

AMGEN CYMRU	
Report Ref	AC2022/002
Document	2021 Annual Report for Bryn Pica Landfill Site EP DP3732SQ
Date	10.02.22
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Overview

Amgen Cymru has carried out a review of the results of environmental monitoring activities undertaken at the Bryn Pica landfill site, during 2021. The submission to the Environment Agency (EA) of a periodic review of environmental monitoring results is required under Section 4.2 of the sites Environmental Permit.

This report constitutes Amgen's submission under 4.2 (a) of the Environmental Permit for the Bryn Pica Landfill Site and includes analysis of results of the following monitoring tasks:

- Leachate Monitoring
- Surface Water Quality Monitoring
- Groundwater Quality Monitoring
- Landfill Gas Monitoring

Leachate Monitoring

Throughout the period Jan 21 – Dec 21 Amgen Cymru carried out leachate monitoring at 9 fixed points, representing various aspects of leachate generation at Bryn Pica. During the current reporting period a total of 52 leachate samples were collected from Bryn Pica and subject to third party laboratory analysis. A summary of results is provided and have assessed to be consistent with publish UK averages for non-hazardous municipal landfill site.

Amgen Cymru staff have continued to undertake monthly dip measurement of the leachate level residing within the landfill containment cells at the Bryn Pica Landfill. The results show that the leachate levels within the landfill site continue to be maintained within the 1m (above the basal liner) required by the Environmental Permit for the site.

Groundwater Monitoring

Throughout the period Jan 21 – Dec 21 Amgen Cymru carried out groundwater monitoring at 4 fixed points; 1 location up-gradient of the landfill and 3 down-

gradient. During the reporting period a total of 43 groundwater samples were collected from Bryn Pica and subject to third party laboratory analysis. A summary of results is provided within the report. There has been no exceedance of any limit specified within the Environmental Permit for the site and no detection of any impact from landfill operations.

Surface Water Monitoring

Throughout the period Jan 21 – Dec 21 Amgen Cymru carried out surface water monitoring at 7 fixed points; 2 location up-stream of the landfill and 5 down-stream. During the reporting period a total of 69 surface water samples were collected from Bryn Pica and subject to third party laboratory analysis.

The quality of surface water observed on and around the site is of a good standard. Throughout 2021 there was no record of an exceedance of any permitted threshold and no indication of impact from the landfill.

Landfill Gas Monitoring

Throughout the period Jan 21 – Dec 21 Amgen Cymru carried out subsurface landfill gas monitoring at 15 fixed ground gas monitoring boreholes. In total, 177 samples were measured using the hand held gas analyser GA5000.

An improvement is noted in relation to the Methane (CH₄) concentration recorded in monitoring installation located toward the northern edge of the Phase 1 landfill. The maximum concentration record was 0.4% (CH₄ by Vol) compared to levels recorded in 2020 which were in the range 0.1% to 9.2% (CH₄ by Vol).

- a) *A review of the results of the monitoring and assessment carried out in accordance with this permit against the relevant assumptions, parameters and results in the risk assessments submitted with the Application.*

Bryn Pica Environmental Monitoring Annual Report
Landfill Leachate Monitoring
Jan-21 to Dec-21

Overview			
Total Number over samples	52	Comments	Restricted acces to some of the leachate sample points due to location of tipping operations.

Key Chemical Determinands						
		Units	Count	Maximum	Minimum	Average
pH	P1L1		11	8.1	7.8	8
	P2AL1		6	8	7.8	7.8
	P2CL1		N/A	N/A	N/A	N/A
	LD1		11	8.9	7.8	8.4
	P3A		N/A	N/A	N/A	N/A
	P3BSWR		11	7.9	7.6	7.8
	P4AL2		11	7.9	7.5	7.8
	P4B		2	7.6	7.5	7.5
Ammonia (NH4 as N)	P1L1	mg/l	11	1,190	780	1,070
	P2AL1		6	952	585	777
	P2CL1		N/A	N/A	N/A	N/A
	LD1		11	287	45	165
	P3A		N/A	N/A	N/A	N/A
	P3BSWR		11	7.9	7.6	7.8
	P4AL2		11	1,640	146	1,332
	P4B		2	7.6	7.5	7.5

