Gridded Receptor Locations in Relation to the Facility



## Meteorology and Surface Characteristics

A2.8. A summary of the model inputs is provided in Table A1 and Table A2.

Table A1: Meteorological and Terrain Data

Parameter	Comments
Meteorological dataset	<p>Observation (OBS) and numerical weather prediction (NWP) datasets were reviewed. As available OBS data sources near the facility were coastal, they were not considered representative of the conditions within the study area, and thus NWP was used in the modelling.</p> <p>Figure A2 shows the NWP grid processed wind roses for 2019 to 2023 for the study area. To account for the annual meteorological variation, five years of meteorological data have been used in the model.</p> <p>The wind rose at the study area uses the ADMS meteorological processor to account for the difference in winds due to the surface characteristics in the study area.</p>
Terrain	<p>Complex topography affects pollutant concentrations. These effects are most pronounced when the terrain gradient exceeds 1 in 10. The gradients in the area surrounding the facility have gradients greater than 1 in 10 and therefore local terrain data, based on Ordnance Survey Terrain 50 dataset, has been used in the model. This is shown in Figure A3.</p>
Table notes: N/A	



Table A2: Other Parameters Used in the Model

Parameter	Dispersion Site Value	NWP Grid Value <sup>a</sup>
Latitude (°)	52.09	52.08
Surface roughness (m)	Variable roughness file used (see Figure A4)	0.501 - 0.503 <sup>b</sup>
Surface albedo <sup>c</sup>	0.251	0.198
Minimum Monin-Obukhov length (m) <sup>d</sup>	10.881	10.881
Priestley-Taylor parameter	1.0	1.0

Table notes:

a) NWP data taken from: Kalaco Grid Square no. 0002102172.

b) Surface roughness is taken from the model.

c) For this study, albedo has been calculated based on land-use up to 5 km from the centre point (the Site) and is an arithmetic mean. The mean includes an inverse distance weighting for distances over 1 km. The NWP grid value has been taken from the NWP model.

d) Minimum M-O ratio is calculated based on land-use up to 5 km from the centre point (both the Site and the NWP grid centre) and is a geometric mean. The mean includes an inverse distance weighting for distances over 1 km.

Figure A2: Processed Wind Roses of Wind Speed and Direction for Each Year from 2019 (Top Left) to 2023 (Bottom Right) for the NWP Data for 3x3 km Grid Covering the Facility

