

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Brookhill Landfill Site

Flintshire County Council Waste Management Services

Environmental Management 2024

Quarterly Monitoring Review, July – September 2024

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13070a Brookhill Landfill Site Survey 2023

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1.0 INTRODUCTION

1.1 Background

1.1.1 This report has been compiled in compliance with the Environmental Permit (EP) AP3739KS for Brookhill Landfill Site (the 'Site'), held by Flintshire County Council (FCC) Waste Management Services, which requires that the monitoring data collected at the Site is reviewed quarterly. The data reviewed in this report was collected between the 5th of July and the 30th of September 2024.

1.1.2 This report records the monitoring data for landfill gas, leachate, groundwater, surface water and dust, and discusses this data in relation to emission limits set in the EP. Third-party information supplied by Flintshire County Council (FCC) Waste Management Services has been used in good faith within this document. Caulmert Limited has not attempted to verify the information.

1.2 Site Location and Surrounding Land Use

1.1.1 Brookhill Landfill Site is located approximately 1.5 km north of Buckley, Flintshire, North Wales at NGR SJ 278 656. The Site is accessed via the Pinfold Industrial Estate, Pinfold Lane, which is located off the A494 Mold to Ewloe Road.

1.2.1 The Site is bound to the east by a wooded, disused railway leading to open grassland. Agricultural land lies to the west of the Site. The Pinfold Industrial Estate and several residential properties (on the outskirts of Buckley, approximately 400 m away) are situated to the south of the Site. A restored refuse tip (Ewloe Barn Landfill) lies to the north of the Site. It is currently rough grassland leading to open grazing land and some woodland.

1.2.2 The landfill Site has been developed in a former quarry, which was worked for Buckley Fireclay and the siltstones and mudstones beneath the Fireclay (known as the Warrant) for use in the manufacturing of bricks and tiles. In 1997, in preparation for the engineering for the landfill site, further Fireclay was removed together with a quantity of coal in the quarry base under agreement with the Coal Authority.

1.2.3 Brookhill Landfill Site started accepting waste in 1999. The wastes permitted at the Site were stipulated within the Site permit. The general waste streams which were permitted at the Site throughout its history can be summarised as:

- Domestic food and organic wastes – approximately 60%;
- Non-hazardous industrial wastes, (including plastic, paper, cardboard, wood, stone and sand, etc) – approximately 40%;
- Special wastes (allowed until June 2004).

1.2.4 The special wastes which were tipped at the Site were accepted pre-June 2004 (under the Waste Management Licence (WML) for the Site). Therefore, they would have been deposited predominantly within Cell 1, and the lower parts of Cells 2, 3 and 4. It is unlikely that any of the waste tipped in Cells 5 and 6 contains any 'special waste' waste streams. The Site ceased

accepting waste in late 2007. The final capping and restoration phases were completed in 2010.

2.0 LANDFILL GAS

2.1 Monitoring regime

- 2.1.1 Routine landfill gas monitoring is carried out on a weekly basis at perimeter locations BH1 to BH25, and monthly at all in-waste locations. Perimeter and in-waste borehole locations are shown on the attached drawing ref. 11681d Rev1, 'Brookhill Gas Infrastructure'.
- 2.1.2 Methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide, relative pressure, and atmospheric pressure are recorded on each visit.

2.2 Perimeter Boreholes

- 2.2.1 Methane and carbon dioxide data from all perimeter boreholes are displayed in a summary table and time-series graphs in Appendix 1. The landfill gas data obtained during the review period was compared with the limits stipulated in the EP (shown in the appendix tables).

Methane

- 2.2.2 During this review period, there were no breaches of the respective methane EP Compliance Limits (Table S3.5 of the EP) at any of the monitoring locations.
- 2.2.3 The average methane concentration for the perimeter boreholes ranged from 0.02 % (BH23) to 26.8% (BH8) during Q3. The average quarterly methane concentration for the perimeter boreholes as a whole was 0.53%, a decrease from Q2 where the average was 0.75 %, and Q1 with a 1.36 % average methane.
- 2.2.4 The highest methane concentrations detected were at BH8, 26.8 %, and BH9, 4.70 %, however, both remained below their respective compliance limits, 32.2 % and 29.6 %, respectively. It should be noted that the methane concentrations in BH8 remained relatively stable across Q3 but significantly increased from 0.10 % to 26.8 % in September.

Carbon Dioxide

- 2.2.5 Carbon dioxide concentrations fluctuated in most locations throughout Q3 2024, as observed in previous reviews. Average concentrations ranged from 0.46% (BH16) to 3.12 % (BH21). The average quarterly carbon dioxide concentration for the perimeter boreholes as a whole was 1.38 %.
- 2.2.6 No exceedances of the EP Compliance Limits for the respective monitoring locations were observed during this review period.
- 2.2.7 The maximum carbon dioxide concentration was 7.40 % in BH21, A significant decrease compared to the concentration detected in BH21 during Q2, 16.40 %.

2.3 In-waste Boreholes

- 2.3.1 The gas field at Brookhill Landfill Site is monitored and balanced on a regular basis. In accordance with Condition 4.2.2 of the EP, landfill gas monitoring data for the in-waste boreholes for this review period is included in Appendix 1.
- 2.3.2 The average methane, carbon dioxide, and oxygen concentrations across the in-waste gas wells for Q3 were 41.87 %, 30.28 %, and 3.53 %, respectively. The concentration of methane and carbon dioxide showed a decrease from the Q2 averages of 51.82 % and 34.85 %, respectively. The average oxygen concentration increased from the Q2 average of 1.97 %.
- 2.3.3 Average methane concentrations across the in-waste boreholes ranged from 3.60 % (GV08) to 69.30 % (PW03). Carbon dioxide averaged between 5.85 % (LC01B) and 41.55 % (GV48). The highest average concentration of oxygen across the in-waste boreholes was 19.10 % (LC03).
- 2.3.4 The carbon monoxide concentrations across all in-waste monitoring locations varied from 0 ppm to 41 ppm. The average carbon monoxide concentration across all the in-waste boreholes was 3.16 ppm. The maximum concentration of carbon monoxide was detected in GV35.
- 2.3.5 The concentration of hydrogen sulphide across the in-waste boreholes ranged from 0 ppm to 71 ppm. The highest concentrations of hydrogen sulphide were detected at GV49. It should be highlighted that GV49 is labelled as “*fully open*”. The concentrations detected at GV49 are significantly elevated compared to the remainder of the site and will be reviewed as part of the annual review to assess any trends within this location. The average concentration of hydrogen sulphide across the in-waste boreholes was 2.57 ppm.
- 2.3.6 The number of wells with potential air ingress during Q3 is nineteen wells. An increase in the number of wells compared to Q2. Wells with potential air ingress are shown in Table 1.

Table 1 Wells with potential Air ingress

Monitoring Point	Series	O2 %			% above 5%
		Min	Max	Avg	
BHG010MA	Other Wells	5.50	8.50	7.50	100%
BHG010MB	Other Wells	7.50	8.00	7.83	100%
BHG01MDA	Other Wells	4.70	8.70	7.37	67%
BHG01MDB	Other Wells	7.30	8.20	7.90	100%
BHGV0001	GV Wells	0.30	23.90	11.53	50%
BHGV0007	GV Wells	0.00	10.30	5.15	50%
BHGV0008	GV Wells	17.80	17.80	17.80	100%
BHGV0013	GV Wells	0.00	10.50	5.05	50%
BHGV0022	GV Wells	18.50	18.50	18.50	100%
BHGV0023	GV Wells	14.00	14.10	14.05	100%
BHGV0036	GV Wells	0.00	11.00	5.48	50%
BHGV0037	GV Wells	0.00	9.20	4.60	50%
BHGV0039	GV Wells	5.40	21.70	13.40	100%
BHGV0044	GV Wells	0.00	22.10	11.03	50%
BHLC0003	LC Wells	19.10	19.10	19.10	100%
BHLC001B	LC Wells	18.80	18.90	18.85	100%

Monitoring Point	Series	O2 %			% above 5%
		Min	Max	Avg	
BHLC004B	LC Wells	0.10	7.60	3.85	50%
BHPW0004	Other Wells	0.00	7.30	3.65	50%
BHR00001	LC Wells	0.00	7.30	3.65	50%

- 2.3.7 With regards to wells that were identified as “*fully open*” or “*partially open*”, the average methane concentration was 41.87 %, the average carbon dioxide concentration was 30.28 % and the average oxygen concentration was 3.53 %.
- 2.3.8 Average concentrations are reflective of the optimum concentrations that would be expected in an active gas field.

3.0 LEACHATE

3.1 Introduction

3.1.1 Leachate levels at leachate chambers LW1, LC1B, LC2B, LC3 LC4B, LW6 and LC6B and remote leachate monitoring points R1B, R2B, R3, R4B, R5 and R6B were monitored monthly. Well locations are shown on the attached drawing ref. 11681cRev2 'Leachate Infrastructure'. No results for LC3 and LC5 are reported, as agreed with Natural Resources Wales on the 16th of April 2013.