Key Chemical Determinands						
		Units	Count	Maximum	Minimum	Average
Electrical Conductivity	P1L1	$\mu\text{S}/\text{cm}^3$	11	14,060	12,700	13,525
	P2AL1		6	12,790	7,020	9,577
	P2CL1		N/A	N/A	N/A	N/A
	LD1		11	5,945	343	2,720
	P3A		N/A	N/A	N/A	N/A
	P3BSWR		11	19,850	14,130	17,551
	P4AL2		11	18,800	16,030	17,697
	P4B		2	8,830	7,600	8,215
Chemical Oxygen Demand (COD)	P1L1	mg/l	11	2,440	210	1,962
	P2AL1		6	1,740	112	1,229
	P2CL1		N/A	N/A	N/A	N/A
	LD1		11	2,270	174	543
	P3A		N/A	N/A	N/A	N/A
	P3BSWR		1	4,220	314	2,704
	P4AL2		11	3,820	237	2,714
	P4B		N/A	N/A	N/A	N/A
Cadmium	P1L1	mg/l	4	N/D	N/D	N/D
	P2AL1		2	N/D	N/D	N/D
	P2CL1		N/A	N/D	N/D	N/D
	LD1		4	N/D	N/D	N/D
	P3A		N/A	N/D	N/D	N/D
	P3BSWR		4	N/D	N/D	N/D
	P4AL2		4	N/D	N/D	N/D
	P4B		1	N/D	N/D	N/D

General Comments:	1. Leachate contamination comparable to previous years and typical of landfill leachate from non-hazardous municipal waste landfill.
	2. No non-compliance with any threshold stated within the Environmental Permit.

Bryn Pica Environmental Monitoring Annual Report
Groundwater Monitoring
Jan-21 to Dec-21

Overview			
Total Number of samples	43	Comments	Minimal impact from Covid-19 during reporting period. Number of samples increased by 50% compared to previous calendar year.

		Monitoring ID	Count	Max	Min	Average	Trigger Level	No. of times Exceeded
Ammoniacal Nitrogen (NH4 as N) mg/l	Upgradient	GMBH07 05	12	0.39	N/D	0.07	N/A	N/A
	Downgradient	GW 5	11	0.15	N/D	0.04	1.5	nil
		GW 6	12	0.15	0.03	0.07	1.5	nil
		GW 7	8	0.23	N/D	0.06	1.5	nil
Chloride mg/l	Upgradient	GMBH07 05	9	16.0	12.0	14.2	N/A	N/A
	Downgradient	GW 5	11	11.0	8.0	9.2	37.0	nil
		GW 6	11	11.0	5.0	7.6	37.0	nil
		GW 7	11	11.0	8.0	9.2	37.0	nil
Zinc ug/l	Upgradient	GMBH07 05	4	11.0	6.0	8.5	N/A	N/A
	Downgradient	GW 5	4	16.0	5.0	10.8	320	nil
		GW 6	4	9.0	3.0	5.8	320	nil
		GW 7	3	14.0	3.0	10.0	320	nil
Cadmium ug/l	Upgradient	GMBH07 05	4	N/D	N/D	N/D	N/A	N/A
	Downgradient	GW 5	4	N/D	N/D	N/D	0.1	nil
		GW 6	4	N/D	N/D	N/D	0.1	nil
		GW 7	3	N/D	N/D	N/D	0.1	nil
Mercury mg/l	Upgradient	GMBH07 05	0	N/R	N/R	N/R	N/A	N/A
	Downgradient	GW 5	1	N/D	N/D	N/D	0.01	nil
		GW 6	1	N/D	N/D	N/D	0.01	nil
		GW 7	1	N/D	N/D	N/D	0.01	nil

		Monitoring ID	Count	Max	Min	Average	Trigger Level	Number of Times Exceeded
Mecroprop mg/l	Upgradient	GMBH07 05	0	N/R	N/R	N/R	N/A	N/A
	Downgradient	GW 5	0	N/R	N/R	N/R	0.00004	N/A
		GW 6	0	N/R	N/R	N/R	0.00004	N/A
		GW 7	0	N/R	N/R	N/R	0.00004	N/A
Naphthalene mg/l	Upgradient	GMBH07 05	3	N/D	N/D	N/D	N/A	N/A
	Downgradient	GW 5	3	N/D	N/D	N/D	0.0001	nil
		GW 6	3	N/D	N/D	N/D	0.0001	nil
		GW 7	3	N/D	N/D	N/D	0.0001	nil

Notes	N/D - Not Detected
	N/A - Not Applicable
	N/R - No Record

Comments:	1) No failure of any trigger recorded in any of the 43 groundwater samples take at Bryn Pica during the period Jan-21 to Dec-21.
	2) Groundwater quality down-gradient of the landfill of good quality and comparable with upgradient observations. No indication of any impact on groudwater from landfill operations.

