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## **ANALYSIS OF THE TRACE LANDFILL GAS**

**AT**  
**Bryn Posteg Landfill Site**  
Tylwch Road  
Llanidloes  
Powys  
SY18 6JJ

Commissioned by: David Williams

Of

**Potter Group Ltd**  
Henfaes Lane  
Welshpool  
Powys  
SY21 7BE

Date of Survey:

15<sup>th</sup> December 2020

Compiled By:

David Littlewood  
*Operations Manager*

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*Operations Manager*  
MCerts Level II (TE1, 2, 3 & 4)

Signed:



Dated: 14<sup>th</sup> January 2021

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Notes to Report.

- a). EnviroDat Ltd, Report Template V10.
- b). This report should not be reproduced except in full, without written approval of Envirodat Ltd.
- c). Opinions and Interpretations herein are outside the scope of UKAS/MCerts Accreditation.

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## **1. INTRODUCTION**

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- 1.1 EnviroDat Limited was commissioned by David Williams, on behalf of Potter Group Ltd, to measure the trace gas and siloxane components from landfill gas located at Bryn Posteg Landfill Site. Sampling was performed on Tuesday, 15 December 2020.
- 1.2 The sampling was conducted in response to permit requirements (Permit No. EPR/RP3338TA). Monitoring was conducted with reference to the Environment Agency document 'Guidance for Monitoring Trace Components in Landfill Gas' (LFTGN 04).

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## **2. PLANT DESCRIPTION**

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- 2.1 Landfill gas is currently utilised by the gas engine generator plant. Samples of the fuel gas were taken from a feed system for trace gas analysis after the gas booster.

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## **3. SAMPLING PROCEDURES**

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- 3.1 Trace gas sampling was performed from the fuel gas inlet, with analysis for components identified in Table 1.1 of the EA LFTGN04 guidance note. General site information is presented in Appendix A.
- 3.2 Mixed bed, automated thermal desorption (ATD) tubes were used for sampling of the priority volatile organic species prior to analysis by gas chromatography with mass spectrometry (GC/MS), in accordance with EA recommendations and documented EnviroDat protocol, SPTGN04. The results are presented in Appendix B. The analytical component of the work was conducted at Marchwood Scientific Services (MSS) Ltd.

- 3.3 The LFTGN04 designated 'priority' carbonyl components (i.e. methanal and ethanal) were sampled onto dinitrophenylhydrazine (DNPH) impregnated, silica gel sorbent tubes prior to analysis by high performance liquid chromatography (HPLC) incorporating an ultraviolet (UV) detection system, in accordance with EA recommendations and SPTGN04. The results are presented in Appendix B. The analytical component of the work was conducted at MSS.
- 3.4 Arsenic was sampled onto an activated charcoal sorbent tube prior to analysis by inductively coupled plasma/optical emission spectrometry (ICP/OES), in accordance with EA recommendations and SPTGN04. The results are presented in Appendix B. The analytical component of the work was conducted at MSS.
- 3.5 Hydrogen sulphide was sampled into a Tedlar bag with analysis by GC/TCD/FID (by MSS) in accordance with SPTGN04. The results are presented in Appendix B
- 3.6 Siloxanes sampling was affected using EnviroDat Ltd. documented internal protocol SP SILOX. This involves passing a metered volume of the gas through solid sorbent material whereby the siloxane congeners are captured and concentrated to allow analysis by gas chromatography utilising mass spectrometric detection (GC/MS). The analysis was carried out at MSS and is UKAS accredited for sampling and analysis.

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## **4. RESULTS**

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- 4.1 Field measurements of the 'bulk gases' are given in Appendix A.
- 4.2 Measured concentrations of the EA 'priority' trace components for the landfill gas are given in Appendix B and shown graphically in Appendix C.
- 4.3 Measured concentrations of the siloxane components for the landfill gas are given in Appendix D.

## **APPENDIX A**

### **Site Information & Preliminary Gas Measurements**

**TABLE A: Site Information & Preliminary Gas Measurements**

<b>Sample Position Details</b>			
<b>Date</b>	15/12/2020	<b>Site</b>	Bryn Posteg LFS
<b>Ambient Temperature</b>	8.5°C	<b>Atmospheric Pressure</b>	958mbar
<b>Monitoring Organisation (s)</b>	EnviroDat Ltd	<b>Analytical Laboratory</b>	Marchwood Scientific Services
<b>Location of Sampling Point</b>	Inlet Line to Utilisation Plant	<b>Area of Influence of collection system sampled</b>	All capped areas of the site
<b>Type of Sampling Point</b>	Red QC fitting	<b>Temperature of gas</b>	11°C, at sample flow meter
<b>Vacuum on Sampling</b>	None, Positive pressure	<b>Type of waste</b>	Domestic, Industrial, Commercial & Hazardous
		<b>Age of Waste</b>	-
<b>Status of Gas System</b>	Fully Operational, Steady State	<b>Other</b>	-
<b>Parameter</b>	<b>Concentration</b>	<b>Units</b>	<b>Comments</b>
Methane*	52.0	%	-
Carbon Dioxide*	36.9	%	-
Oxygen*	0.7	%	-
Nitrogen	10.4	%	Assumed to be balance of gas
Hydrogen Sulphide	-	ppm	See Appendix B

