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PROPOSED BIOMASS BOILERS, GELL BWCH, LLANDARCY

Air Quality Technical Note

On Behalf of Hale Construction Ltd
July 2023

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Air Quality Assessment
Proposed Biomass Boilers, Gell Bwch, Llandarcy



Document Control Sheet

Project Name: Proposed Biomass Boilers, Gell Bwch, Llandarcy
Project Ref: 0128
Report Title: Air Quality Technical Note

Client	Hale Construction Ltd
Principal Contact	Jonathan Hale
Job Number	0128
Item	Air Quality Technical Note
File Location	\\Job Numbers\0128\Report\0128A(AQ)v0.docx

Quality Management

Prepared by	Harley Parfitt	Air Quality Consultant	04/07/2023
Checked by	Harley Parfitt	Air Quality Consultant	06/07/2023
Revision Number	V0		

Revision History	Date of Issue	Reason for revision
V0	0	For client comment

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1 Introduction

- 1.1 Greenavon Ltd was commissioned by Hale Construction Ltd to provide an Air Quality Technical Note to support an application for the installation of two biomass boiler at Gell Bwch Farm, Llandarcy, Neath.
- 1.2 The proposed biomass boilers have a combined thermal output of 0.19 MW, which falls below the 1 MW threshold for requiring an Environmental Permit associated with the Medium Combustion Plant Directive (MCPD).
- 1.3 The proposed development is found within 500m of the Crymlyn Bog Special Area of Conservation (SAC). An ecological receptor of international importance that is protected under the Habitats Regulations.
- 1.4 Given the application site's proximity to the SAC, Neath Port Talbot Council (NPTC) require evidence that air emissions associated with the proposed development would not significantly impact it.
- 1.5 This report assesses the proposed development's impact on statutory ecological receptors only, to support a Habitats Regulations Assessment (HRA). It focuses on emissions from the biomass boiler during the operational phase.



2 Methodology

SCAIL-Combustion Assessment

- 2.1 The SCAIL-Combustion tool¹, which uses the dispersion model AERMOD to quantify emissions of sulphur dioxide (SO₂) and oxides of nitrogen (NO_x) from small to medium sized combustion sources was used in this assessment.
- 2.2 The assessment has been undertaken in line with the methodology and approach outlined in Environment Agency (EA) guidance². Whilst this guidance is designed to support air quality assessments for larger installations that require bespoke Environmental Permits, the principals of the guidance have been applied to the proposed development.

SCAIL Inputs

- 2.3 The inputs used in the SCAIL-Combustion tool are set out in Table 2.1 below. The inputs are based on the specification sheet for the proposed boilers³, which are, in part, reproduced in Appendix A. The specification sheets do not, however, contain detailed emissions data for NO_x and SO₂ and as such, emission rates from the boilers have been calculated based on the emission limits for Medium Combustion Plant (MCPs), as set out in the Environmental Permitting Regulations⁴ and associated MCPD⁵.

Table 2.1: Inputs for the SCAIL-Combustion Assessment

Input	Value	Justification / Source
Meteorological Data	Conservative Met	Assumes the closest part of the habitat is downwind of the emission source, thus providing a conservative assessment.
Stack Location (X, Y)	272013.2,194552.9	Approximate location of proposed stack
Stack Height (m)	1.66	As the proposed stack height is not 2.5 times greater than the height of the building, nor greater than 1m above the ridge of the building, the 'effective stack height' of 1.66m has been used.
Stack Diameter (m)	10.9	The stack is restricted by a chimney cowl cap. As such, the calculation for the equivalent stack diameter' has been undertaken.
Exhaust velocity (m/s)	0.001	The stack is restricted by a chimney cowl cap. As such, the calculation for the equivalent exhaust velocity has been undertaken.