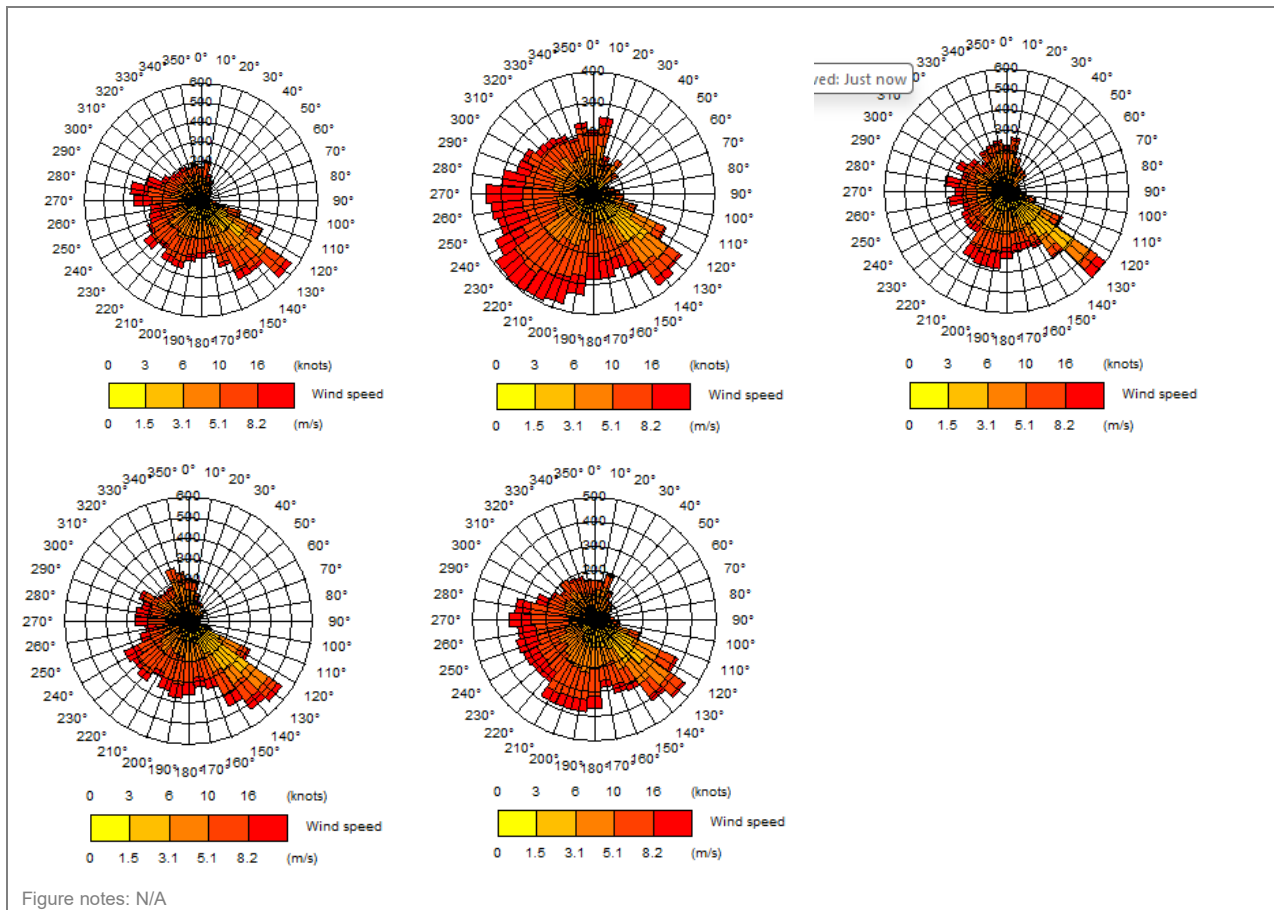


Figure notes: N/A



Figure A3: Modelled Terrain