Notes: \*Raw result obtained from EnviroDat landfill gas analyser

## **APPENDIX B**

### **Trace Gas Results**

**TABLE B: Trace Gas Results**

Trace Gases							
	Test Duration	Flow Rate	Flowmeter	Volume	Ambient T	Barometric P	Volume
	(min)	(ml/min)	CAL Factor	(l as sampled)	(°C)	(kPa)	(l @ STP)
Arsenic	60	200	1.0065	12.08	9	95.8	11.07
Aldehydes	20	200	1.0065	4.03	9	95.8	3.69
VOC	6	50	1.012	0.30	9	95.8	0.28

Compound	Mass of TG (ng)	LoD of TG (ng)	Concentration	Units	Analysis Notes (See below)	Analysis UKAS Accredited (Y/N)
Arsenic (as As)	1200	500	108	µg/m <sup>3</sup>	-	N
Acetaldehyde (Ethanal)	200	100	54	µg/m <sup>3</sup>	-	Y
Formaldehyde (Methanal)		100	< 27	µg/m <sup>3</sup>	-	Y
Vinyl chloride	863	10	3100	µg/m <sup>3</sup>	-	N
1,3-butadiene		10	< 36	µg/m <sup>3</sup>	-	N
Methanethiol		50	< 180	µg/m <sup>3</sup>	-	N
Chloroethane	29	10	104	µg/m <sup>3</sup>	-	N
1-pentene		20	< 72	µg/m <sup>3</sup>	-	N
1,4-epoxy-1,3-butadiene (Furan)	210	10	754	µg/m <sup>3</sup>	-	N
Ethanethiol		50	< 180	µg/m <sup>3</sup>	-	N
1,1-dichloroethene		5	< 18	µg/m <sup>3</sup>	-	N
Dimethyl sulphide	150	10	539	µg/m <sup>3</sup>	-	N
Dichloromethane		10	< 36	µg/m <sup>3</sup>	-	N
Carbon disulphide	280	10	1006	µg/m <sup>3</sup>	-	N
1,2-dichloroethene (trans + cis)	45	10	162	µg/m <sup>3</sup>	-	N
1,1-dichloroethane	11	5	40	µg/m <sup>3</sup>	-	N
Propanethiol		40	< 144	µg/m <sup>3</sup>	-	N
1,2-dichloroethane	16	5	57	µg/m <sup>3</sup>	-	N
Carbon tetrachloride		5	< 18	µg/m <sup>3</sup>	-	N
Benzene	890	1	3197	µg/m <sup>3</sup>	c	N
Trichloroethylene	26	5	93	µg/m <sup>3</sup>	-	N
Butanethiol		40	< 144	µg/m <sup>3</sup>	-	N
Dimethyl disulphide		10	< 36	µg/m <sup>3</sup>	-	N
Toluene	2400	5	8621	µg/m <sup>3</sup>	c	N
Butyric acid		10	< 36	µg/m <sup>3</sup>	-	N
Ethyl butyrate		10	< 36	µg/m <sup>3</sup>	-	N
2-Butoxyethanol		10	< 36	µg/m <sup>3</sup>	-	N
Styrene	150	5	539	µg/m <sup>3</sup>	-	N
Compound	Concentration of H <sub>2</sub> S (%)	LoD of H <sub>2</sub> S (%)	Concentration	Units	Analysis Notes (See below)	Analysis UKAS Accredited (Y/N)
Hydrogen sulphide	0.022	0.001	333720	µg/m <sup>3</sup>	-	N