¹ Centre for Ecology and Hydrology (CEH), Jacobs and Westlake Scientific Consulting (2014). "SCAIL Combustion. May 2010. Available at: <https://www.scail.ceh.ac.uk/cgi-bin/combustion/input.pl>

² Environment Agency (2023) Medium combustion plant: screening tool. Available at: <https://www.gov.uk/guidance/medium-combustion-plant-screening-tool>

³ New Horizon Corporation Online Store (nd) Attack DP boiler. Available at: <http://www.newhorizonstore.com/Products/90-attack-dp-boiler.aspx>

⁴Environmental Permitting (England and Wales) (Amendment) Regulations 2018. Available at: https://www.legislation.gov.uk/uksi/2018/110/pdfs/uksi_20180110_en.pdf

⁵ Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2193>

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Exhaust Temperature (°C)	176.7	Taken from the 'ATTACK DP Profi" wood gasifying boiler specification sheet.
Volumetric Flow Rate (Am³/s)	0.08	Calculated based on conversion of a flue gas flow, per boiler, of 0.35 kg/s, taken from specification sheet. The density of air was assumed to be 0.7972 kg.m ⁻³ at 176.7°C
NO _x emission rate g/s	0.035	Calculated based on the assumption that the two boilers would emit NO _x in line with the MPCD emission limit of (650 mg.Nm ⁻³)
SO ₂ emission rate	0.001 g/s	Calculated based on the assumption that the two boilers would emit SO ₂ in line with the MPCD emission limit of (200 mg.Nm ⁻³)
Hours of operation	8760	Worst case assumption assuming constant operation.

Modelled Receptors and Baseline

2.4 The SCAIL-combustion tool has been used to predict ground level NO_x and SO₂ concentrations, as well as resultant nitrogen and acid deposition, at the locations shown in Table 2.2 and Figure 2.1. Estimates of existing background NO_x and SO₂ concentrations and levels of nitrogen and acid deposition, output from the SCAIL tool, has also been provided.

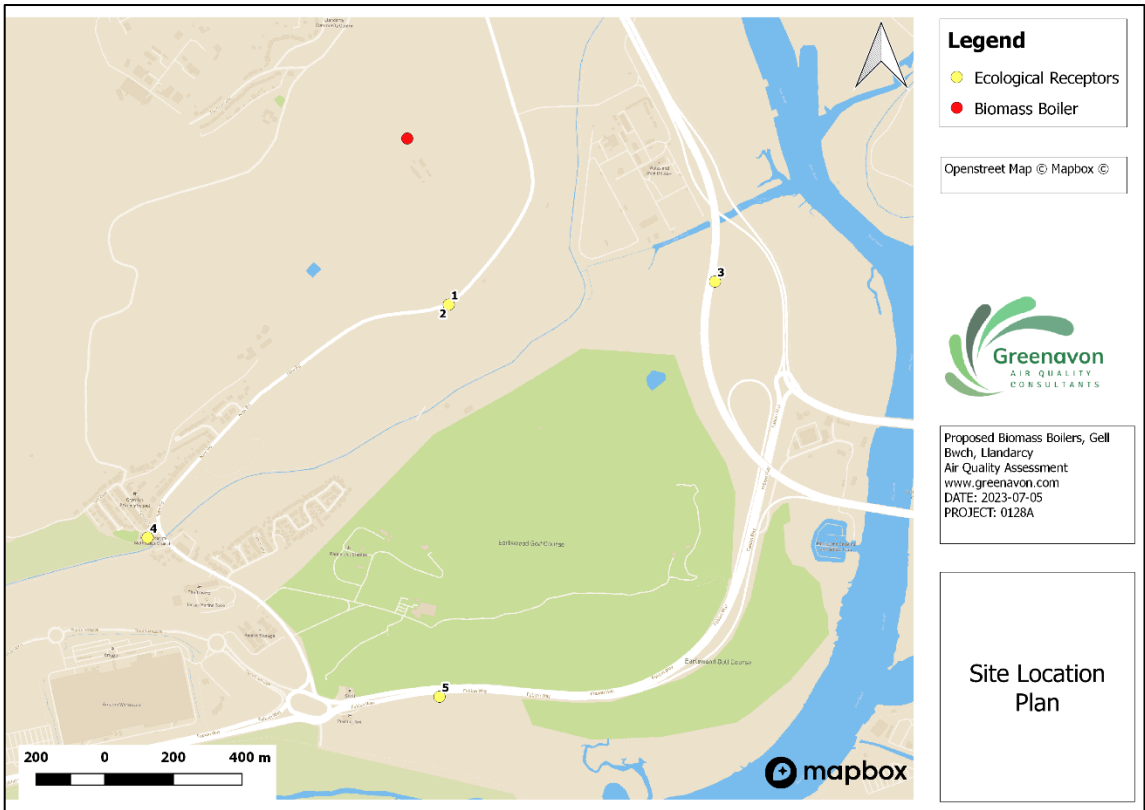
Table 2.2: Modelled Receptor Locations and Baseline Conditions