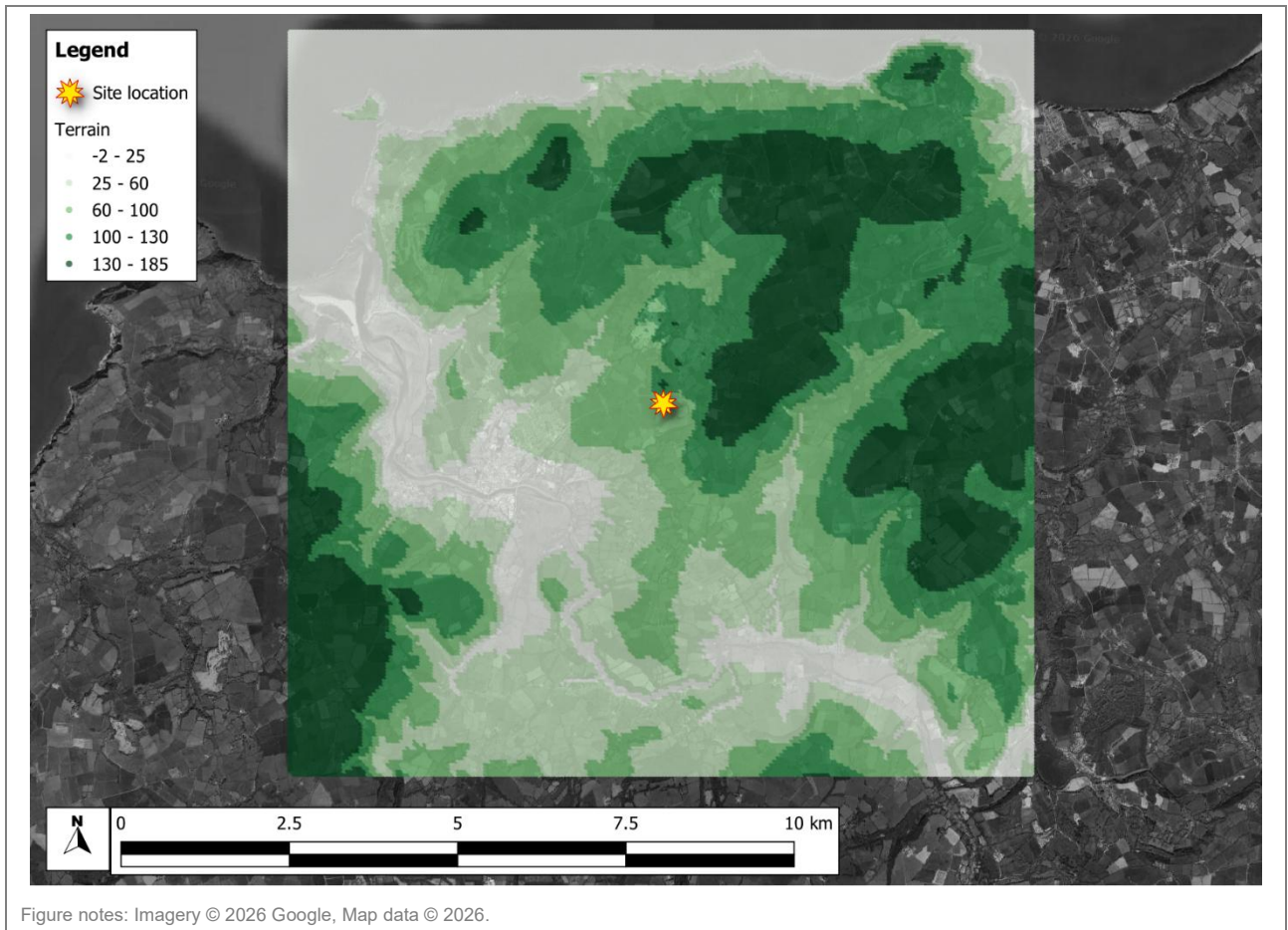
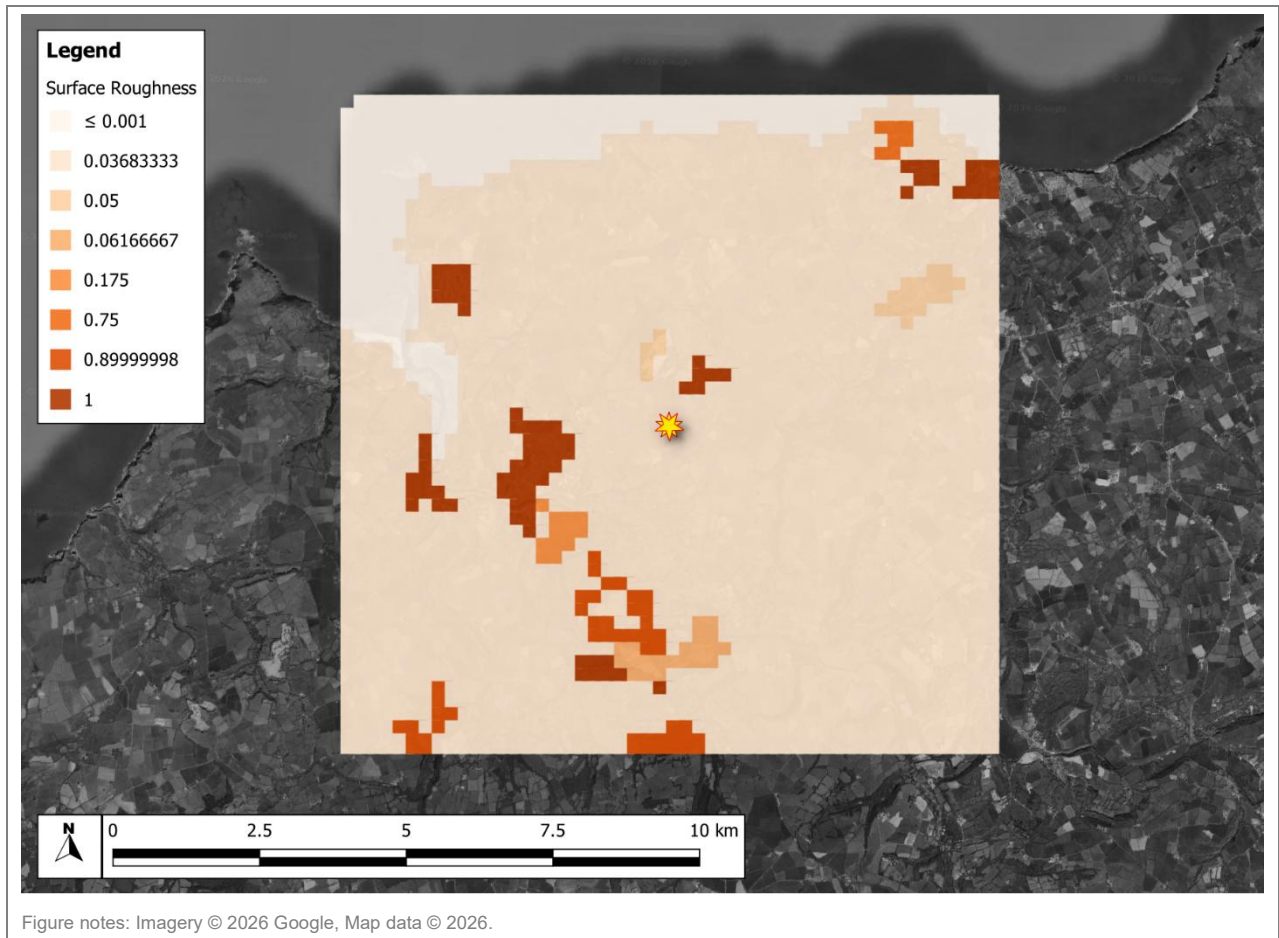




