

AMGEN CYMRU	
Report Ref	AC2021/001
Document	Annual Report for Bryn Pica Landfill Site EP DP3732SQ
Date	10.02.21
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Introduction

Amgen Cymru has carried out a review of the results of environmental monitoring activities undertaken at the Bryn Pica landfill site, during 2019. 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.

Environmental water monitoring activities were significantly impacted by the COVID Pandemic due to withdrawal of external laboratory testing services (National Laboratory Services) and Amgen Officers also experienced a reduce service from courier services with samples being reported as being missing in transit. To mitigate this the company procured alternative and external services and completed around 70% of tests it would expect in a normal year.

Given current works pressure and staffing levels, Amgen Officers have provide a shorter concise annual report, when compared to previous. There is no indication that landfill activities are having a negative impact on the local environment.

- 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-20 to Dec-21

Overview			
Total Number over samples	62	Comments	Redcued number of samples compared to 2019 due to issues with laboratory services resulting from Covid Pandemic.

Key Chemical Determinands		Units	Count	Maximum	Minimum	Average
pH	P1L1		9	8.3	7.9	8.1
	P2AL1		9	8.2	7.5	7.9
	P2CL1		5	8.4	7.6	8.2
	LD1		9	9	8.2	8.4
	P3A		4	8.4	7.9	8.2
	P3BSWR		9	8.3	7.5	7.8
	P4AL2		9	8.3	7.6	7.9
	P4B		8	8.4	7.5	7.8
Ammonia (NH4 as N)	P1L1	mg/l	9	1,120	964	1,063
	P2AL1		9	995	520	829
	P2CL1		6	2,300	1,500	1,897
	LD1		9	233	41	139
	P3A		4	2,600	2,310	2,405
	P3BSWR		9	1,770	1,200	1,443
	P4AL2		9	1,640	1,280	1,412
	P4B		8	1,060	520	821

Key Chemical Determinands						
		Units	Count	Maximum	Minimum	Average
Electrical Conductivity	P1L1	$\mu\text{S}/\text{cm}^3$	9	13,250	1,300	11,689
	P2AL1		9	11,850	7,100	10,002
	P2CL1		6	22,900	8,300	18,535
	LD1		9	3,300	1,852	2,749
	P3A		4	24,800	23,600	24,100
	P3BSWR		9	18,440	14,000	15,742
	P4AL2		9	18,620	15,940	16,924
	P4B		8	13,240	6,800	10,351
Chemical Oxygen Demand (COD)	P1L1	mg/l	9	2,831	2,090	2,282
	P2AL1		9	2,087	900	1,511
	P2CL1		6	4,900	3,400	4,411
	LD1		9	695	5	412
	P3A		4	6,620	5,600	6,114
	P3BSWR		9	5,799	2,240	3,259
	P4AL2		9	3,500	2,500	3,259
	P4B		8	2,236	950	2,953
Cadmium	P1L1	mg/l	3	N/D	N/D	N/D
	P2AL1		3	N/D	N/D	N/D
	P2CL1		1	N/D	N/D	N/D
	LD1		3	N/D	N/D	N/D
	P3A		0	N/D	N/D	N/D
	P3BSWR		3	0.098	N/D	0.033
	P4AL2		2	N/D	N/D	N/D
	P4B		2	N/D	N/D	N/D

Key Chemical Determinands						
		Units	Count	Maximum	Minimum	Average
	P1L1	mg/l	9	1,710	1,400	1,522
	P2AL1		9	1,430	670	1,072
	P2CL1		6	3,070	2,100	2,688
	LD1		9	543	266	346
	P3A		4	3,170	2,800	2,972
	P3BSWR		9	2,240	1,300	1,673
	P4AL2		9	2,650	1,700	2,094
	P4B		8	1,600	620	1,173

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-20 to Dec-20

Overview			
Total Number of samples	62	Comments	Reduced number of samples compared to 2019 due to issues with withdrawal of external laboratory services resulting from Covid Pandemic.