Bryn Pica Environmental Monitoring Annual Report
Surface Water Monitoring
Jan-21 to Dec-21

Overview			
Total Number over samples	69	Comments	

Key Chemical Determinands		Units	Count	Maximum	Minimum	Average	Non Compliance
pH	Upstream		22	8.3	6.9	7.5	N/A
	Downstream		46	8.94	6.2	7.7	nil
Conductivity @20C	Upstream	mg/l	23	1009	68	175	N/A
	Downstream		46	1309	N/D	660	nil
Chemical Oxygen Demand	Upstream	mg/l	23	14	N/D	3	N/A
	Downstream		46	67	N/D	7.3	nil
Ammoniacal Nitrogen (NH4 as N)	Upstream	µS/cm^3	22	5.54	0	0.34	nil
	Downstream		46	4.67	0	0.3	nil
Chloride	Upstream	mg/l	23	11	3	6	nil
	Downstream		46	65	7	13.5	nil
Suspended Solids	Upstream	mg/l	23	16	0	1	nil
	Downstream		46	305	0	12.7	nil

General Comments:	1. Water quality reported in samples taken upgradient comparative with downgradient, indicating no discernable impact from waste management operation at Bryn Pica.
	2. No breach of any emissions limit specified in site's environmental permit.

Bryn Pica Environmental Monitoring Annual Report
Subsurface Landfill Gas Monitoring
Jan-21 to Dec-21

Overview

Total Number of Samples	177	Comments	Reduced level of subsurface gas present in GMBH0602 compared to 2020.
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Summary of Sub-Surface Landfill Gas Monitoring (Outside Waste) carried out at Bryn Pica Landfill Site Jan 21 - Dec 21.												
Determinant	GMBH 7						GMBH06-01			GMBH06-02		
	Max	Min	Ave				Max	Min	Ave	Max	Min	Ave
CH4 (% by Vol)	0.1	0.0	0.1				0.1	0.0	0.0	0.4	0.0	0.1
CO2 (% by Vol)	0.2	0.1	0.1				1.5	0.1	0.4	2.0	0.0	0.5
O2 (% by Vol)	22.1	20.4	21.3				21.3	20.3	20.9	21.6	14.3	19.9
CO (ppm)	0	0	0				0	0	0	0	0	0
H2S (ppm)	0	0	0				0	0	0	0	0	0
Pressure (mbar)	0.1	-0.1	0.0				0.8	-0.1	0.3	0.1	-0.1	0.0
Determinant	GMBH06-03			GMBH06-05			GMBH06-06			GMBH06-07		
	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave
CH4 (% by Vol)	0.4	0.0	0.1	0.1	0.1	0.1	0.1	0.1	19.5	0.1	0.0	0.1
CO2 (% by Vol)	1.0	0.1	0.3	5.3	0.1	2.3	20.4	0.1	11.9	3.7	0.0	1.0
O2 (% by Vol)	21.5	19.4	20.7	21.5	14.4	19.1	21.0	1.3	8.8	21.4	2.1	15.8
CO (ppm)	0	0	0	0	0	0	0	0	0	0	0	0
H2S (ppm)	0	0	0	0	0	0	1	0	0	0	0	0
Pressure (mbar)	0.4	-0.1	0.1	0.2	-0.1	0.0	0.1	-0.1	0.0	0.1	-0.1	0.0
Determinant	GMBH06-08			GMBH06-09			GMBH06-10			GMBH06-11		
	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave
CH4 (% by Vol)	0.2	0.0	0.1	0.2	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0
CO2 (% by Vol)	0.5	0.0	0.1	3.4	0.0	0.5	2.5	0.0	0.0	1.3	0.0	0.5
O2 (% by Vol)	22.1	20.8	21.4	22.4	15.5	20.8	21.9	19.9	0.0	21.9	19.9	21.0
CO (ppm)	1	0	0	0	0	0	0	0	6	0	0	0
H2S (ppm)	0	0	0	0	0	0	0	0	6	0	0	0
Pressure (mbar)	0.1	-0.1	0.0	0.1	-0.1	0.0	0.1	-0.1	0.0	0.1	-0.1	0.0
Determinant							GMBH07-04					
							Max	Min	Ave			
CH4 (% by Vol)							0.1	0.0	0.1			
CO2 (% by Vol)							1.8	0.0	1.0			
O2 (% by Vol)							21.4	19.5	20.7			
CO (ppm)							0	0	0			
H2S (ppm)							0	0	0			
Pressure (mbar)							0.1	-0.1	0.0			
Determinant	GMBH08-01						GMBH09-01			GMBH12-01		
	Max	Min	Ave				Max	Min	Ave	Max	Min	Ave
CH4 (% by Vol)	39.9	28.2	32.6				0.1	0.0	0.1	0.1	0.0	0.0
CO2 (% by Vol)	16.8	13.9	15.3				6.6	0.0	1.3	0.8	0.1	0.4
O2 (% by Vol)	4.9	0.5	1.7				22.0	-9.3	19.6	21.5	17.1	19.7
CO (ppm)	1	0	0				0	0	0	0	0	0
H2S (ppm)	4	0	1				0	0	0	0	0	0
Pressure (mbar)	0.9	-22.8	-5.6				0.1	-0.1	0.0	0.2	-0.2	0.0