Figure A4: Modelled Surface Roughness



### Stack Emissions Modelling

A2.9. The stacks have been modelled as point sources positioned within the facility as shown in Figure 2. The coordinates and release height of the point sources are shown in Table A3.

Table A3: Point Source Locations and Heights

Source ID	X (m)	Y (m)	Height (m) <sup>a</sup>
CHP 1	220396	247221	4
CHP 2	220401	247222	4

Table notes:  
a. Height above ground level.

A2.10. Table A4 sets out the parameters used in the model for the point source.

Table A4: Modelled Source Parameters

Parameter	CHP1	CHP2
Exhaust Temperature (°C)	100	100
Flue Internal Diameter (m)	0.26	0.26
Exhaust Volumetric Flow Rate (Am <sup>3</sup> /s) for Actual Flow	0.8 <sup>a</sup>	0.8 <sup>a</sup>
Exhaust Volumetric Flow Rate (Nm <sup>3</sup> /s) for Normalised Flow	0.65 <sup>b</sup>	0.65 <sup>b</sup>
Exhaust Velocity (Am/s) for Actual Flow	15 <sup>a</sup>	15 <sup>b</sup>

Table notes:  
Exhaust temperatures have been assumed in the absence of measured data.



Table A4: Modelled Source Parameters

Parameter	CHP1	CHP2
a. Actual conditions are 373 K, 101.325kPa, 5% O <sub>2</sub> and 14.7% H <sub>2</sub> O.		
b. Normalised conditions are 273 K, 101.325kPa, 5.0% O <sub>2</sub> dry.		

### Emissions Concentrations

A2.11. The flue emissions concentrations used are presented in Table A5.

Table A5: Flue Emission Concentrations (mg/Nm<sup>3</sup>)

Pollutant	Emission Concentration (mg/Nm <sup>3</sup> )	
	CHP1 <sup>a</sup>	CHP2 <sup>a</sup>
VOC (as Benzene)	1,293	1,000
Table notes: a. Normalised conditions are 273K, 101.325kPa, 5% O <sub>2</sub> and dry.		

### Modelled Emission Rates

A2.12. The emission rates are derived from the normalised volumetric flow rate at the point of release and the emissions concentrations. The calculated emission rates for the stack are shown in Table A6.

Table A6: Emissions Rates from Energy from Facility

Pollutant	Emission Rates	
	CHP1	CHP2
VOC (g/s)	1.03	0.78
Table notes: N/A		

### Modelled Buildings

A2.13. The model can incorporate the impact of buildings on the concentrations in the downwind area of buildings. However, buildings with a height 40% lower than the stack will be automatically ignored in the model.

A2.14. There is one on-site building which is greater than 40% of the modelled stack height. This building has been included within the models. The height of the on-site building has been provided by the applicant. The modelled buildings are shown in Figure A5 and information is presented in Table A7.