ID	Name	Habitat Type	Distance (m)	X	Y	NO _x Concentration (ug.m ⁻³)	SO ₂ Concentration (ug.m ⁻³)	Nitrogen Deposition (kg/ha/yr)	Acid Deposition (kEqH ⁺ /ha/yr)
1	Crymlyn Bog / Cors Crymlyn	SAC	499	272013.2	194552.9	10.5	1.6	9.28	0.88
2	Pant-y-Sais	SSSI	499	272013.2	194552.9	10.5	1.6	9.28	0.88
3	Earlswood Road Cutting and Ferryboat Inn Quarries	SSSI	989	272789.2	194620.3	10.5	1.6	9.28	0.88
4	Cors Crymlyn / Crymlyn Bog	SSSI	1039	271135.3	193873.3	7.9	1.5	15.83	0.86
5	Crymlyn Burrows	SSSI	1630	271986.2	193409.4	7.9	1.5	9.12	0.86

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Figure 2.1: Modelled Receptors



Significance Criteria

- 2.5 The screening of air quality impacts for Environmental Permits follows a two-stage approach, where impacts are first assessed against the process contribution (PC) and then the predicted environmental concentration (PEC). The PC refers to the environmental concentration of each substance that an installation releases into the air, whilst the PEC refers to the PC plus the concentration of the substance already present in the environment.
- 2.6 MCPD guidance² states that impacts on the sites can be screened out where:
- the PC of new MCPs would not contribute greater than 4% of the long-term Environmental Assessment Levels (EAL) (e.g., critical load or critical level).
- 2.7 Joint Defra and Environment Agency guidance⁶ on *Air emissions risk assessment for your environmental permit* includes a more conservative screening criteria, stating that changes in the long-term PC relative to an EAL of less than 1% can be considered insignificant.
- 2.8 In the scenario where either of these initial screening stages are exceeded, each guidance recommends that where the PEC is less than 70% of the relevant long-term EAL, impacts can also be screened out. This allows for a larger PC to be screened in

⁶ Environment Agency (2016) 'Air Emission Risk Assessment for your Environmental Permit'. (March 2023 Update). Available at: <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

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areas of good air quality. If impacts cannot, however, be screened based on the PC or PEC, the guidance dictate that dispersion modelling would be required.

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3 SCAIL Assessment

3.1 Table 3.1 below shows the predicted impact of the proposed development on annual mean concentrations of NO_x.

Table 3.1: Impact of the proposed development on NO_x concentrations

Receptor	Annual (µg.m ⁻³)	Mean	Concentration		PC	% of	PEC	% of	Potentially
	PC	EAL	PEC		EAL		EAL		significant
Crymlyn Bog / Cors Crymlyn	0.2	30	10.6		0.5%		35.4%		No
Pant-y-Sais	0.2	30	10.6		0.5%		35.4%		No
Earlswood Road Cutting Ferryboat Quarries and Inn	0.0	30	10.5		0.2%		35.1%		No
Cors Crymlyn / Crymlyn Bog	0.0	30	7.9		0.1%		26.3%		No
Crymlyn Burrows	0.0	30	7.9		0.1%		26.2%		No

3.2 All predicted changes in NO_x are predicted to be less than 1% of the relevant critical level, and therefore insignificant.

3.3 Table 3.1 below shows the predicted impact of the proposed development on annual mean concentrations of SO₂.

Table 3.2: Impact of the proposed development on SO₂ concentrations

Receptor	Annual (µg.m ⁻³)	Mean	Concentration		PC	% of	PEC	% of	Potentially
	PC	EAL	PEC		EAL		EAL		significant
Crymlyn Bog / Cors Crymlyn	0.0	20	1.6		0.2%		8.1%		No
Pant-y-Sais	0.0	20	1.6		0.2%		8.1%		No
Earlswood Road Cutting Ferryboat Quarries and Inn	0.0	20	1.6		0.1%		8.0%		No
Cors Crymlyn / Crymlyn Bog	0.0	20	1.5		0.0%		7.7%		No
Crymlyn Burrows	0.0	20	1.5		0.0%		7.7%		No

3.4 All predicted changes in SO₂ are predicted to be less than 1% of the relevant critical level, and therefore insignificant.