		Monitoring ID	Count	Max	Min	Average	Trigger Level	No. of times Exceeded
Ammoniacal Nitrogen (NH4 as N) mg/l	Upgradient	GMBH07 05	8	8.1	N/D	1.3	N/A	N/A
	Downgradient	GW 5	7	8.8	N/D	1.3	1.5	1
		GW 6	7	5.2	N/D	0.8	1.5	1
		GW 7	7	5.2	N/D	0.9	1.5	1
Chloride mg/l	Upgradient	GMBH07 05	8	15	13	14.4	37	N/A
	Downgradient	GW 5	7	10	8.8	9.4	37	0
		GW 6	8	9	6.7	7.5	37	0
		GW 7	7	55	11	19.3	37	1
Zinc mg/l	Upgradient	GMBH07 05	2	11	7	9	N/A	N/A
	Downgradient	GW 5	2	3	3	3	0	0
		GW 6	2	8	3	5.5	0	0
		GW 7	1	8	8	N/A	0	0
Cadmium mg/l	Upgradient	GMBH07 05	2	N/D	N/D	N/D	N/A	N/A
	Downgradient	GW 5	2	N/D	N/D	N/D	0.0001	0
		GW 6	2	N/D	N/D	N/D	0.0001	0
		GW 7	1	N/D	N/D	N/D	0.0001	0
Mercury mg/l	Upgradient	GMBH07 05	1	N/D	N/D	N/D	N/A	N/A
	Downgradient	GW 5	1	N/D	N/D	N/D	0.0001	0
		GW 6	1	N/D	N/D	N/D	0.0001	0
		GW 7	0	N/R	N/R	N/R	0.0001	N/R

		Monitoring ID	Count	Max	Min	Average	Trigger Level	Number of Times Exceeded
Mecroprop mg/l	Upgradient	GMBH07 05	1	N/D	N/D	N/D	N/A	N/A
	Downgradient	GW 5	1	N/D	N/D	N/D	0.00004	0
		GW 6	1	N/D	N/D	N/D	0.00004	0
		GW 7	1	N/D	N/D	N/D	0.00004	0
Naphthalene mg/l	Upgradient	GMBH07 05	1	N/D	N/D	N/D	N/A	N/A
	Downgradient	GW 5	1	N/D	N/D	N/D	0.0001	0
		GW 6	1	N/D	N/D	N/D	0.0001	0
		GW 7	1	N/D	N/D	N/D	0.0001	0

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

Comments:	1. Amgen Officers currently investigating elevated NH4 as N readings recorded in Nov-20. Elevated levels recorded across all monitoring location including upgradient boreholes may suggest error in lab reporting, cross contamination of samples or a general reduction in ground water quality at this time.
	2. Amgen Officer encountered much disruption due to the Covid Pandemic with samples missing in transit and delays in reporting from external labs,
	3. Groundwater quality appear consistent in upgradient and downgradient groundwater monitoring location, indicating that the landfill site is not have a demonstrable.impact on groundwater quality.

Bryn Pica Environmental Monitoring Annual Report
Surface Water Monitoring
Jan-20 to Dec-20

Overview			
Total Number over samples		Comments	Redcued number of samples compared to 2019 due to issues with laboratory services resulting from Covid Pandemic.

Key Chemical Determinands		Units	Count	Maximum	Minimum	Average	Non Compliance
pH	Upstream		15	8.1	6.9	7.6	n/a
	Downstream		30	8.4	7.2	7.9	nil
Conductivity @20C	Upstream	mg/l	15	324	55	143.3	n/a
	Downstream		30	1302	100	632	nil
Chemical Oxygen Demand	Upstream	mg/l	14	11	5	8	n/a
	Downstream		29	26	5	10	nil
Ammoniacal Nitrogen (NH4 as N)	Upstream	$\mu\text{S}/\text{cm}^3$	15	4.56	0.03	0.89	n/a
	Downstream		30	5.79	0.03	0.77	nil
Chloride	Upstream	mg/l	15	6	4.7	5.6	n/a
	Downstream		30	19	6	10.1	nil
Suspended Solids	Upstream	mg/l	15	80	3	19	n/a
	Downstream		30	96	3	18	nil

General Comments:	1. Water qualtiy reported in samples taken upgradient comparative with downgradient, indicating no descernable 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-20 to Dec-20

Overview

Total Number of Samples	141	Comments	Monitoring continued through Covid disruption as not reliant on external laboratory services.
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Summary of Sub-Surface Landfill Gas Monitoring (Outside Waste) carried out at Bryn Pica Landfill Site Jan 20 - Dec 20.