Figure A5: Modelled Buildings (green block) and Modelled Stack Locations (red/black cylinders)

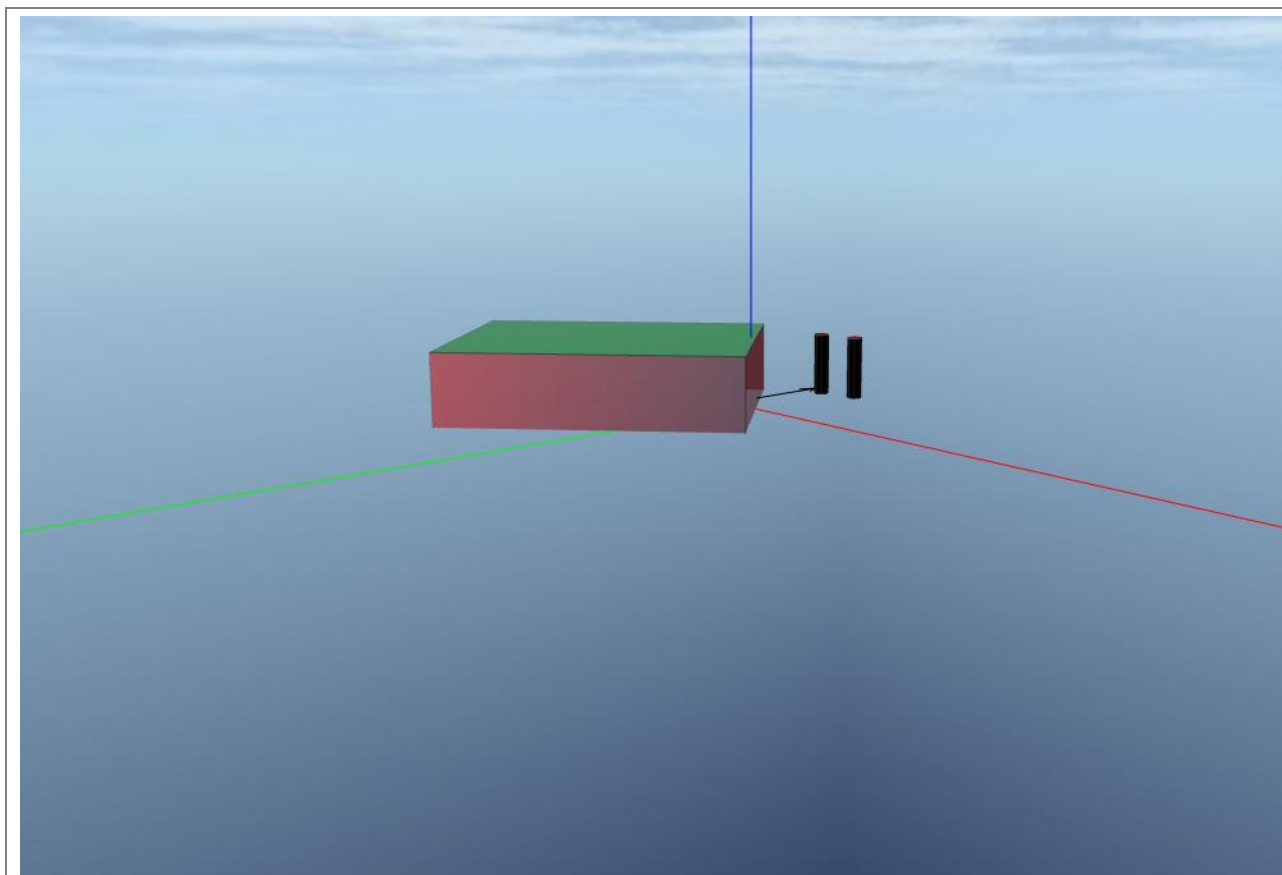


Figure notes: Screenshot taken from ADMS-6.

Table A7: Modelled Building Parameters <sup>a</sup>

Name	Height (m)
Reception Building	10

Table notes: N/A

### Model Run Scenarios

A2.15. The influence of both terrain and buildings on the dispersion of pollutants has been considered. The exhaust flues have been represented in the modelling by running the following two scenarios, each for five meteorological years (2019-2023):

- Scr1: two point sources, emitting vertically from the flue, with modelled buildings and terrain, using a variable surface roughness and meteorological data from NWP for the location of the stack; and
- Scr2: two point sources, emitting vertically from the flue, with modelled terrain and no buildings, using a variable surface roughness and meteorological data from NWP for the location of the stack.