\*H<sub>2</sub>S value is equivalent to 220ppm

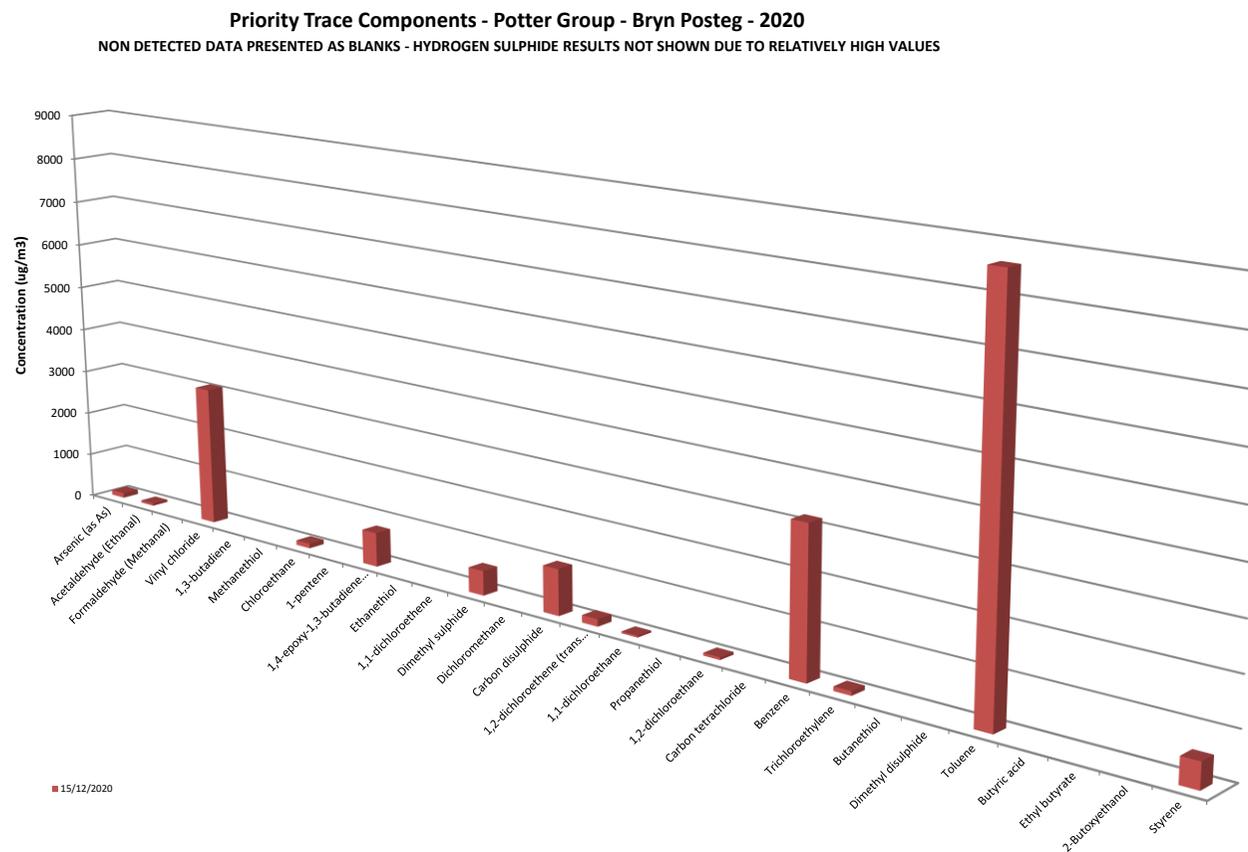
- (a) – Results have been blank corrected
- (b) – Results should be considered a minimum due to detector saturation
- (c) – Results should be viewed with caution due to being outside of the instrument calibration range

Reference to UKAS (final column) relates to the accreditation status of the analysis only, sampling is covered under EnviroDat Accreditation scope.

## **APPENDIX C**

### **Trace Gas Chart**

**TABLE C: Trace Gas Chart**



## **APPENDIX D**

### **Siloxane Results**

**TABLE D(i): Siloxane Results**

Test No	✓	T1
Date	✓	15/12/2020
Site	✓	Bryn Posteg
Stack	✓	Fuel Gas Line
Reference Conditions - Oxygen (%)	✓	n/a
- Temperature (°C)		0
- Pressure (kPa)		101.3
Job Number	✓	R20460
Site Team	✓	DL
Test Conducted By	✓	DL
Data Entered By	✓	DL

Test Start Time	✓	11:54
Test End Time	✓	12:14
Test Duration (min)		20
Flowmeter Rate at Start (ml/min)	✓	200
Flowmeter Rate at End (ml/min)	✓	200
Mean Flowmeter Rate (ml/min)		200
Uncorrected Volume Sampled (l)		4.00

Barometric Pressure (kPa)	✓	95.9
Ambient Temperature (°C)	✓	9
Flowmeter Calibration Factor (f)	✓	1.0065
Stack Oxygen Level (%)	✓	n/a
Volume Sampled @ Reference Conditions		3.69

Primary Tube Reference Identification Number	✓	8743127968
Security Tube Reference Identification Number	✓	8743127974
Blank Tube Reference Identification Numbers	✓	8743127967/8743127971
Mass of Siloxane on Primary Tube (ug)	✓	76.3
Mass of Siloxane on Security Tube (ug)	✓	4.8
Breakthrough (Reject if > 5%)		Accepted
Total Mass of Siloxane in Sample (ug)		81.1

Siloxane Concentration (mg/m <sup>3</sup> @ STP and Ref O <sub>2</sub> )		21.99
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**TABLE D(ii): Siloxane/Silicon Congener Breakdown**

Siloxane	Siloxane Concentration (mg/m <sup>3</sup> @ STP)	Organic Silicon Concentration (mg/m <sup>3</sup> @ STP)
Decamethylcyclopentasiloxane	6.64	2.52
Decamethyltetrasiloxane	< 0.27	< 0.10
Hexamethylcyclotrisiloxane	0.52	0.20
Hexamethyldisiloxane	1.73	0.60
Octamethylcyclotetrasiloxane	12.01	4.55
Octamethyltrisiloxane	0.27	0.10
Dodecamethylcyclohexasiloxane	< 0.27	< 0.10
Dodecamethylpentasiloxane	< 0.27	< 0.10
<b>Total Siloxane Concentration:</b>	<b>21.99</b>	
<b>Total Silicon Concentration:</b>		<b>8.26</b>