Determinant	GMBH 7						GMBH06-01			GMBH06-02		
	Max	Min	Ave				Max	Min	Ave	Max	Min	Ave
CH4 (% by Vol)	0.2	0.0	0.1				0.1	0.0	0.1	9.2	0.1	1.9
CO2 (% by Vol)	0.5	0.0	0.1				1.4	0.0	0.3	4.6	0.1	1.4
O2 (% by Vol)	23.0	20.0	21.3				22.0	20.2	21.2	22.0	6.0	16.7
CO (ppm)	0	0	0				0	0	0	1	0	0
H2S (ppm)	1	0	0				0	0	0	1	0	0
Pressure (mbar)	0.1	-0.1	0.0				0.8	-1.0	0.1	0.2	-1.2	-0.1
Determinant	GMBH06-03			GMBH06-05			GMBH06-06			GMBH06-07		
	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max	Min	Ave
CH4 (% by Vol)	0.6	0.0	0.1	0.1	0.1	0.1	33.6	0.1	12.9	0.8	0.0	0.2
CO2 (% by Vol)	2.1	0.0	0.7	3.2	0.0	1.2	21.5	0.1	8.2	4.0	0.0	1.2
O2 (% by Vol)	21.2	12.0	19.5	23.0	19.0	20.5	22.0	0.3	12.5	22.0	1.1	13.3
CO (ppm)	0	0	0	0	0	0	1	0	0	0	0	0
H2S (ppm)	0	0	0	1	0	0	1	0	0	0	0	0
Pressure (mbar)	0.1	0.0	0.0	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	0.2	0.0	0.1	0.2	0.0	0.1
CO2 (% by Vol)	4.2	0.0	0.5	5.2	0.0	1.0	2.1	0.0	0.6	2.5	0.0	0.9
O2 (% by Vol)	22.0	16.0	20.5	22.0	17.0	20.5	22.0	18.4	20.7	22.0	18.4	20.4
CO (ppm)	1	0	0	1	0	0	0	0	0	0	0	0
H2S (ppm)	2	0	0	2	0	0	7	0	1	9	0	1
Pressure (mbar)	0.1	-0.1	0.0	0.1	-0.2	0.0	0.2	-0.1	0.0	0.5	-0.1	0.1
Determinant							GMBH07-04					
							Max	Min	Ave			
CH4 (% by Vol)							0.1	0.0	0.1			
CO2 (% by Vol)							2.8	0.0	1.0			
O2 (% by Vol)							22.0	17.4	20.6			
CO (ppm)							0	0	0			
H2S (ppm)							0	0	0			
Pressure (mbar)							0.2	-0.1	0.0			
Determinant	GMBH08-01						GMBH09-01			GMBH12-01		
	Max	Min	Ave				Max	Min	Ave	Max	Min	Ave
CH4 (% by Vol)	43.1	29.0	34.0				0.1	0.0	0.1	0.1	0.0	0.1
CO2 (% by Vol)	17.5	14.5	16.0				7.8	0.0	0.8	0.8	0.1	0.3
O2 (% by Vol)	3.9	0.2	2.1				22.1	-1.1	19.6	22.0	15.9	19.8
CO (ppm)	2	0	0				1	0	0	1	0	0
H2S (ppm)	7	0	2				3	0	0	0	0	0
Pressure (mbar)	-0.2	-25.2	-9.9				0.1	-0.1	0.0	0.1	-0.5	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 2020. 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	285.0	Cubic meters
Energy used	Annually	324	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;	57,600
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)	241,000
Combustion in gas engines (estimated)	3,650,641
Other methods of gas utilisation;	0

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

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.

Please see attached survey drawing.

- 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 survey 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 2020 and Jan 2021 gives a fill volume during that period of **23,985 cubic meters**.

Item i – Settlement Behaviour

The table on the next page is an assessment of the settlement behaviour of the landfill body based on the difference between annual topographical surveys. Also please find Drawing No.AC2021/ENG/03/002 (included in settlement Behaviour Table attached) to demonstrate 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.