### Post Processing

A2.16. The maximum concentrations at each receptor using the five years of meteorological data and two scenarios have been used to derive the PEC for the facility. The VOC emissions have been factored assuming benzene accounts for 5% of the total VOCs emitted from the CHP engines. To support this assumption, a review was undertaken of an emissions dataset gathered from a field measurement study conducted on 500 operational CHP engines (<25 MW) running on biogas (Kristensen and Jensen, n.d.), and the study does not list benzene as a significant component of CHP exhaust emissions. In addition, the guide for CHP developers (Department



for Business, Energy and Industrial Strategy, 2021) notes that combustion processes can produce small amounts of unburned hydrocarbons. Therefore, the assumption that benzene accounts for 5% of total VOC emissions is conservative and represents a worst-case assessment.

### ***Annual operation***

- A2.17. For annual mean impacts, the assessment has assumed the CHPs will discharge emissions to the atmosphere for 8,760 hours per annum (i.e. operational 100% of the time).

### ***Total Concentrations***

- A2.18. Calculating the total concentrations (i.e., the PEC) for point sources follows the NRW approach (NRW, 2025) which states that: annual mean PEC = annual mean PC + annual mean baseline concentration.

### **Uncertainty and Limitations**

- A2.19. The assessment involves a range of uncertainties, including the model inputs, assumptions, the model parameters and post-processing of model results.
- A2.20. The key uncertainties, including the dispersion model used in the assessment, are dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each source, all of which vary. There are additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms, although the model has been validated, it is not possible to verify the point-source model outputs.
- A2.21. Although there is uncertainty associated with air quality modelling, the predictions made by this assessment have been carried out in a robust manner to minimise uncertainties where possible; the approach has been to use reasonable worst-case assumptions.
- A2.22. The assessment has accounted for uncertainties in the approach by including the use of two sets of meteorological data, both of which covered five years of data. Four modelling scenarios were assessed, including buildings and no buildings within the models. The maximum PC value at each receptor from any of the modelled scenarios was used in the assessment to ensure a robust approach. The robust approach taken in the assessment is likely to result in an overestimate at each receptor location.



## A3. Air Quality Human Health Locations

A3.1. There are some human health receptors (residential properties) close to the application site. The closest human health receptor location is located approximately 200 m to the east of the nearest emissions stack. The worst-case receptor locations are not located near busy roads or industrial facilities, and thus the baseline concentrations of benzene at these locations are likely to be close to background levels.

### Methodology

#### *Guidance*

A3.2. The assessment has been carried out using approaches set out in the following documents:

[Natural Resources Wales: Air Emissions Risk Assessment for your Environmental Permit](#)

A3.3. NRW provides guidance (NRW, 2025) on assessing the impacts of emissions released to air from regulated facilities. The guidance provides a methodology along with assessment thresholds for pollutants.

A3.4. Additional guidance provided by the EA and NRW includes, but is not limited to:

- Medium combustion plant and specified generators: environmental permits (Environment Agency, 2025);
- Medium combustion plant and specified generators: how to comply (Environment Agency, 2025);
- Medium combustion plant and specified generator regulations (2019);
- Specified generator: when you need a permit (2022);
- Specified generator: comply with permit conditions (2022);
- Specified generator: apply for an environmental permit (2025); and
- Specified generators: dispersion modelling assessment (2023).

### Local Air Quality Management Technical Guidance

A3.5. Defra and the devolved administrations have published a guidance document on LAQM - Local Air Quality Management Technical Guidance ([LAQM.TG22](#)) (Defra, 2022). This document is designed to support local authorities in carrying out their duties under the Environment Act 1995, the Environment (Wales) Order 2024, and subsequent regulations including the Environment Act 2021. LAQM is the statutory process by which local authorities monitor, assess, and take action to improve local air quality. The Technical Guidance (2022) provides tools, approaches and technical information related to air quality.

### *Criteria for this Assessment*

A3.6. The assessment criteria or 'Environmental standards for air emissions' include a number of different types, covered by different legislation, policy and guidance. These include:

- UK Air Quality Strategy Objectives referred to as AQOs in this report; and
- NRW Environmental Assessment Levels ([EALs](#)).

A3.7. Collectively these have been referred to as AQALs in the report.