Comments:	1. Action taken in Sept-20 to increase gas extraction in area of landfill near to GMBH06 02. This is shown to have desire effect of reducing ground migration identified within this area.
	2. Similar action taken I relation to elevated levels of methane illustrated in GMBH06 06.

b) Where the Operator's management system encompasses annual improvement targets, a summary report of the previous year's progress against such targets.

No improvement targets set for 2021. No update to report.

- c) *The energy consumed at the site, reported in the format set out in Schedule 5 Table S5.3.*
- d) *The water consumed at the site, reported in the format set out in Schedule 5 Table S5.2.*

S5.3 Performance Parameters 2020			
Parameter	Frequency of Assessment	Annual Total	Unit
Potable water use	Annually	284 (est)	Cubic meters
Energy used	Annually	353	MW of electricity
Non potable water use	Annually	0	Cubic meters

- e) *The annual production / treatment set out in Schedule 5 Table S5.2.*

Table S5.2: Annual (2020) Production / Treatment	
Leachate:	Cubic meters/year
Disposed of off-site;	53,200 (est)
Disposed of to any onsite effluent treatment plant;	0
Recirculated into the waste mass;	0
Surface water and / or groundwater:	Cubic meters/year
Disposed of off-site;	n/r
Disposed of to any onsite effluent treatment plant;	0
Landfill Gas:	Normalised cubic meters/year
Combustion in flares (estimated)	123,004
Combustion in gas engines (estimated)	3,520,163
Other methods of gas utilisation;	0

f) details of any contamination or decontamination of the Site which has occurred;

There has been no evidence of contamination at the site during the reporting period and there have been no decontamination activities to report.

g) The topographical survey required by condition 3.6.3 other than those submitted as part of a CQA validation report.

To follow

- h) The volumetric difference (reported in cubic meters) between the most recent topographical survey and the previous annual topographical survey.*
- i) An assessment of the settlement behaviour of the landfill body based on the difference between the most recent topographical survey and the previous annual topographical survey for the areas of the landfill, which did not receive waste between the surveys.*
- j) A calculation of the remaining capacity (reported in cubic meters) derived from the pre-settlement contours and the most recent topographical survey.*

Please see following void-space report.

Introduction

This document provides information required under items (h), (i) and (j) of Section 4.2 of the Bryn Pica Landfill Site PPC Permit (No. DP3732SQ), which states:

A report or reports on the performance of the Activities over the previous year shall be submitted to the Agency by the 31st January (or other date agreed in writing by the Agency) each year. The reports shall include as a minimum:

- (h) the volumetric difference (reported in cubic metres) between the most recent topographical survey and the previous annual topographic survey (i.e. the additional volume of the landfill void that is occupied by waste);
- (i) an assessment of the settlement behaviour of the landfill body based on the difference survey for the areas of the landfill which did not receive waste between the surveys;
- (j) a calculation of the remaining capacity (reported in cubic metres) derived from the pre-settlement contours and the most recent topographical survey.

Item h – Volumetric Difference

The volumetric difference calculated between the topographical surveys taken at Bryn Pica in Jan 2021 and Feb 2022 gives a fill volume during that period of **24,750 cubic meters**.