3.1.2 A comprehensive borehole survey was carried out in July 2021. Updated ordnance datum values for the leachate monitoring points have been used in the calculations of the levels during this review period. Leachate well depths to base were last measured on 21st December 2021.

3.1.3 Leachate samples are analysed quarterly. Samples were collected on the 26th of September 2024, and analysed for:

- | | | |
|-----------------------------------|---------------------------------|----------------------------------|
| • Total Organic Carbon, | • Chloride, | • Total Oxidised Nitrogen (TON), |
| • Alkalinity, | • Chemical Oxygen Demand (COD), | • Calcium, Magnesium, |
| • Ammoniacal Nitrogen, | • pH, | • Potassium, |
| • Biological Oxygen Demand (BOD), | • Sulphate, | • Sodium. |

3.1.4 The leachate treatment plant at the Site accepts leachate from Brookhill Landfill Site and the nearby Standard Landfill Site. The treated effluent is discharged to the public sewer and is subject to a trade effluent agreement (Discharge Consent, DC).

3.1.5 Treated leachate discharge (Final Discharge, FD) is sampled monthly and is analysed for:

- | | | | |
|-----------------------------------|-------------------|-----------------------------|--------------|
| • Alkalinity, | • Copper, | • Suspended Solids, | • Chromium, |
| • Ammoniacal Nitrogen, | • Iron, | • TPH/Oil & Grease, | • Copper, |
| • Biological oxygen demand (BOD), | • Lead, | • Zinc, | • Iron, |
| • Chloride, | • Nickel, | • Cyanide (free and total), | • Lead, |
| • Chromium, | • Nitrate, | • Total Oxidised Nitrogen, | • Magnesium, |
| • Chemical Oxygen Demand (COD), | • Nitrite, | • Cadmium, | • Manganese, |
| | • Organic Carbon, | • Calcium, | • Mercury, |
| | • pH, | | • Nickel, |
| | • Sodium, | | • Potassium, |
| | • Sulphate, | | • Sodium, |
| | | | • Zinc. |

3.1.6 Data summaries of leachate and discharge quality can be found in Appendix 2. Leachate levels are represented graphically, in meters above ordnance datum (mAOD) for easier comparison to groundwater levels.

3.2 Leachate Levels

- 3.2.1 Table S4.1 in the EP requires that leachate levels must not exceed 2 m above the base of Cells 1 and 6, and 3 m above the cell base of Cells 2-5.
- 3.2.2 Pumped leachate levels recorded during this review period are summarised in Table 2. As discussed with NRW, ‘pumped’ leachate levels are recorded after pumps are switched off for up to 4 hours before a dip is obtained. Pumped leachate levels are provided for completeness, and to provide additional information regarding the efficiency of the leachate management strategy at the Site.
- 3.2.3 As part of the routine monitoring, ‘rest’ levels of leachate were also recorded, which reflect the head of leachate after 48 hours of recovery (which has been demonstrated to be enough time to reach rest, in accordance with report 3448-VAU-XX-XX-RP-V-9107.A0-C1¹). The rest leachate levels are reported in relation to the compliance limits in Table 3 and plotted in Appendix 2.

Leachate Wells

- 3.2.4 The ‘pumped’ leachate levels, indicated in Table 2, which were consistent throughout the quarter and generally indicates that leachate extraction appears to be optimised, with leachate head above the base of the wells typically less than 2 m.

Table 2 Pumped Leachate Levels (mAOD) (Levels above 2m are highlighted in yellow).

Landfill Cell	Monitoring Point	Pumped Level 24.07.2024	Pumped Level 26.08.2024	Pumped Level 25/09/2024	Base of well
Cell 1	BK LC 1B	119.37	119.33	119.29	118.73
	BK R1 B	119.48	119.5	119.48	118.72
	BK LW 1	121.96	121.99	122.01	121.32
Cell 2	BK LC 2B	115.42	115.37	115.4	113.47
	BK R2B	116.85	116.87	116.85	115.4
Cell 3	BK LC 3	124.85	124.82	124.84	119.73
	BK R3	112.05	112.06	112.09	109.99
Cell 4	BK LC 4B	114.83	115.3	115.28	113.83
	BK R4B	116.66	116.68	116.65	114.86
Cell 5	R5	117.03	117.05	117.03	114.15
Cell 6	BK LC 6B	123.66	123.64	123.61	122.36
	BK R6B	122.36	122.38	122.43	120.77
	BK LW 6	123.92	123.96	124	-

¹ Caulmert Ltd, February 2019; Document reference 3448-CAU-XX-XX-RP-V-9107-A0-C1: Brookhill Improvement Actions; Trial of Leachate Extraction from Gas Wells – Interpretative report.

- 3.2.5 The 'rest' leachate levels compared against relevant compliance limits are presented in Table 3. In the current review period, ten of the 13 wells were over their respective compliance limits during the review period, with the exception of LC4B in September.

Table 3 Rest Leachate Levels (mAOD) (exceedances of the EP limit are highlighted in yellow)

Landfill Cell	Monitoring Point	Rest Level 24.07.2024	Rest Level 26.08.2024	Rest Level 25/09/2024	Compliance limit
Cell 1	BK LC 1B	120.2	120.25	120.13	119
	BK R1 B	120.05	120.08	120.15	119
	BK LW 1	122.36	122.3	122.19	119
Cell 2	BK LC 2B	116.63	116.4	116.18	117
	BK R2B	117.36	117.3	117.36	117
Cell 3	BK LC 3	125.46	125.41	125.34	-
	BK R3	112.61	112.55	112.46	113.37
Cell 4	BK LC 4B	115.44	115.73	112.58	115
	BK R4B	117.65	117.58	117.53	115.6
Cell 5	R5	117.72	117.83	117.74	115.91
Cell 6	BK LC 6B	124.11	124.18	124.11	122
	BK R6B	123.44	123.27	123.13	122.24
	BK LW 6	124.6	124.76	124.7	122

- 3.2.6 The results overall indicate relatively stable leachate levels across the Site and suggest extraction may be in equilibrium with leachate generation over the Site. The average difference between the rest and pumped levels was 0.55 m across the Site with a range from -0.55 m to 1.01 m. This continues to suggest that the extraction at the Site is optimised.
- 3.2.7 The observed results and compliance limits around the Site will be assessed in relation to the relative risk posed by the Site as part of the Hydrogeological Risk Assessment, and appropriate management strategies proposed therein as required to manage risks posed by the Site.

Gas Wells

- 3.2.8 As highlighted in the interpretive report 3448-CAU-XX-XX-RP-V-9107¹, a brief update and review of the progress of the leachate extraction from gas wells is to be included in the quarterly reports. No counter readings were collected during this quarter.
- 3.2.9 Leachate head continues to be well maintained (Appendix 2, Graph 5), with levels remaining stable throughout the review period. Generally, levels have remained low (± 0.5 m), while extraction remained sustainable, suggesting steady-state conditions.
- 3.2.10 Leachate extraction from these wells will be continued and reported within the quarterly reviews for the Site. The extraction in individual areas as well as from the gas-well system will continue to be reviewed in relation to leachate dynamics and ongoing leachate management strategy for the Site.

3.3 Leachate Quality

3.3.1 Detailed leachate quality data is highlighted in Appendix 2.

Quarterly parameters

- 3.3.2 The leachate concentration of Ammonia (as N) concentrations ranged from 1,009 mg/L (LC3) to 2,673 mg/L (LC6). The average ammonia concentration in leachate across the Site in Q3 (1,967.8 mg/L) increased compared to Q2 (1,834.8 mg/L). However, it should be noted that concentrations are 643.5 mg/L less than the average leachate ammonia concentration in Q1 (2,611.3 mg/L).
- 3.3.3 The sulphate concentration in leachate at the Site ranged from 64.6 mg/L (LC5) to 186 mg/L (LW1 and LW6) in Q3. The lowest sulphate leachate concentration is marginally higher than the equivalent in Q2 (60 mg/L). The greatest leachate sulphate concentration decreased by 64.00 mg/L compared to Q2 (250 mg/L).
- 3.3.4 The chloride leachate concentrations detected on Site ranged from 1,413 mg/L (LC3) to 3,396 mg/L (LC6). The average chloride leachate concentration detected on the Site was 2,446.88 mg/L. This is a slight decrease from the average chloride leachate concentrations detected in Q2 and Q1 (2,786.38 mg/L, and 2,591.25 mg/L respectively).
- 3.3.5 The maximum chemical oxygen demand (COD) concentration within the leachate on Site in Q3 was 6,490.00 mg/L in LC6. It should be noted that locations LC6, LW1, and LW6 contained considerably higher concentrations of COD in the leachate than the remaining monitoring locations (6490 mg/L, 6450 mg/L, and 6190.00 mg/L respectively). The average COD concentration in the leachate in Q3 was 4,485 mg/L. This is 1,152.50 mg/L greater than the average COD concentration in the leachate in Q2 (3,332.50 mg/L).
- 3.3.6 pH concentrations within the leachate were near neutral across the site with an average of 7.6.