### Air Quality Objectives (AQOs)

A3.8. The human health-related air quality objectives ([AQOs](#)) for Wales for the pollutant relevant to this project (VOCs) are detailed in Table A8.



Table A8: Air quality Objectives (AQOs) and Limit Values (LVs)

Pollutant	Time Period	Source of AQAL <sup>a</sup>	Concentration
Benzene	Annual Mean	AQO	5 µg/m <sup>3</sup>

### Relevant Exposure

A3.9. The locations of relevant exposure for AQOs and LVs are set out in Table A9.

Table A9: Locations of relevant exposure

Receptor Locations	Relevant exposure
AQO	The annual mean AQO applies at locations where members of the public might be regularly exposed, such as building façades of residential properties, schools, hospitals, and care homes. Places of work like factories or offices are not considered places where members of the public might be regularly exposed and therefore the AQO's do not apply at these locations.
Table notes: N/A	

### Approach Overview

A3.10. Standard practice is to assess the risk of impacts of emissions from the facility on local air quality in relation to human health exposure, using the NRW's guidance (NRW, 2025).

A3.11. The approach of assessment considered the PC from the facility in relation to screening criteria (discussed later) and progresses through a series of steps evaluating the potential for impacts to occur. Dispersion modelling has been carried out to predict concentrations throughout the study area, including at locations of human health exposure.

A3.12. The predicted concentrations have been compared to the relevant screening criteria. Where the assessment requires further consideration, then baseline conditions have been considered. The screening steps are:

- Step 1) Compare the maximum PC from any dispersion model run at any location within the study area regardless of whether the location represents relevant human health exposure or not.
- Step 2) Where the PC from Step 1 does not screen out as not significant, consider the PC at locations of relevant human health exposure and compare the maximum to the screening criterion.
- Step 3) Where the PC from Step 2 does not screen out as not significant, consideration of the baseline concentration is carried out, and the PEC is screened against the relevant screening threshold accounting for the baseline concentration.
- Step 4) Where the PC from Step 2 and PEC from Step 3 do not screen out as not significant, further assessment of the potential risk of impact is carried out.

### Evaluating the Risk of Adverse Impacts

#### Screening

A3.13. The PCs are screened out as insignificant if the long-term PC is less than 1% of the long-term AQAL.

A3.14. If the above are exceeded, then the PECs are then screened out as insignificant if the long-term PEC is less than 70% of the long-term AQAL.

A3.15. Where the PECs are above these levels the impacts cannot automatically be screened out; however, it does not mean the impacts of the process will necessarily have a significant adverse contribution to air quality.



### Significance

A3.16. The purpose of the report is to present the risk of potential impacts due to the operation of the facility and therefore the judgement of significance is determined by the regulator. However, commentary is provided to discuss the results and the significance of any impacts on air quality.

### Baseline Assessment

#### *Methodology*

A3.17. This desk-top study was undertaken using the following sources:

- aerial photography from Google Satellite;
- local authority and national monitoring networks;
- UK Pollutant Release and Transfer Register (PRTR) (Defra, 2025); and
- Local authority air quality review and assessment reports.

#### *Air Quality Zones*

A3.18. There are no declared clean air zones and air quality management areas within the study area. The closest AQMA, declared by Carmarthenshire County Council, is located approximately 33 km southeast of the facility.

#### *Monitoring Data*

A3.19. There are no VOC monitoring sites operated by Ceredigion Council, or operated under the Welsh Air Quality Network, in the vicinity of the facility. Table A10 sets out the Welsh government's published 2021 background concentrations in the study area; this is the most recent data available at the time of this assessment and is considered conservative.

Table A10: Local Air Quality Monitoring

Pollutant	Grid Code	X	Y	Relevant to site?	2021 Concentration
Benzene	726111	220500	247500	Yes	0.127 µg/m <sup>3</sup>
Table notes: N/A					

#### *Other Sources of Air Pollution*

A3.20. A search of the UK Pollutant Release and Transfer Register (Defra, 2025) database for 2023 has not identified any regulated facilities within 1 km of the facility.

#### *Overall Baseline Conditions*

A3.21. There are no VOC monitoring sites representative of the conditions at the facility. Furthermore, Defra has not predicted roadside concentrations at any of roads adjacent to the facility; VOC contributions from the road traffic is thus unlikely to be significant. The Welsh government-published background concentrations do not exceed the AQO and are judged to be broadly representative of conditions at the worst-case residential properties closest to the facility, and are conservative.