3.5 Table 3.3 below shows the predicted impact of the proposed development on annual nutrient nitrogen deposition.

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Table 3.3: Impact of the proposed development on nutrient nitrogen deposition

Receptor	Nitrogen Deposition (kg.N/ha/yr)			PC % of EAL	PEC % of EAL	Potentially significant
	PC	EAL	PEC			
Crymlyn Bog / Cors Crymlyn	0.02	5	9.28	0.4%	186%	No
Pant-y-Sais	0.02	5	9.28	0.4%	186%	No
Earlswood Road and Cutting Ferryboat Quarries	0.01	NA	9.28	NA	NA	No
Cors Crymlyn / Crymlyn Bog	0.01	3	15.83	0.3%	528%	No
Crymlyn Burrows	0.00	5	9.12	0.0%	182%	No

- 3.6 It is noted that existing levels of nutrient nitrogen are above the receptor’s relevant critical loads. However, all predicted changes in nutrient nitrogen are predicted to be less than 1% of the relevant critical level, and therefore can be considered insignificant.
- 3.7 Table 3.4 below shows the predicted impact of the proposed development on annual acid deposition.

Table 3.4: Impact of the proposed development on acid deposition

Receptor	Acid Deposition (kEqH+/ha/y)			PC % of EAL	PEC % of EAL	Potentially significant
	PC	EAL	PEC			
Crymlyn Bog / Cors Crymlyn	0.003	0.661	0.884	0.5%	133.7%	No
Pant-y-Sais	0.003	0.536	0.884	0.6%	164.9%	No
Earlswood Road and Cutting Ferryboat Quarries	0.001	NA	0.882	NA	NA	No
Cors Crymlyn / Crymlyn Bog	0.001	0.536	0.862	0.2%	160.8%	No
Crymlyn Burrows	0.000	2.008	0.861	0.0%	42.9%	No

- 3.8 It is noted that existing levels of acid deposition are above the receptor’s relevant critical loads. However, all predicted changes in acid deposition are predicted to be less than 1% of the relevant critical level, and therefore can be considered insignificant.

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4 Conclusions

- 4.1 Greenavon Ltd was commissioned by Hale Construction Ltd to provide an Air Quality Technical Note to support an application for the installation of two biomass boiler at Gell Bwch Farm, Llandarcy, Neath.
- 4.2 An Air Quality Assessment was required to assess the potential impacts on the Crymlyn Bog Special Area of Conservation, as part of the screening process for a Habitats Regulations Assessment.
- 4.3 The proposed boilers have a combined thermal output of 0.19 MW, which is below the threshold for requiring an Environmental Permit under the Medium Combustion Plant (MCP) Directive. The approach for carrying out an air quality assessment for a MCP was nonetheless undertaken and impacts of the proposal were assessed using the SCAIL-combustion screening tool, in accordance with Defra and Environment Agency guidance.
- 4.4 The SCAIL-combustion assessment incorporated several conservative assumptions and parameters. Nevertheless, predicted changes in NO_x, SO₂, nutrient nitrogen deposition and acid deposition, as a result of the proposed development, were predicted to be insignificant.
- 4.5 As such, it can be concluded that air emissions associated with the proposed development do not have the potential to significantly impact the integrity of the Crymlyn Bog SAC and other local designated receptors.

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Appendix A: Boiler Specification Sheet

Attack Model:	DP 75 Profi	DP 95 Profi
Nominal output	75 kW (256 KBTU)	95 kW (325 KBTU)
Range of output setting (PROFI version)	30-75 kW (102-256 KBTU)	38-95 kW (140-325 KBTU)
Prescribed chimney draught	26 Pa	28 Pa
Max water operation overpressure	250 kPa (35 PSI)	
Pressure loss of water (T 10K)	8.8 kPa (1.3 PSI)	
Pressure loss of water (T 20K)	1.6 kPa (0.23 PSI)	
Diameter of flue gas outlet	200 mm (8")	
Loading chamber dimensions		L 41"x W 21"x H 31"
Diameter of C.H. flow connection	2 "	
Diameter of C.H. return connection	2 "	
Protection level	21 IP	
Maximum electric load	4 A	
Boiler class	3	
Flue gas temperature by nominal output	350 °F	
Flue gas flow by nominal output	0.033 kg/s	0.035 kg/s
Average wood consumption	18.7 kg/h	29.2 kg/h

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