3.4 Final Discharge to Sewer

- 3.4.1 It should be noted that only one sample was taken in the final discharge to sewer in September rather than the normal three.
- 3.4.2 The lowest recorded ammonia concentration in the final discharge was 0.17 mg/L at the end of August. Conversely, the highest ammonia concentration was 87.50 mg/L (29th of September). It should be noted that leachate will not be discharged if it is over the compliance limit. The average concentration of ammonia in the final discharge in Q3 was 12.97 mg/L. This is a noticeable increase compared to the average in Q2 (2.42 mg/L).
- 3.4.3 The COD concentrations in the final discharge did not exceed the relevant EP Compliance Limit (2,000 mg/L) throughout Q3 (maximum of 1,860 mg/L).

- 3.4.4 A maximum suspended solid concentration of 420 mg/L was recorded during Q3. The suspended solids concentrations in the final discharge did not exceed the relevant EP Compliance Limit (500 mg/L) throughout Q3.

The final discharge was analysed for metals (chromium, copper, lead, nickel, and zinc). The concentrations of all metals did not exceed the relevant EP Compliance Limit, 2.00 mg/L, throughout Q3. It should be noted, the concentration of Iron in the final discharge was monitored three times (05/07/2024 (3.221 mg/L), 22/08/2024 (2.966 mg/L), and 26/09/2024 (5.968 mg/L)).

4.0 GROUNDWATER

4.1 Introduction

4.1.1 Borehole locations are shown on the attached drawing ref. 11681b Rev2 'Brookhill Ground Water Plan'. Groundwater levels were recorded monthly in monitoring boreholes GW1 – GW8.

4.1.2 Samples were collected monthly and were analysed for the determinants listed below:

- *Ammonia,*
- *Chloride,*
- *Electrical conductivity,*
- *Dissolved oxygen,*
- *pH.*

4.1.3 In addition to the monthly determinants, groundwater samples collected in June were analysed for the following quarterly parameters:

- | | | |
|-----------------------------------|---------------------|--------------------------------|
| • <i>Alkalinity,</i> | • <i>Copper,</i> | • <i>Benzene,</i> |
| • <i>Chemical oxygen demand,</i> | • <i>Iron,</i> | • <i>Ethylbenzene,</i> |
| • <i>Sulphate,</i> | • <i>Lead,</i> | • <i>M,p-xylene,</i> |
| • <i>Total oxidized nitrogen,</i> | • <i>Magnesium,</i> | • <i>BTEX,</i> |
| • <i>Cadmium,</i> | • <i>Manganese,</i> | • <i>Xylenes,</i> |
| • <i>Calcium,</i> | • <i>Nickel,</i> | • <i>Toluene,</i> |
| • <i>Chromium,</i> | • <i>Potassium,</i> | • <i>Total organic carbon.</i> |
| | • <i>Sodium,</i> | |
| | • <i>Zinc,</i> | |

4.1.4 Time-series graphs and results summary of the laboratory analysis data are included in Appendix 3.

4.2 Groundwater Levels

4.2.1 Time series graphs of the groundwater levels are included in Appendix 3. Groundwater levels across the Site generally decreased throughout the quarter, reflecting seasonal trends. Groundwater levels ranged from 114.02 mAOD (GW8) to 131.24 mAOD (GW7).

4.3 Groundwater Quality

4.3.1 Detailed groundwater quality data is highlighted in Appendix 3. Monthly testing was carried out in July (26th), August (23rd) and September (26th). The quarterly parameters were tested in September 2024.

Monthly parameters

4.3.2 As reported in the previous review, the EP limit of 1.7 mg/L for ammoniacal nitrogen was exceeded consistently throughout the review period in locations GW2A, GW3A and GW4. The concentrations within these wells are recorded in Table 4. It should be noted that these

concentrations are below the maximums reported during Q2 (4.30 mg/L, 15.4 mg/L and 7.15 mg/L in GW2A, GW3A and GW4 respectively). The average concentration of ammoniacal nitrogen across the remaining boreholes in Q3 was 1.96 mg/L.

Table 4 locations where the concentration of ammoniacal nitrogen exceeds the EP limit across Q3.

Date	Units	EP Limit	GW2A	GW3A	GW 4
26/07/2024	mg/L	1.7	3.30	2.70	2.10
23/08/2024	mg/L	1.7	2.70	7.50	5.20
26/09/2024	mg/L	1.7	2.50	1.50	5.70

- 4.3.3 The concentration of chloride detected at GW2A and GW4 was consistently greater than the EP limit of 60 mg/L chloride across Q3. Additionally, GW3A exceeded the EP limit during August. The concentrations of chloride which exceeded the EP limit in Q3 are highlighted in Table 5. Maximum concentrations within the remaining monitoring locations ranged from 17.10 mg/L (GW1.1) to 409 mg/L (GW5A). The chloride concentrations within GW5A were significantly higher during September than in the previous reviews, this trend will be monitored within the following quarterly and annual review.

Table 5 Locations where the concentration of chloride exceeds the EP limit across Q3.

Date	Units	EP Limit	GW2A	GW3A	GW 4
26/07/2024	mg/L	60	73.30	57.20	60.80
23/08/2024	mg/L	60	75.80	124.00	139.00
26/09/2024	mg/L	60	74.00	53.70	140.00

- 4.3.4 The pH across the monitoring locations ranged from pH 6.2 (GW8 and GW4) to pH 7.7 (GW7). The average pH across the boreholes was near neutral at pH 6.8.
- 4.3.5 The average concentration of electrical conductivity across the site increased to 1,661.48 mS/cm in Q3 from 995.08 mS/cm in Q2. As expected, the greatest electrical conductivity was seen within GW5A (3,489 mS/cm during September.) As noted in previous reviews, this coincides with elevated levels of chloride.

Quarterly parameters

- 4.3.6 The concentration of Iron in the groundwater had significant variability across the borehole locations. The concentration of Iron ranged from 0.03 mg/L (GW6) to 27.72 mg/L (GW4). The concentration of Iron in previous quarters has consistently been elevated at GW4. Locations GW2 and GW8 also presented with elevated Iron levels at 2.14 mg/L and 1.40 mg/L respectively. The average Iron concentration within the groundwater was 3.64 mg/L during Q3. This is lower than the average of 5.25 mg/L observed in Q2.
- 4.3.7 Chromium concentrations ranged from below the limit of detection (<0.0001 mg/L) within GW4 to 0.0063 mg/L within GW5. The concentration of Lead was below the limit of detection (<0.0002 mg/L) at all groundwater monitoring locations during Q3.
- 4.3.8 Nickel and Zinc concentrations remained below the compliance limit of <0.15 mg/L and <0.254 mg/L, respectively. Nickel concentrations ranged from <0.0015 mg/L (GW1, GW1.1,

GW3A, GW6, and GW7) to 0.069 mg/L (GW5A). Zinc concentrations were greatest within GW1.1 at 0.0249 mg/L. Zinc concentrations at the remaining monitoring locations ranged from 0.0036 mg/L (GW6) and 0.0239 mg/L (GW1).

- 4.3.9 The groundwater calcium concentrations were greatest at GW1 and GW1.1, 469 mg/L and 467 mg/L respectively. This reflects the groundwater calcium concentrations in the previous quarter (Q2), 496 mg/L and 419 mg/L respectively. The average groundwater calcium concentration across all borehole locations was 182.5 mg/L.
- 4.3.10 The sulphate concentration in the groundwater had increased in Q3 compared to Q2. The range of sulphate concentration in the groundwater during Q3 was 32.20 mg/L (GW7) to 743.00 mg/L (GW1). The boreholes with the lowest and greatest groundwater sulphate concentration in Q3 remain the same as noted in Q2, GW7 (10.1 mg/L) and GW1 (126 mg/L) respectively.
- 4.3.11 The groundwater BTEX concentration was below the limit of detection (<0.1 mg/L) across all borehole monitoring locations in Q3.

5.0 SURFACE WATER

5.1 Introduction

5.1.1 Surface water samples can be taken from three locations, SW2, P2, and P4. Water flows in a northerly direction alongside the outside perimeter fence of the western boundary of the Site. Water accumulates in a pond at SW2 before slowly seeping through a man-made underground bypass drain which runs along the outside of the Site towards the northern boundary. P2 is a pond to the west, which collects surface water run-off from the landfill. P4 is located in a field to the northwest of the Site, beyond landfill gas monitoring borehole BH10.

5.1.2 Samples were only obtained from P4 during this quarter. As agreed with NRW, water in P2 is only sampled when there is the likelihood of an overflow to the discharge point². P2 was not sampled during this review period. In addition, there were no samples taken from SW2 during this review period.

5.1.3 As only one sample has been analysed, it cannot be assumed the data subsequently presented represents the whole Site. Caution should be taken when interpreting results.

5.1.4 Collected sample was analysed for the range of determinants listed below:

- *Ammoniacal nitrogen,*
- *Chloride,*
- *Chemical oxygen demand (COD),*
- *pH,*
- *Total suspended solids.*

5.1.5 In the Environmental Permit, Table S4.3, it indicates that location P2 is the only surface water controlled by chemical quality limits. Subsequently, the data presented in this report cannot be compared against any EP Compliance Limits. A summary of the laboratory analysis data is included in Appendix 4.

