

Plas Farm Biomass Extension
Air Quality Impact Assessment

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Air Quality Impact Assessment

Screening-level assessment of emissions from a 149 kW Hargassner Eco-HK Class 5 biomass boiler, undertaken in accordance with DEFRA LAQM.TG(23) and IAQM/EPUK (2017) guidance.

Proposed Biomass Boiler (149 kW), Plas Farm, Cilybebyll, Pontardawe, Swansea, SA8 3JQ

Planning Application: P2025/0671

Date: November 2025

1. Introduction

This Air Quality Screening Assessment has been prepared in accordance with DEFRA Local Air Quality Management Technical Guidance LAQM.TG(23) and IAQM/EPUK (2017) “Planning for Air Quality.” It assesses the potential impact of emissions from a proposed 149 kW biomass boiler and associated flue at Plas Farm, Cilybebyll, Pontardawe. The purpose is to demonstrate that predicted concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}) remain comfortably below national air-quality objectives. The assessment has been prepared by Geo-4D (Technical Consultancy) using methodologies accepted by UK local authorities for small combustion plant.

2. Boiler & Flue Summary

- **Model:** Hargassner ECO-HK 150 (149 kW) biomass boiler, certified to EN 303-5 Class 5 – the highest performance standard for small combustion plant.
- **Fuel:** Virgin woodchip or pellet compliant with EN ISO 17225.
- **Flue:** Vertical twin-wall stainless-steel system, internal diameter approximately 0.20 m, terminating 5.5 m above ground level with unrestricted upward discharge.
- **Building context:** Boiler housed within a 3.6 m-high container located within the existing farm complex, positioned adjacent to an agricultural shed.
- **Emission performance:** Certified Class 5 limits of < 20 mg/Nm³ PM and < 100 mg/Nm³ NO_x. Typical measured performance ≈ 10 mg/Nm³ PM and 70–90 mg/Nm³ NO_x.
- **Emission rate:** Equivalent to ≈ 0.013 g s⁻¹ NO_x, well below the DEFRA screening-tool target of 0.1079 g s⁻¹ for the site geometry. Hargassner ECO-HK 150 (149 kW), certified to EN 303-5 Class 5 (highest emissions performance standard).

3. Method

A screening-level air-quality assessment has been undertaken using recognised methodologies for small (<200 kW) biomass installations in rural locations. The following guidance and data sources have been applied:

- **DEFRA Local Air Quality Management Technical Guidance (LAQM.TG(23))** – screening methodology for biomass combustion point sources
- **IAQM/EPUK (2017) “Land-Use Planning & Development Control: Planning for Air Quality”** – criteria for assessing impact significance (<1% of an Air Quality Objective = negligible)
- **EN 303-5 Class 5 emission limits** – certified maximum particulate and NO_x concentrations for the boiler
- **Manufacturer technical data** – flue-gas flow rate and stack parameters

Wind-direction data from the nearest representative meteorological station (Morriston, 2023) indicate that winds from the west (270°) occur for approximately 7.5% of the year. This sector represents the only wind direction transporting the plume toward the nearest sensitive receptor, located approximately 15 m east of the proposed flue. Applying the W±1 sector (15% frequency) gives NO₂ = 1.24 µg/m³ (3.1% of objective), confirming substantial headroom under conservative assumptions and that predicted concentrations remain well within the relevant Air Quality Objectives under both scenarios.

The DEFRA Biomass Screening Tool (2023) was applied using the final site geometry (building height 3.5 m, stack height 5.5 m, stack diameter 0.20 m, background NO₂ = 4.2 µg m⁻³). The tool calculated a target emission rate of 0.1079 g s⁻¹, below which the 40 µg m⁻³ annual mean NO₂ objective cannot be exceeded. The boiler’s actual emission rate (0.013 g s⁻¹)—derived from its EN 303-5 Class 5 certification—is an order of magnitude lower, confirming compliance.

This screening approach is proportionate for a single <0.2 MWth biomass installation and aligns with the method routinely accepted by Welsh local authorities for small combustion plant.

Detailed dispersion modelling is not required because:

- (a) the site is outside any Air Quality Management Area (AQMA);
- (b) process contributions are small, with total concentrations well below the relevant objectives;
- and
- (c) the installation clearly meets DEFRA screening criteria for negligible impact.