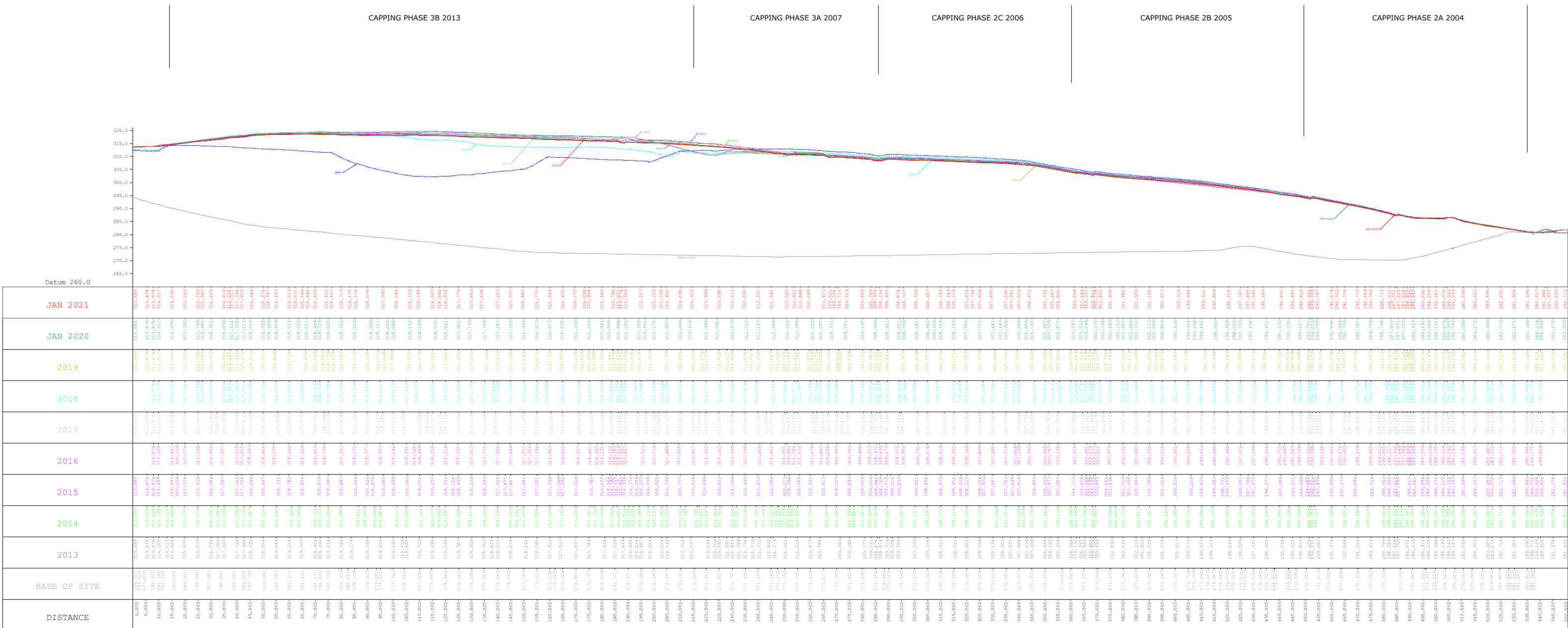
The remaining void calculated for the Bryn Pica Landfill Site is **2,848,910 cubic meters**.