5.2 Surface Water Quality

5.2.1 Detailed surface quality data is highlighted in Appendix 4.

5.2.2 The concentration of ammoniacal nitrogen in surface water ranged from 0.2 mg/L to 2.3 mg/L across Q3. Concentrations within P4 increased compared to the previous quarters' maximum of 0.18 mg/L. On average, the ammoniacal nitrogen concentration was 1.04 mg/L. The surface water chloride concentration in Q3 averaged 49.97 mg/L. This is a significant decrease from the Q2 average of 93.56 mg/L.

5.2.3 At the surface water location P4, the COD concentration was lowest in August and highest in September, 40 mg/L and 67 mg/L respectively. Concentrations decreased significantly compared to the maximum noted during May (242 mg/L)

² E-mail correspondence, 14.07.2014, Alison Soper (NRW) to Phil Mulhall (FCC).

- 5.2.4 The concentration of suspended solids increased monthly in Q3 from 23.2 mg/L in July to 132 mg/L in September. The elevated concentration of suspended solids in September may be a result of increased run-off due to high levels of rain across the month. The continued assessment of suspended solids will continue into Q4 to monitor any potential risks to the Site.
- 5.2.5 The pH of the surface water location in Q3 was near neutral at an average of pH 7.70. Average concentrations remain similar to Q2 and Q1, pH 7.89 and pH 7.91 respectively.

6.0 DUST

6.1 Introduction

- 6.1.1 Dust monitoring was undertaken during this review period from 24/09/2024 to 22/10/2024.
- 6.1.2 Location 2 is located next to the electricity meter housing. It should also be noted that young trees around the gauge are starting to mature, potentially affecting results at location 2 in the near future. Location 3 was at Oaks Farm; algal growth was noted during this review period.
- 6.1.3 A value from Location 1 was unobtainable due to the collection bottle having an insufficient sample to analyse.

6.2 Dust Results

- 6.2.1 Dust monitoring results are shown in Table 4, and the lab report is included in Appendix 5.

Table 4: Results from dust monitoring at Brookhill Landfill Site

Monitoring Locations	Sample Volume	Total Suspended Solids		Compliance Limit
	(mg/l)	(mg)	(mg/m ² /day)	(mg/m ² /day)
Location 1	-	-	-	200
Location 2	4960.00	<10.00	<8.82	200
Location 3	4970.00	14.30	12.61	200

- 6.2.2 All dust concentrations were below the compliance limit during Q3.

7.0 CONCLUSIONS

7.1 Landfill Gas

- 7.1.1 Landfill gas concentration was monitored at locations on a weekly basis at perimeter locations and monthly at all in-waste locations.
- 7.1.2 Methane concentrations within all perimeter boreholes remained below their respective EP limits throughout the review period. Carbon dioxide concentrations of all perimeter boreholes remained below their respective EP limits. Two in-waste locations detected significantly high hydrogen sulphide boreholes.
- 7.1.3 Q3 exhibited lower gas concentrations in comparison to the preceding quarter. Both methane and carbon dioxide showed a decrease from the previous quarter's averages. It is suspected that nineteen in-waste boreholes are demonstrating various amounts of air ingress across the Site (Table 1).

7.2 Leachate

- 7.2.1 Since the first quarter of 2019 leachate levels have been recorded and reported both as 'pumped' levels and as 'rest' levels. Compliance has been assessed using the 'rest' leachate levels.
- 7.2.2 Leachate levels remained steady throughout this quarter. However, ten wells exceeded their compliance limits. The results continue to suggest extraction may be in equilibrium with leachate generation over the Site. Overall, leachate levels are consistent with previous review periods, and the data suggests the leachate abstraction regime is optimised.
- 7.2.3 The concentrations of ammonia, and COD were elevated compared to Q2 in the leachate. Conversely, concentrations of sulphate and chloride in the leachate on Site had decreased in Q3 compared to Q2.
- 7.2.4 The concentrations of COD, suspended solids and all metals, in the final discharge did not exceed the relevant EP Compliance Limit throughout Q3.

7.3 Groundwater

- 7.3.1 The ammoniacal nitrogen EP limit of 1.7 mg/L was consistently exceeded by GW2A, GW3A and GW4 in Q3. Additionally, GW2A and GW4 locations had consistently elevated chloride levels (above the EP limit of 60 mg/L) during the review period. It should be noted that GW3A also exceeded the chloride EP limit during August.
- 7.3.2 All other parameters with EP limits remained below their respective compliance limits.

7.4 Surface Water

- 7.4.1 Only one surface water sample (P4) was collected and may not represent the Site as a whole. There are no relevant EP compliance limits for P4.

7.4.2 The concentrations of ammoniacal nitrogen, chloride, COD, and suspended solids in Q3 compared to Q2 had increased.

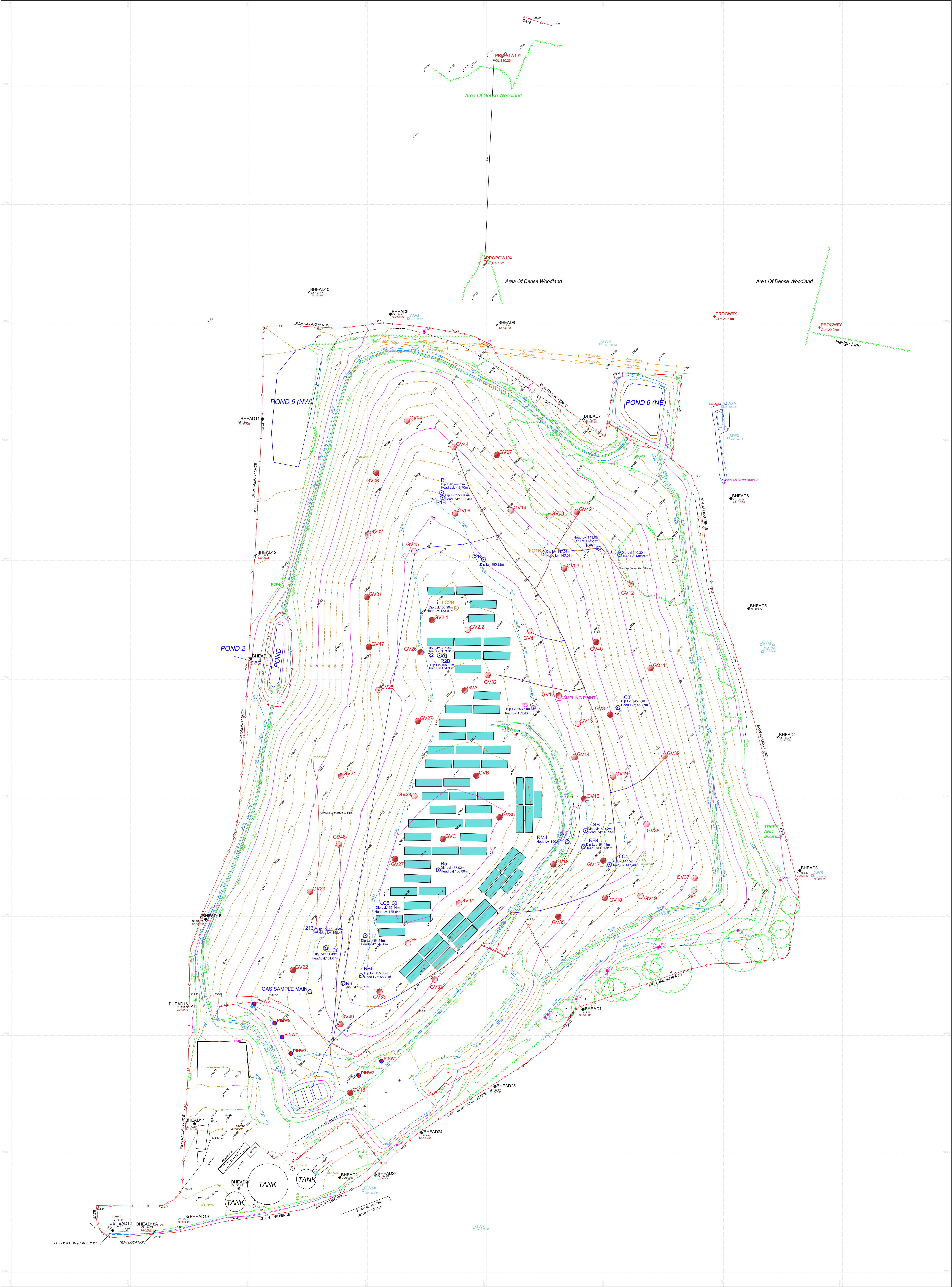
7.4.3 The pH of the surface water remains near neutral in alignment with Q2 and Q1.