4. Planning Policy (Wales)

This assessment has been undertaken having regard to the following national and local policy frameworks:

- **Planning Policy Wales (Edition 12, 2021)** – promoting sustainable development and protection of environmental quality.
- **Technical Advice Note (TAN) 11: Noise and Air Quality** – guidance on preventing unacceptable impacts from emissions and ensuring appropriate siting of plant.
- **Well-being of Future Generations (Wales) Act 2015** – principles of prevention, long-term sustainability, and enhancement of local environmental quality.
- **Neath Port Talbot Local Development Plan (Policy EN8: Pollution and Land Stability)** – ensuring proposals do not create or exacerbate pollution or land instability issues.

This assessment demonstrates compliance with the above policy objectives by showing that emissions from the proposed biomass installation will remain well within national air-quality objectives and will not give rise to any unacceptable impact on human health or amenity.

5. Receptors

The nearest sensitive receptor is a residential dwelling (holiday cottage) approximately 15 m east of the proposed flue. Other on-site accommodation buildings and the farmhouse are located 34–44 m from the emission point (see Appendix A).

The site lies in open rural surroundings and is not within or adjacent to an Air Quality Management Area (AQMA).

DEFRA's *Estimated Background Air Pollution Maps* (2024 release; <https://uk-air.defra.gov.uk/data/laqm-background-maps>) indicate annual mean NO₂ concentrations of 4.05–4.41 µg m⁻³ for the 1 km × 1 km grid squares surrounding Plas Farm. Taking the mean of these gives 4.2 µg m⁻³, equivalent to ≈ 11 % of the 40 µg m⁻³ Air Quality Objective.

DEFRA 2024 mapped background data indicate typical rural conditions for this part of Neath Port Talbot, with NO₂ ≈ 4.2 µg m⁻³, PM_{2.5} ≈ 5.4 µg m⁻³ and PM₁₀ ≈ 9.2 µg m⁻³. These values are well below national air quality objectives and confirm the area's low baseline concentrations.

6. Results

Predicted Process Contributions

At the nearest receptor (R1, holiday cottage 15 m east of the proposed flue), the predicted annual-mean process contributions are:

Pollutant Process contribution (µg m⁻³) % of AQ Objective Impact classification

NO ₂	0.62	≈ 1.5 %	<i>Small</i>
PM ₁₀	0.13	≈ 0.3 %	<i>Negligible</i>

Pollutant Process contribution ($\mu\text{g m}^{-3}$) % of AQ Objective Impact classification

PM_{2.5}	0.10	$\approx 0.4 \%$	<i>Negligible</i>
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Only the nearest receptor (R1) shows a *Small* process contribution for annual-mean NO₂; all particulate impacts and all other receptors are *Negligible*. Total concentrations remain well below the Air Quality Objectives.

Interpretation of Results

Predicted process contributions from the proposed 149 kW biomass boiler are **well within the relevant Air Quality Objectives**.

At the nearest receptor (15 m), the annual-mean process contribution for NO₂ is **0.62 $\mu\text{g m}^{-3}$** ($\approx 1.5 \%$ of the 40 $\mu\text{g m}^{-3}$ objective). For PM₁₀ and PM_{2.5}, contributions are $\leq 0.13 \mu\text{g m}^{-3}$ ($\leq 0.5 \%$ of their respective objectives).

DEFRA's 2024 background mapping indicates a local NO₂ background of **4.2 $\mu\text{g m}^{-3}$** , equivalent to $\approx 11 \%$ of the objective. When combined with the process contribution, total concentrations remain below **15 % of the AQ objective**, confirming **no potential for exceedance**.

Under **IAQM/EPUK (2017)** impact significance criteria, these results correspond to *Small* impacts for NO₂ and *Negligible* impacts for particulates. Consequently, no further detailed dispersion modelling is required.

Screening Tool Verification

Using the DEFRA Biomass Screening Tool (2023) with the site geometry (building 3.5 m, stack 5.5 m, diameter 0.20 m) and a representative background NO₂ of 4.2 $\mu\text{g m}^{-3}$, the calculated target emission rate is 0.1079 g s⁻¹.

The boiler's certified actual emission rate of $\approx 0.013 \text{ g s}^{-1}$ (derived from EN 303-5 Class 5 performance data) is nearly an order of magnitude lower, confirming that the installation cannot result in exceedance of the 40 $\mu\text{g m}^{-3}$ annual-mean NO₂ objective.

This finding is consistent with the modelled process contribution of 0.62 $\mu\text{g m}^{-3}$, reinforcing that predicted impacts are *Small* or *Negligible* under IAQM/EPUK (2017) guidance.