Settlement Behaviour Table

		Restored Waste Cell Areas					
		Phase 4A	Phase 3B	Phase 3A	Phase 2C	Phase 2B	Phase 2A
2021	Average Waste Level	316.94	316.18	311.095	307.071	299.294	286.156
	Average Waste Thickness	44.56	45.468	39.30	34.306	25.50	11.437
	Percentage Difference	0.5	0.0	0.1	0.1	0.1	0.1
2020	Average Waste Level	317.145	316.196	311.125	307.109	299.328	286.162
	Average Waste Thickness	44.76	45.484	39.33	34.344	25.53	11.443
	Percentage Difference	0.3	0.1	-0.3	0.2	0.3	0.2
2019	Average Waste Level	317.262	316.227	311.018	307.165	299.398	286.189
	Average Waste Thickness	44.881	45.515	39.225	34.400	25.601	11.470
	Percentage Difference	0.5	0.1	-0.1	-0.1	-0.1	-0.3
2018	Average Waste Level	317.493	316.284	310.985	307.145	299.376	286.158
	Average Waste Thickness	45.112	45.572	39.192	34.380	25.579	11.439
	Percentage Difference	0.4	0.1	0.1	0.2	0.2	0.1
2017	Average Waste Level	317.672	316.331	311.022	307.214	299.419	286.169
	Average Waste Thickness	45.29	45.62	39.23	34.45	25.62	11.45
	Percentage Difference	0.5	0.2	0.3	0.2	0.3	0.4
2016	Average Waste Level	317.89	316.43	311.13	307.28	299.49	286.21
	Average Waste Thickness	45.51	45.72	39.33	34.52	25.70	11.49
	Percentage Difference	0.5	0.5	-2.3	0.3	0.4	0.2
Feb-15	Average Waste Level	317.89	316.67	310.26	307.39	299.61	286.23
	Average Waste Thickness	45.51	45.96	38.46	34.62	25.81	11.52
	Percentage Difference	1.2	0.5	-0.9	0.2	0.1	-0.3
Mar-14	Average Waste Level	318.46	316.89	309.90	307.46	299.64	286.20
	Average Waste Thickness	46.08	46.18	38.11	34.70	25.84	11.48
	Percentage Difference		0.8	0.0	0.4	0.4	0.6
Mar-13	Average Waste Level		317.27	309.91	307.60	299.74	286.27
	Average Waste Thickness		46.55	38.12	34.83	25.95	11.55
	Percentage Difference			2.0	0.3	0.4	0.2
Feb-12	Average Waste Level			310.69	307.71	299.84	286.30
	Average Waste Thickness			38.89	34.94	26.04	11.58
	Percentage Difference			1.0	0.4	0.2	-0.6
Jan-11	Average Waste Level			311.06	307.86	299.90	286.23
	Average Waste Thickness			39.27	35.10	26.10	11.51
	Percentage Difference			0.9	0.4	0.1	0.5
Jan-10	Average Waste Level			311.43	307.99	299.92	286.29
	Average Waste Thickness			39.64	35.23	26.13	11.57
	Percentage Difference			1.5	1.0	1.3	0.8
Dec-09	Average Waste Level			312.02	308.36	300.26	286.38
	Average Waste Thickness			40.23	35.59	26.47	11.67
	Percentage Difference			1.8	-3.3	0.2	21.0

Jan-08	Average Waste Level			312.75	307.22	300.32	289.48
	Average Waste Thickness			40.96	34.46	26.52	14.76
	Percentage Difference				4.4	1.4	-1.3
Jan-07	Average Waste Level				308.80	300.69	289.29
	Average Waste Thickness				36.04	26.89	14.58
	Percentage Difference					3.1	-0.4
Jan-06	Average Waste Level					301.55	289.23
	Average Waste Thickness					27.75	14.51
	Percentage Difference					2.4	2.8
Jan-05	Average Waste Level					302.24	289.65
	Average Waste Thickness					28.44	14.93
	Percentage Difference					-9.1	-12.3
Feb-04	Average Waste Level					299.86	288.02
	Average Waste Thickness					26.1	13.3
Overall Difference		-0.97	-0.98	-1.767	-1.656	-2.863	-3.490
Assumed Difference (Average Base Level)		272.381	270.712	271.793	272.765	273.797	274.719

	Average level influenced by haulage road on capped area.
	Level prior to restoration.
	Restored level.



<u>Client:</u> AMGEN Cymru Ltd <u>Job Title:</u> BRYN PICA WASTE MANAGEMENT FACILITY ANNUAL REPORT 2020 <u>Drawing Title:</u> TYPICAL SECTION THROUGH PHASES 2A, 2B, 2C, 3A, 3B & 4A SHOWING SETTLEMENT CHARACTERISTICS	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Rev.</th> <th style="width: 60%;">Description</th> <th style="width: 30%;">Date</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Drawn by:</td> <td style="width: 35%; text-align: center;">APW</td> <td style="width: 30%;">Checked by:</td> <td style="width: 35%; text-align: center;">APW</td> </tr> <tr> <td>Date:</td> <td style="text-align: center;">30.01.2021</td> <td>Date:</td> <td style="text-align: center;">30.01.2021</td> </tr> </table>	Rev.	Description	Date																						Drawn by:	APW	Checked by:	APW	Date:	30.01.2021	Date:	30.01.2021	 AMGEN Cymru Ltd. Bryn Pica Llwydcoed Aberdare CF44 0BX. Tel: 01685 870770
Rev.	Description	Date																																
Drawn by:	APW	Checked by:	APW																															
Date:	30.01.2021	Date:	30.01.2021																															

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.