7.5 Fugitive emissions (dust)

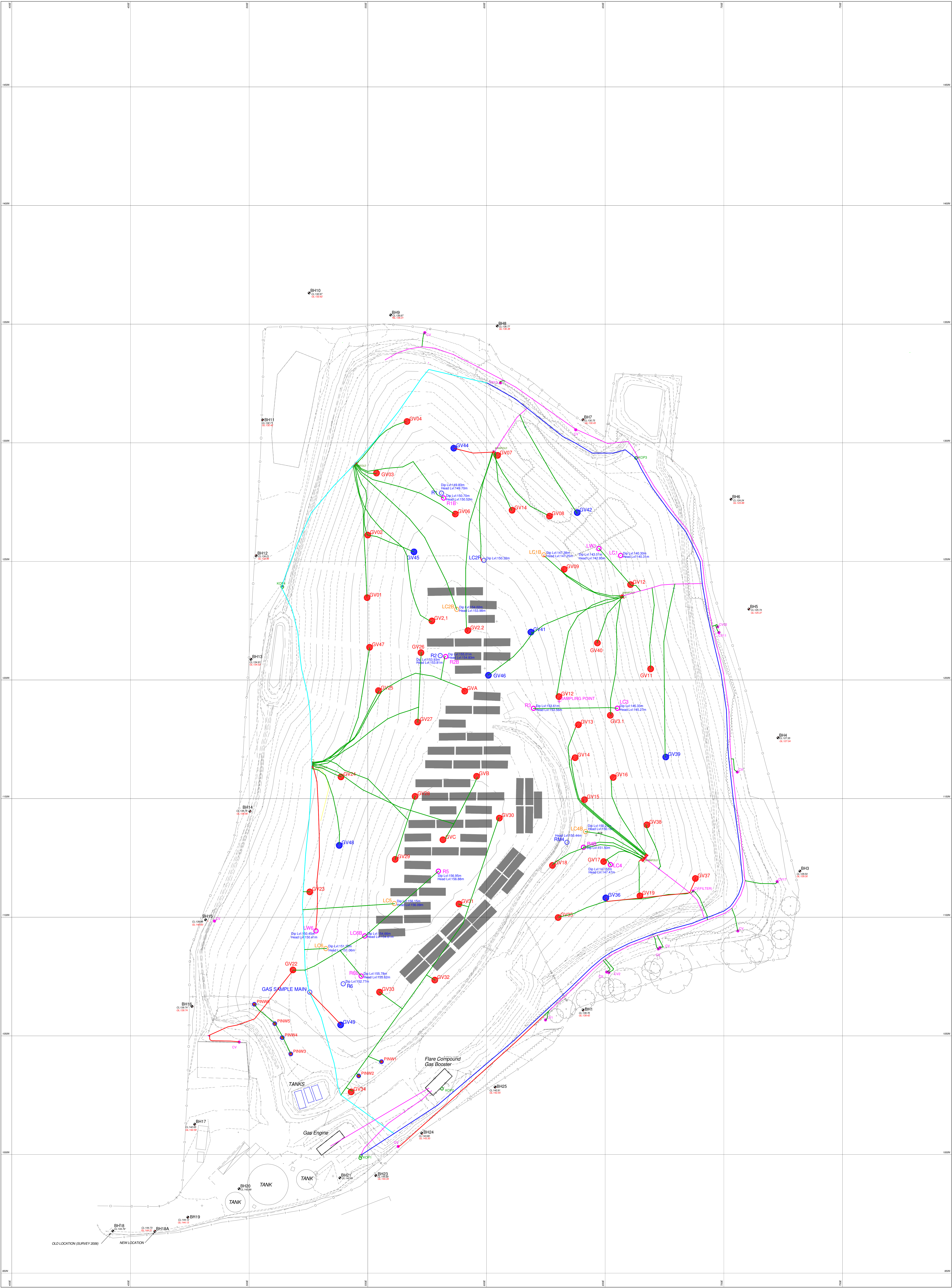
7.5.1 A value from Location 1 was unobtainable due to an insufficient sample.

7.5.2 All concentrations were below the compliance limit during Q3.

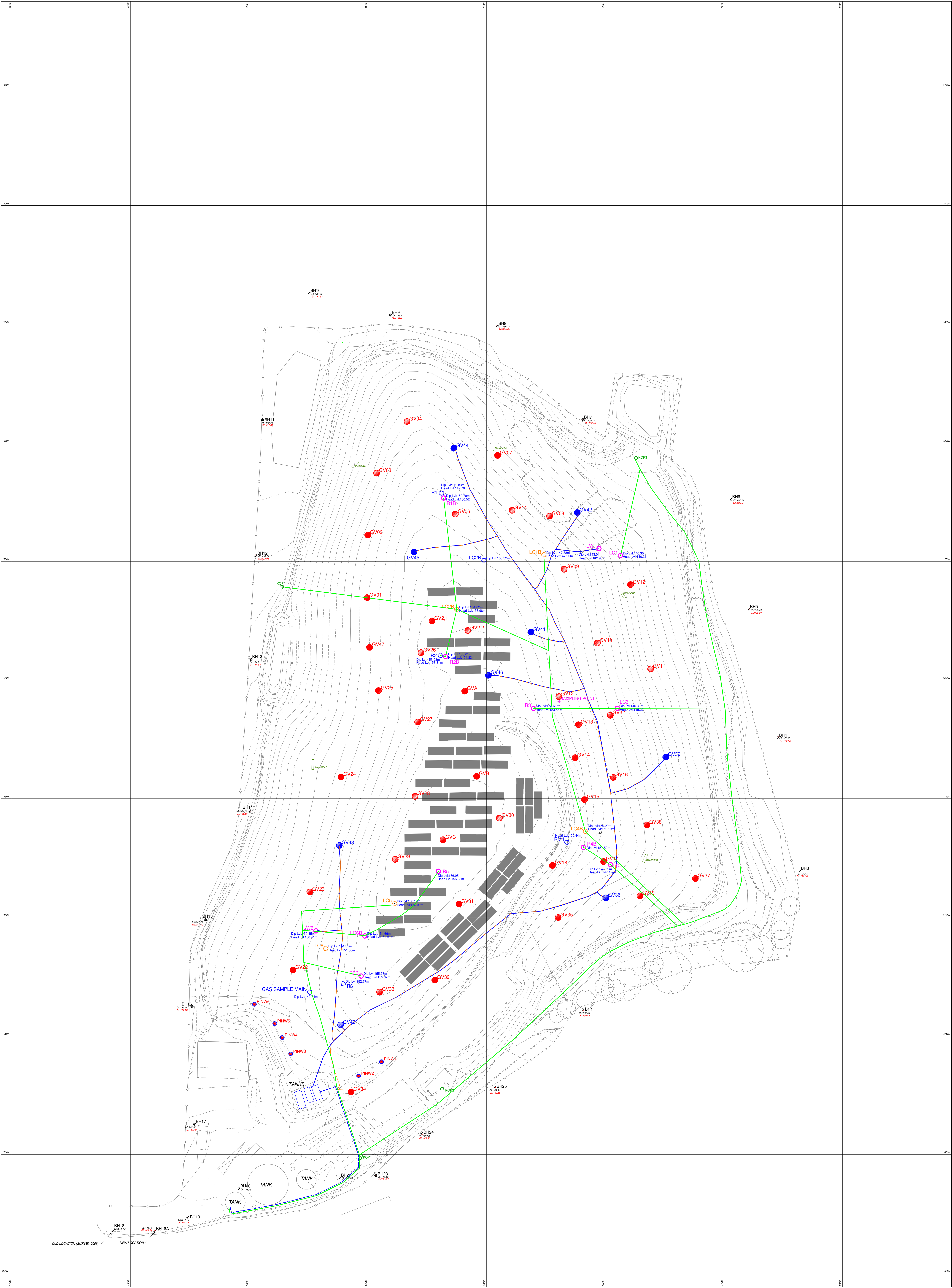
DRAWINGS



SITE Brookhill Landfill Site PROJECT Site Survey	SCALE 1:500 @ A0 DRAWING DATE 20/07/2023 DRAWING No. 13070a - 0	CLIENT	NOTES Levels Relate To : SITE DATUM Co-ordinates : SITE GRID GV Gas Vent PINW Pin Well GV Gas Vent with Air Pump LW Leachate Well LW Leachate Well With Air Pump LW Leachate Well With Electric Pump Leachate Pipe Main 90mm Branch 63mm Air Line Main 63mm Branch 32mm Gas Line Main 63mm BH Perimeter Gas Borehole GW Perimeter Ground Water Borehole	www.stafsurv.com Version: Courtland, Main Road, Sudbury, Derbyshire, DE5 9HS T: 01283 584800 F: 01284 584844 E: info@stafsurv.com
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SITE Brookhill Landfill Site	SCALE 1:500 @ A0		Levels Relate To : SITE DATUM	GV Gas Vent	63mm Dia Pipe		staffsurv LAND SURVEYORS www.staffsurv.com Vernon Court, Main Road, Sudbury, Derbyshire, DE6 9HS T: 01293 584630 - F: 01293 584634 - E: info@staffsurv.com
PROJECT Gas Infrastructure	DRAWING DATE 22/07/2021		Co-ordinates : SITE GRID	PINW Pin Well	90mm Dia Pipe		
	DRAWING No. 11681d Rev.1		GV Gas Vent with Air Pump	LW Leachate Well	250mm Dia Pipe		
				LW Leachate Well With Air Pump	315mm Dia Pipe		
				LW Leachate Well With Electric Pump			



SITE

Brookhill
Landfill Site

PROJECT

Leachate Infrastructure

SCALE

1:500 @ A0

DRAWING DATE

22/07/2021

DRAWING No.