7. Conclusion

The proposed 149 kW Hargassner ECO-HK biomass boiler, housed within a timber-clad container at Plas Farm, Cilybebyll, will emit approximately $0.013 \text{ g s}^{-1} \text{ NO}_x$ at full load (EN 303-5 Class 5 performance).

Applying the DEFRA Biomass Screening Tool (2023) with a building height of 3.5 m, stack height of 5.5 m, stack diameter of 0.20 m, and a mapped background NO_2 concentration of $4.2 \mu\text{g m}^{-3}$ gives a target emission rate of 0.1079 g s^{-1} . The actual emission rate is therefore an order of magnitude lower than the threshold required for compliance with the $40 \mu\text{g m}^{-3}$ annual mean objective for NO_2 .

At the nearest receptor (15 m east), the predicted process contribution is $0.62 \mu\text{g m}^{-3}$, equivalent to $\approx 1.5 \%$ of the objective. When combined with the background concentration ($4.2 \mu\text{g m}^{-3}$), total predicted levels remain below 15 % of the national Air Quality Objective, confirming a substantial margin of compliance.

Under IAQM/EPUK (2017) significance criteria, these results represent a *Small* impact for NO_2 and *Negligible* impacts for PM_{10} and $\text{PM}_{2.5}$. Accordingly, no further dispersion modelling or local background monitoring is required to support planning determination.

The assessment demonstrates that the proposed biomass installation will not cause or contribute to any exceedance of air-quality objectives and is fully compliant with DEFRA, IAQM/EPUK (2017) guidance, and Neath Port Talbot LDP Policy EN8 (Pollution and Land Stability).

8. Recommended Planning Conditions (if required)

Condition 1 – Fuel

Only virgin woodchip or wood-pellet fuel compliant with EN ISO 17225 standards (Parts 2 and 4) shall be used. Burning of waste, treated, coated, or contaminated wood is not permitted.

Condition 2 – Flue

The flue shall terminate at a minimum height of 5.5 m above adjacent ground level. A rain collar or terminal may be fitted provided it does not impede upward discharge of exhaust gases.

Appendix A – Technical Inputs (summary of evidence)

Emission factors used (EN 303-5 Class 5 certified limits):

- PM (dust): 20 mg/Nm³
- NOx: 100 mg/Nm³

Pollutant	DEFRA 2024 Background (µg m ⁻³)	% of Objective	Source
NO ₂	4.2	10 % of 40 µg m ⁻³	DEFRA 2024 background maps
PM ₁₀	9.2	23 % of 40 µg m ⁻³	DEFRA 2024 background maps
PM _{2.5}	5.4	27 % of 20 µg m ⁻³	DEFRA 2024 background maps

Table1: DEFRA (2024) Estimated Background Air Pollution Maps, 2024; grid-square values for Plas Farm, Cilybebyll.