Item i – Settlement Behaviour

The table on the next page an assessment of the settlement behaviour of the landfill body based on the difference between annual topographical surveys. Also please find Drawing No.AC2022/ENG/03/002 (included in settlement Behaviour Table attached) to demonstrated the settlement behaviour.

Item j – Calculation of the Remaining Void Space

The remaining capacity of the landfill is based on the November 2018 Phase 4B void survey, and the proposed basal design as submitted in the PPC, compared with the agreed Pre settlement Waste Contours prepared for the PPC.

The remaining void calculated for the Bryn Pica Landfill Site is **2,824,160 cubic meters**.

k) The compliance testing undertaken in the period.

The non-hazardous commercial municipal waste accepted at Bryn Pica over the previous 12 months is not suitable for compliance testing and in this respect, none has been carried out.

Compliance testing was undertaken on waste glass fines accepted at the landfill during Mar-21. This was limited to Loss on Ignition for the purpose of landfill tax. Results were reported to the Welsh Revenue Authority and adjustment made to landfill tax. Results can be provided if required. A list of tests undertaken during 2021 is provided below.

Qualifying Fines Sample Log Sheet

Customer : Tom Prichard Contracting

Laboratory : Envirolabs Ltd

<u>Date</u>	<u>Ticket No</u>	<u>Sample Ref</u>	<u>Date Sent</u>	<u>Lab Ref</u>	<u>Date Returned</u>	<u>Result %</u>
02/03/2021	11519	TPGF020321RS	03/03/21	21/02214	09/03/21	6.9
03/03/2021	11618	TPGF030321RS	03/03/21	21/02214	09/03/21	11.8
04/03/2021	11739	TPGF040321RS	05/03/21	21/02348	11/03/21	9.1
05/03/2021	11840	TPGF050321RS	05/03/21	21/02348	11/03/21	7.5
08/03/2021	11985	TPGF080321RS	08/03/21	21/02374	11/03/21	8.5
09/03/2021	12103	TPGF090321RS	09/03/21	21/02433	15/03/21	6.4
10/03/2021	12285	TPGF100321RS	10/03/21	21/02478	16/03/21	5.5
11/03/2021	12382	TPGF110321RS	11/03/21	21/02524	18/03/21	8.1
12/03/2021	12501	TPGF120321RS	15/03/21	21/02653	24/03/21	8.8
15/03/2021	12644	TPGF150321RS	15/03/21	21/02653	24/03/21	7.7
16/03/2021	12783	TPGF160321RS	16/03/21	21/02743	01/04/21	7.9
17/03/2021	12968	TPGF170321RS	17/03/21	21/02805	25/03/21	8
18/03/2021	13099	TPGF180321RS	22/03/21	21/03010	02/04/21	4.9
19/03/2021	13224	TPGF190321RS	22/03/21	21/03010	02/04/21	11.7
22/03/2021	13355	TPGF220321RS	22/03/21	21/03011	01/04/21	6.9
23/03/2021						
24/03/2021	13660	TPGF240321RS	24/03/21	21/03118	08/04/21	8.1
11/05/2021	18187	TPGF110521ARTL1	11/05/21	21/05128	18/05/21	7.3
12/05/2021	18281	TPGF12CDL1	13/05/21	21/05231	19/05/21	6.3
	18289	TPGF12CDL2	13/05/21	21/05231	19/05/21	6.6
13/05/2021	18390	TPGF130521ARTL1	13/05/21	21/05231	19/05/21	6.6
	18394	TPGF130521ARTL2	13/05/21	21/05231	19/05/21	5.6
14/05/2021	18517	TPGF140521ARTL1	14/05/21	21/05277	20/05/21	0.6

[illegible]

WRA Reg No: 379005 (Cynon Valley Waste)

<u>Comment</u>	<u>Invoice Number</u>
Pass	82075
Failure - WRA Notified - PreQ Reviewed	82075
Pass	82087
Pass	82087
Pass	81893
Pass	82105
Pass	82012
Pass	82030
Pass	82055
Pass	82055
Pass	83299
Pass	82336
Pass	82654
Failure - WRA Notified - PreQ Reviewed	82654
Pass	82514
Pass	83016
Pass	84498
Pass	84510
Pass	84510
Pass	84510
Pass	84510
Pass	84993

Continue testing next 20 loads until 20 consecutive passes, then review.

Continue testing next 20 loads until 20 consecutive passes, then review.

 QTR1 2021

[illegible] QTR2 2021 QTR4 2021

20th Consecutive Pass, review risk level and determine new level of testing.