11681c Rev.2

CLIENT

Levels Relate To :

SITE DATUM

Co-ordinates :

SITE GRID

NOTES

GV

Gas Vent

PINW

Pin Well

GV

Gas Vent with Air Pump

LW

Leachate Well

LW

Leachate Well With Air Pump

LW

Leachate Well With Electric Pump

Leachate Pipe (Surface)

Main 90mm Branch 63mm

Air Line

Main 63mm Branch 32mm

Leachate Pipe (Sub-Surface)

Main 90/125mm Branch 63mm

BH

Perimeter Gas Borehole

www.stafsurv.com

Vernon Court, Main Road, Sudbury, Derbyshire, DE6 9HS
T: 01293 584600 - F: 01293 584644 - E: info@stafsurv.com

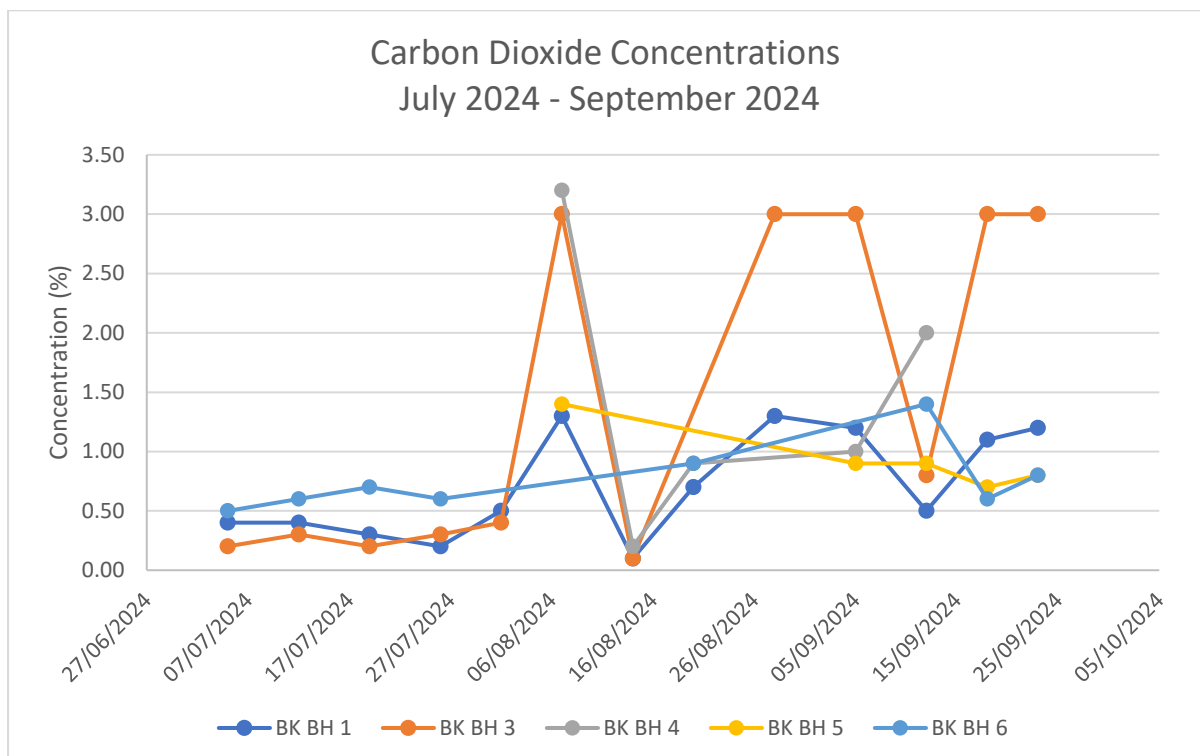
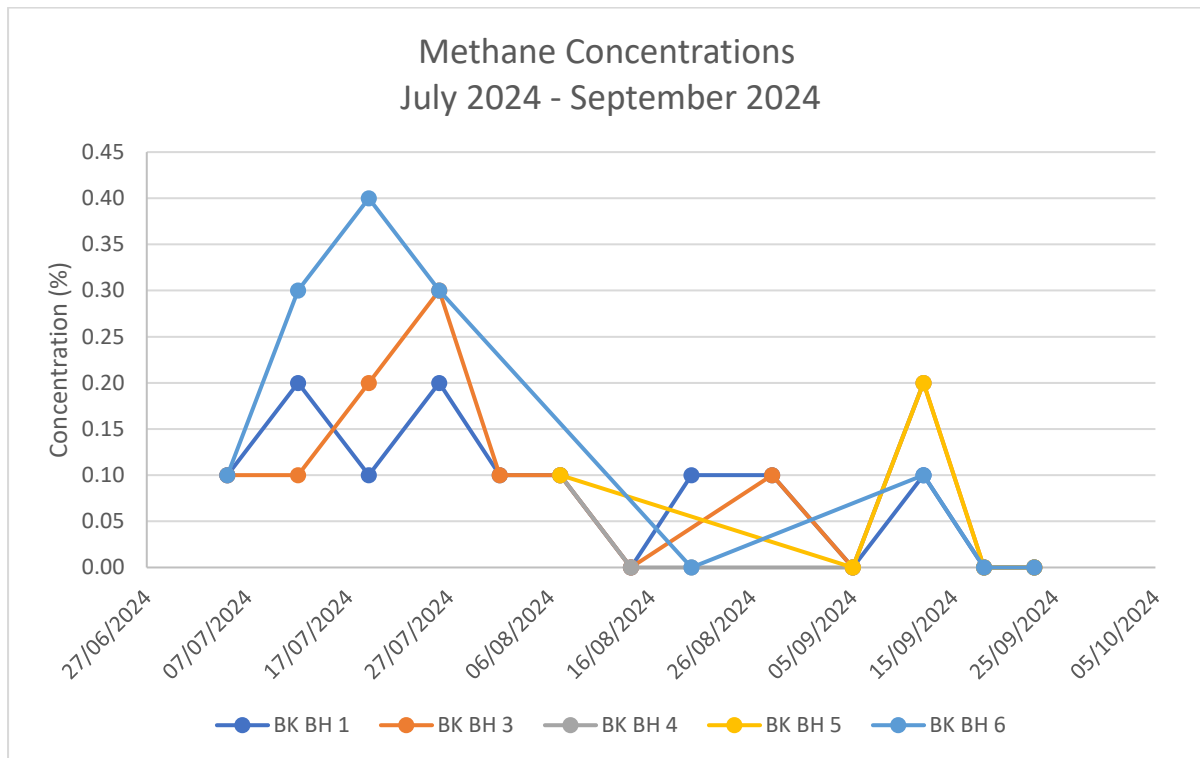
APPENDIX 1