Source: <https://uk-air.defra.gov.uk/data/laqm-background-maps>

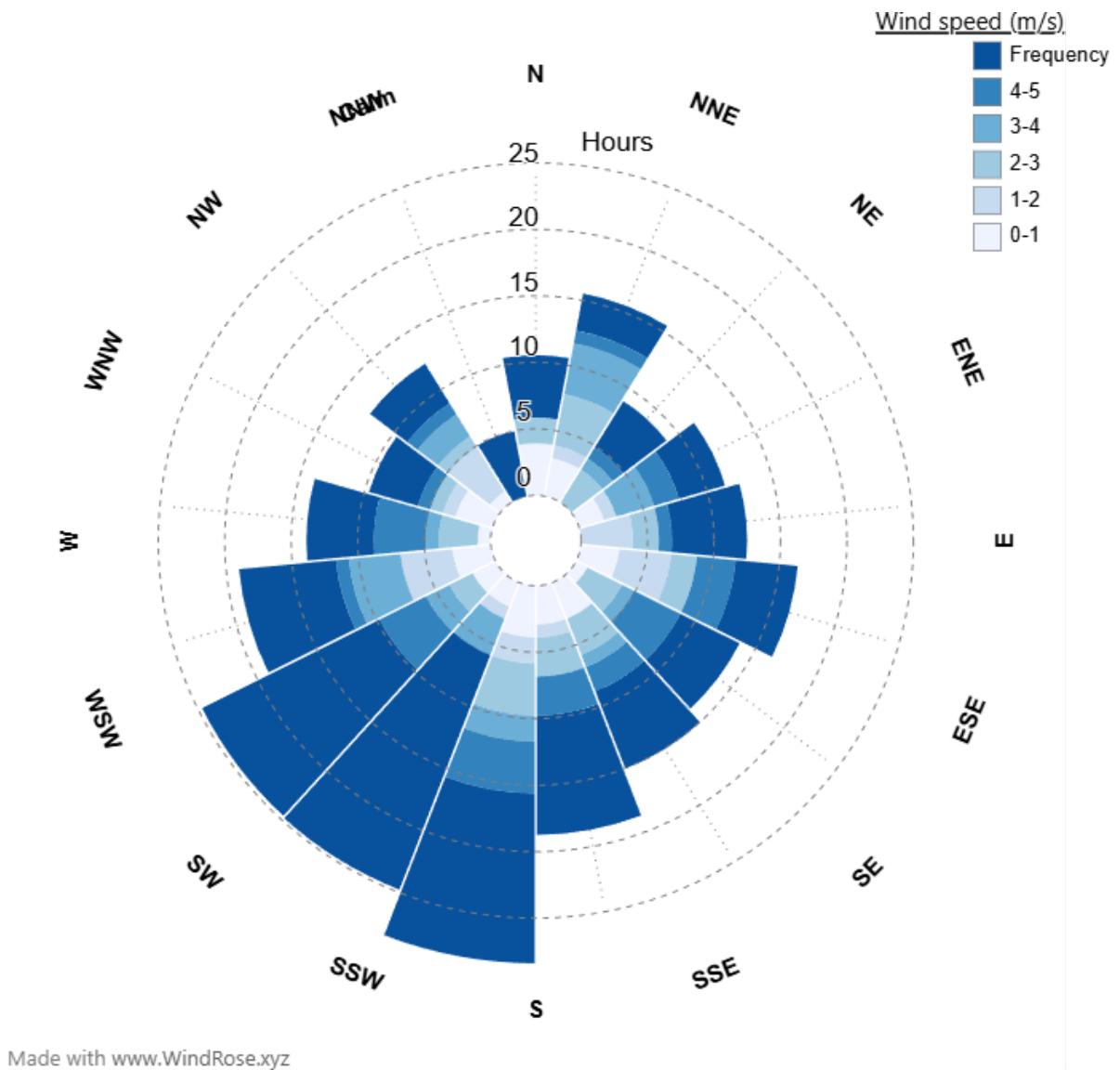


Figure 1: Wind rose used for directional frequency

Wind rose for the nearest station (Morrison / Swansea Valley). The W (270°) sector = 7.5% is the sector that transports the plume from the stack to the receptor located to the east.

Receptor ID	Description / Location	Distance (horizontal façade to stack distances) (m)	NO ₂ PC (µg/m ³)	PM ₁₀ PC (µg/m ³)	PM _{2.5} PC (µg/m ³)	% of AQ Objective	Impact
Nant Y Plas	Holiday accommodation	15	< 0.62	< 0.05	< 0.04	<1.55 %	Small
Bwthyn Y Saer	Holiday accommodation	34	< 0.08	< 0.02	< 0.01	< 1%	Negligible
Ty Cerbyd	Holiday accommodation	42	< 0.06	< 0.01	< 0.01	< 1%	Negligible
Lloc Llo	Holiday accommodation	43	< 0.05	< 0.01	< 0.01	< 1%	Negligible
Plas Farm	Farmhouse / residential	44	< 0.05	< 0.01	< 0.01	< 1%	Negligible

Table 2: Predicted Annual Mean Process Contributions at Sensitive Receptors

Applying the observed W-sector frequency (7.5%) gives an annual mean NO₂ process contribution at R1 of 0.62 µg/m³ (≈1.5% of the objective). PM₁₀ and PM_{2.5} remain <1% and therefore *Negligible*.