### Annual Mean Impacts

A3.22. In this section the predicted VOC concentrations resulting from the facility (i.e. the PC) are presented and discussed with relation to the AQALs. The annual mean AQAL applies at locations described in Table A9.

A3.23. The results from each modelled meteorological year have been compiled and the maximum value from any of the modelled meteorological years and either of the two modelling scenarios have been used to create



contours of the worst-case impact area. These impacts may therefore be overpredicted and should be treated as worst-case.

- A3.24. Consideration is first given to the area over which impacts could occur regardless of the presence of sensitive receptors. Once the extent of the potential impacts is defined, consideration is made regarding the likely presence of sensitive receptors within the area. Where sensitive receptors are identified within the bounds of potential impacts, the PECs are then considered.

### **Process Contributions**

- A3.25. The maximum annual mean VOC PC across the study area, regardless of whether there is any relevant exposure, is shown in Table A11.

**Table A11: Maximum Annual Mean NO<sub>2</sub> PC in the Study Area**

Pollutant	AQO ( $\mu\text{g}/\text{m}^3$ )	Maximum PC ( $\mu\text{g}/\text{m}^3$ )	% of AQAL	Screened out without further consideration	Comments
Benzene	5	103.06	2061.2%	No	N/A

Table notes: N/A

- A3.26. From the NRW guidance it can be inferred that any change in concentration smaller than 1% of the long-term (annual mean) AQAL (i.e.  $<0.05 \mu\text{g}/\text{m}^3$  for VOC) will be insignificant, regardless of the existing air quality conditions. Figure A6 shows the annual mean VOC PC contour line which defines the area within the emissions from the facility are predicted to add more than 1% ( $0.05 \mu\text{g}/\text{m}^3$ ) to annual mean benzene concentrations.
- A3.27. The area within the contour includes residential properties, the nearest being approximately 150m west of the facility. As there is relevant exposure with regards to the AQAL within the area, significant impacts cannot be discounted without further considering the PECs.



Figure A6: Maximum Long Term VOC PC greater than 1% of the AQO



### Predicted Environmental Concentrations

- A3.28. In this section the predicted concentrations resulting from the facility are presented and discussed taking account of the baseline concentrations in the area.
- A3.29. Initially, the baseline concentration required for a significant impact to occur requires consideration. The maximum annual mean VOC PC at the worst-case relevant receptor location is 0.39 µg/m<sup>3</sup>. For there to be an exceedance of the AQO at this worst-case relevant receptor location the baseline concentration would need to exceed 4.61 µg/m<sup>3</sup> (i.e., 5 µg/m<sup>3</sup> – 0.39 µg/m<sup>3</sup>) - this is the lowest baseline concentration that may result in an exceedance of the AQO. The Welsh government-published background concentration in 2021 at this receptor location is 0.12 µg/m<sup>3</sup>. The maximum annual mean VOC PEC at the worst-case relevant receptor location is thus 0.51 µg/m<sup>3</sup> (7.6% of the AQO) in 2021, as shown in Table A12.
- A3.30. The annual mean PEC of VOC is below 70% of the AQAL at the worst-case relevant receptor location; therefore the impacts can all be screened out as insignificant based on the NRW guidance (NRW, 2025) and further consideration is not required.

Table A12: Maximum Annual Mean NO<sub>2</sub> PEC at the Worst-Case Receptor Location of Relevant Exposure

Receptor	Pollutant	AQO (µg/m <sup>3</sup> )	Maximum PC (µg/m <sup>3</sup> )	2025 NO <sub>2</sub> Baseline Concentration (µg/m <sup>3</sup> )	Total PEC Concentration (µg/m <sup>3</sup> )	% of AQAL	Screened out without further consideration	Comments
1	VOC	5	0.39	0.12	0.51	10.2	Yes	N/A

Table notes: N/A



### Significance of Operational Air Quality Effects on Human Health

A3.31. A summary of the impacts in relation to the air quality at locations of human health exposure are set out in Table A13.

Table A13: Locations of relevant exposure

Pollutant	Annual mean
VOC	PC not discounted; relevant receptor PC not discounted; PEC insignificant.
Table notes: n/a	