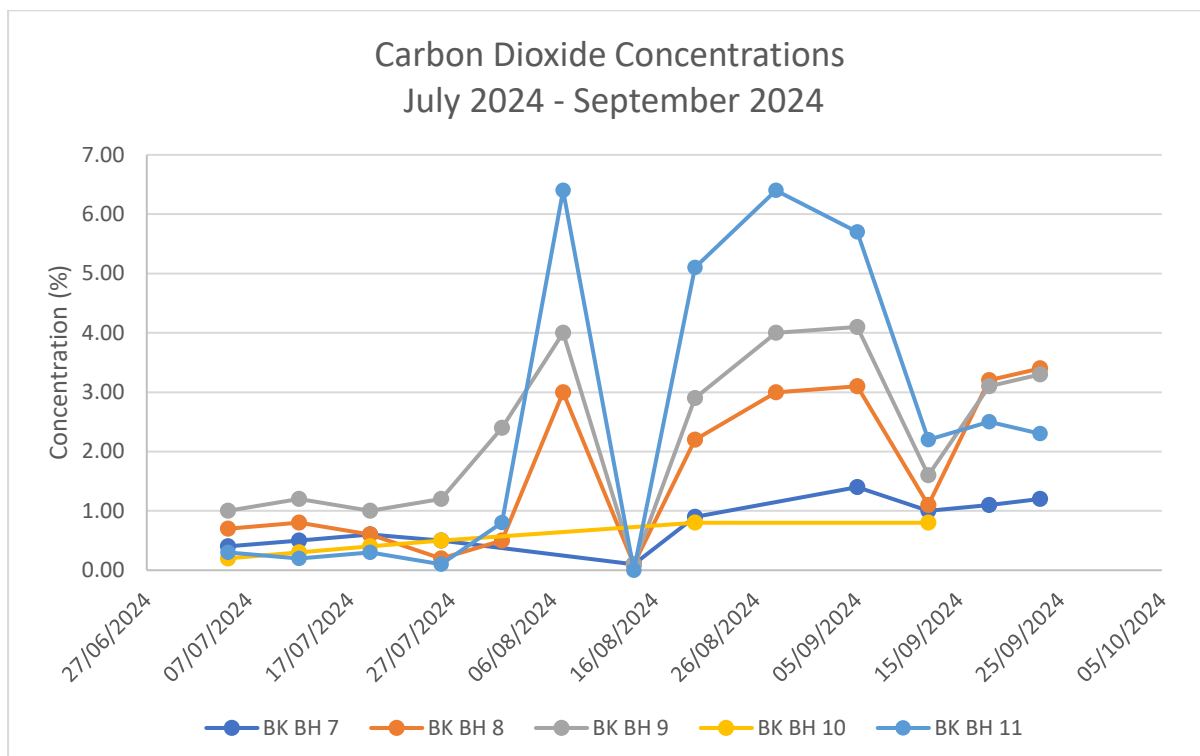
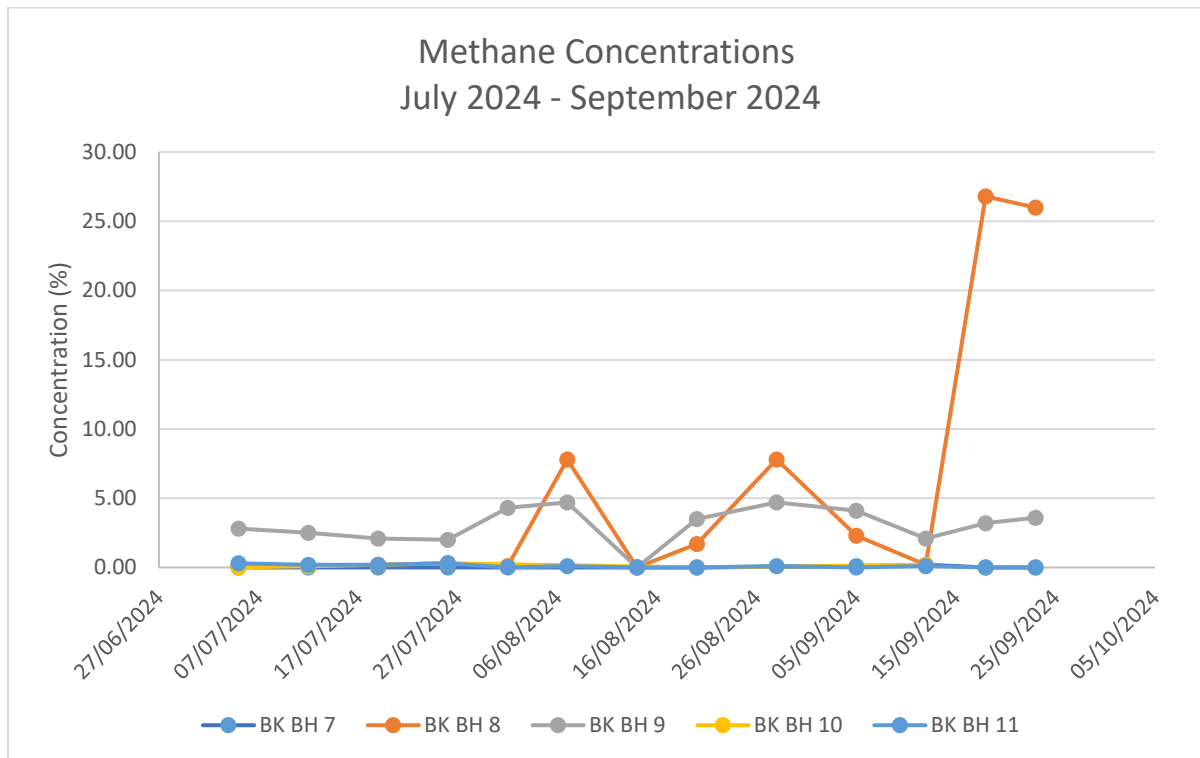
Landfill Gas Time Series Graphs

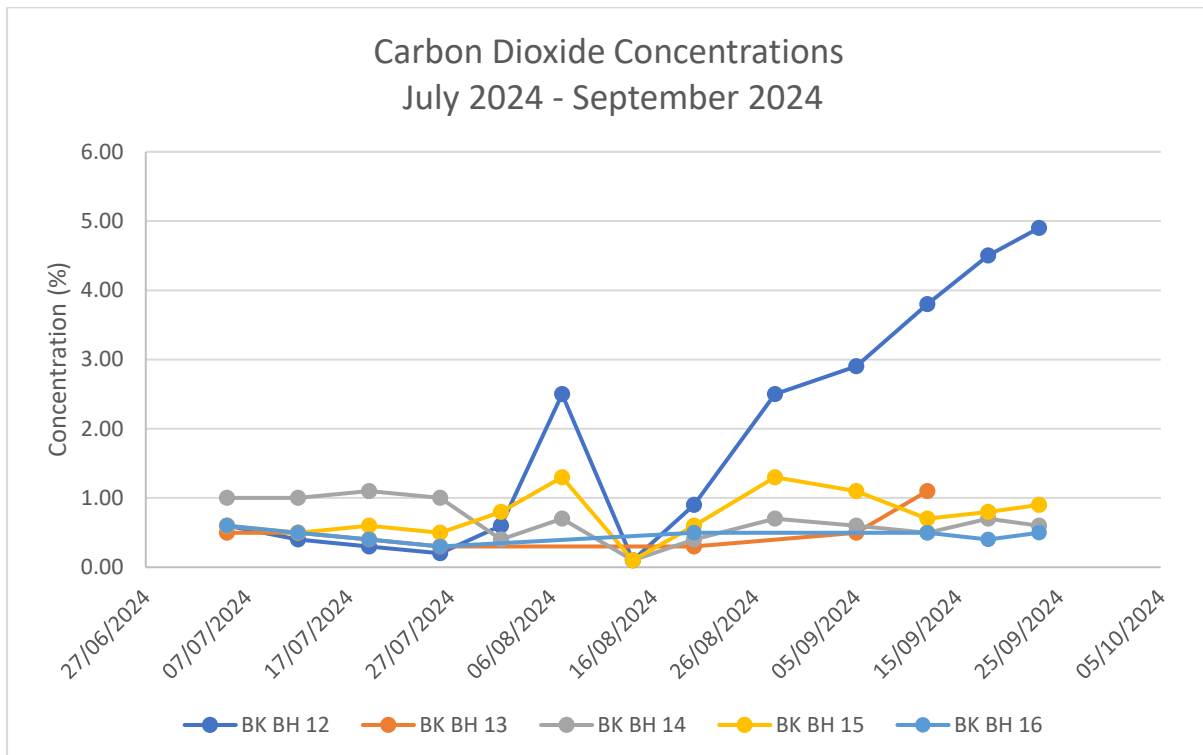
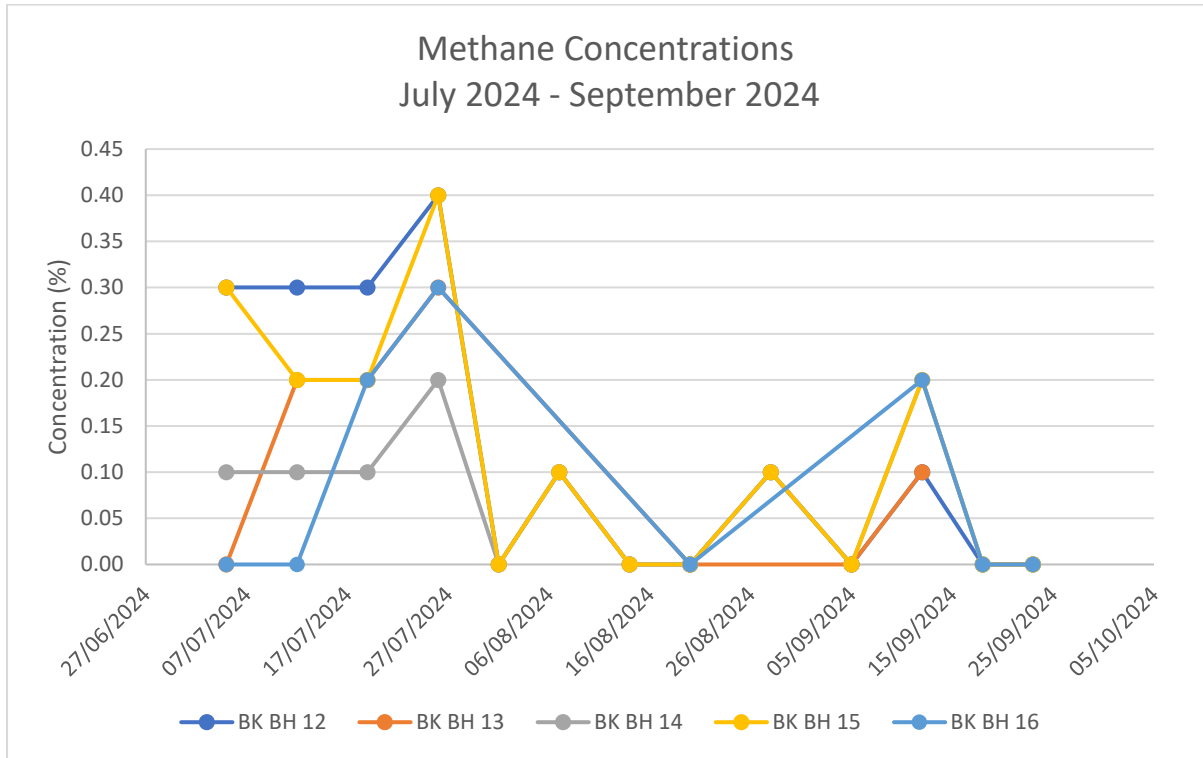
Table 1: Perimeter landfill gas monitoring data summary