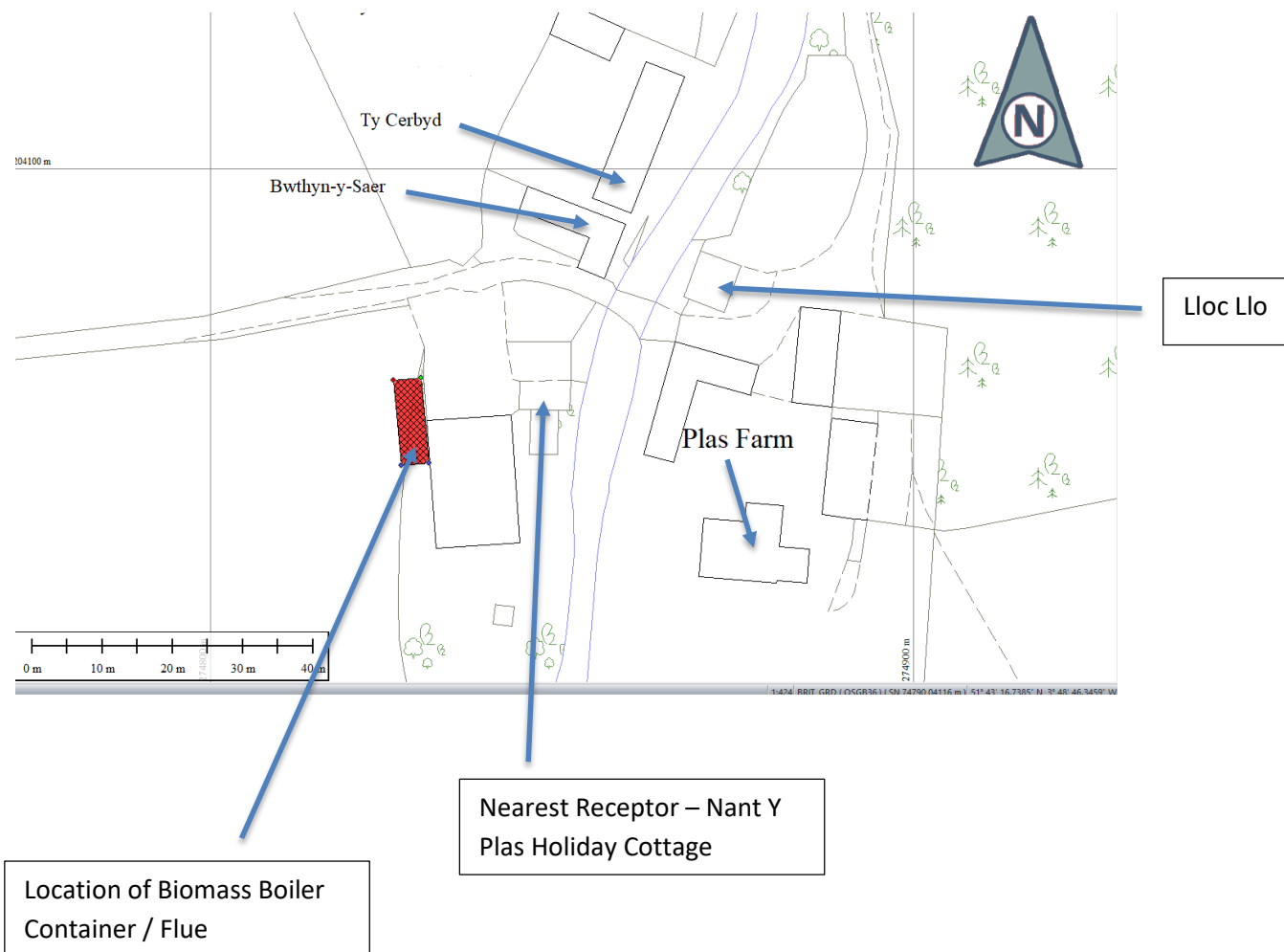


Figure 2 – Site Location and Sensitive Receptors

Plan showing the location of the biomass flue and the identified receptors assessed in the Air Quality Impact Assessment.

Parameter	Value	Unit	Source
Flue gas temp	150	°C	Hargassner ECO-HK Technical Data Sheet
Flue gas flow rate	0.092	Nm ³ s ⁻¹	Hargassner manufacturer data (ECO-HK 150, full load)
Stack height	5.5	m	Design specification
NOx concentration	80	mg Nm ⁻³	EN 303-5 Class 5 certification Hargassner manufacturer data
PM concentration	10	mg Nm ⁻³	EN 303-5 Class 5 certification Hargassner manufacturer data

Table 3: Emission Inputs

Note: Sulphur dioxide (SO₂) has not been assessed as the proposed boiler will use virgin woodchip or pellet (EN ISO 17225 A1/B1) with negligible sulphur (< 0.05 %), and there are no designated ecological sites within 500 m of the installation.

This report provides sufficient information for Environmental Health and Planning Officers to determine that the proposed biomass installation will not result in any breach of air-quality objectives or significant adverse impact.

Prepared by:

Prepared by Geo-4D (Technical Consultancy) in accordance with DEFRA LAQM.TG(23) and IAQM/EPUK (2017) methodologies for small combustion plant.