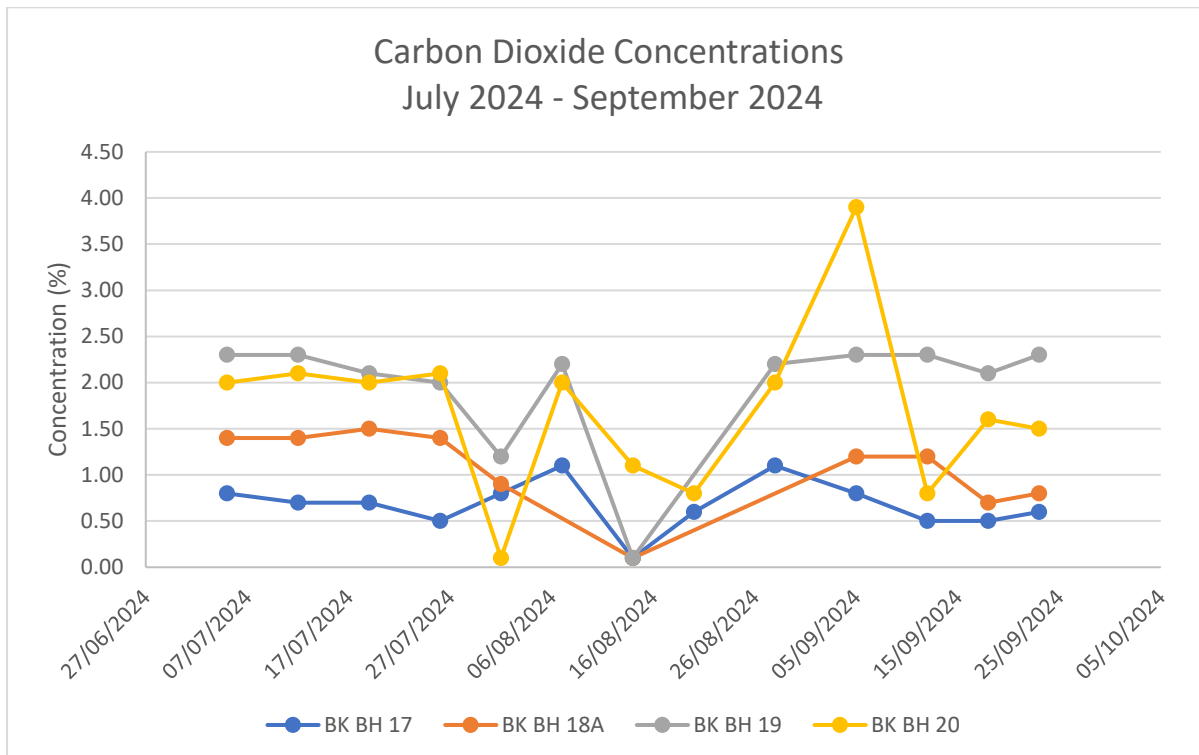
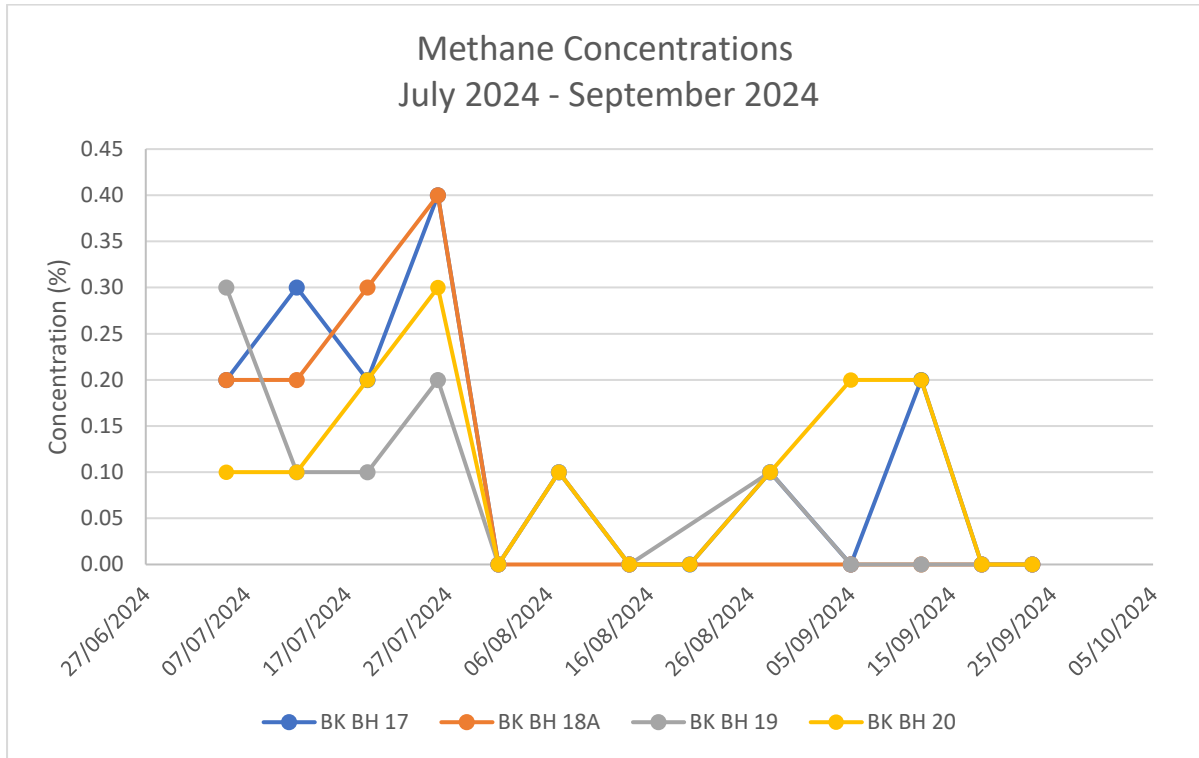
Parameter		BH1	BH3	BH4	BH5	BH6	BH7	BH8	BH9	BH10	BH11	BH12	BH13
Methane (% v/v)	Trigger Limit	1	1	1	1	1	1	32.2	29.6	1	1	1	1
	Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Max	0.20	0.30	0.20	0.20	0.40	0.20	26.80	4.70	0.30	0.30	0.40	0.30
	Average	0.08	0.10	0.06	0.06	0.15	0.03	5.65	3.05	0.13	0.10	0.12	0.11
	Count	13.00	12.00	5.00	5.00	8.00	10.00	13.00	13.00	6.00	13.00	13.00	7.00
Carbon Dioxide (% v/v)	Trigger Limit	8.8	3.1	5.1	1.5	1.5	10	3.6	10.4	3.9	6.5	6.6	9.4
	Min	0.10	0.10	0.20	0.70	0.50	0.10	0.10	0.10	0.20	0.00	0.10	0.30
	Max	1.30	3.00	3.20	1.40	1.40	1.40	3.40	4.10	0.80	6.40	4.90	1.10
	Average	0.71	1.44	1.46	0.94	0.76	0.77	1.68	2.30	0.50	2.48	1.86	0.51
	Count	13.00	12.00	5.00	5.00	8.00	10.00	13.00	13.00	6.00	13.00	13.00	7.00

Parameter		BH14	BH15	BH16	BH17	BH18A	BH19	BH20	BH21	BH23	BH24	BH25
Methane (% v/v)	Trigger Limit	1	1	1	1	3.5	1	1	1	1	1	1
	Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Max	0.20	0.40	0.30	0.40	0.40	0.30	0.30	0.30	0.20	0.30	0.40
	Average	0.07	0.12	0.09	0.12	0.11	0.08	0.10	0.15	0.02	0.10	0.12
	Count	13.00	13.00	8.00	13.00	10.00	12.00	13.00	13.00	13.00	13.00	12.00
Carbon Dioxide (% v/v)	Trigger Limit	3.5	17.6	11.4	12.9	10	11.2	10.7	21.7	7.3	1.5	9.9
	Min	0.10	0.10	0.30	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	Max	1.10	1.30	0.60	1.10	1.50	2.30	3.90	7.40	4.90	1.00	1.20
	Average	0.68	0.75	0.46	0.68	1.06	1.95	1.69	3.12	2.90	0.52	0.63
	Count	13.00	13.00	8.00	13.00	10.00	12.00	13.00	13.00	13.00	13.00	12.00









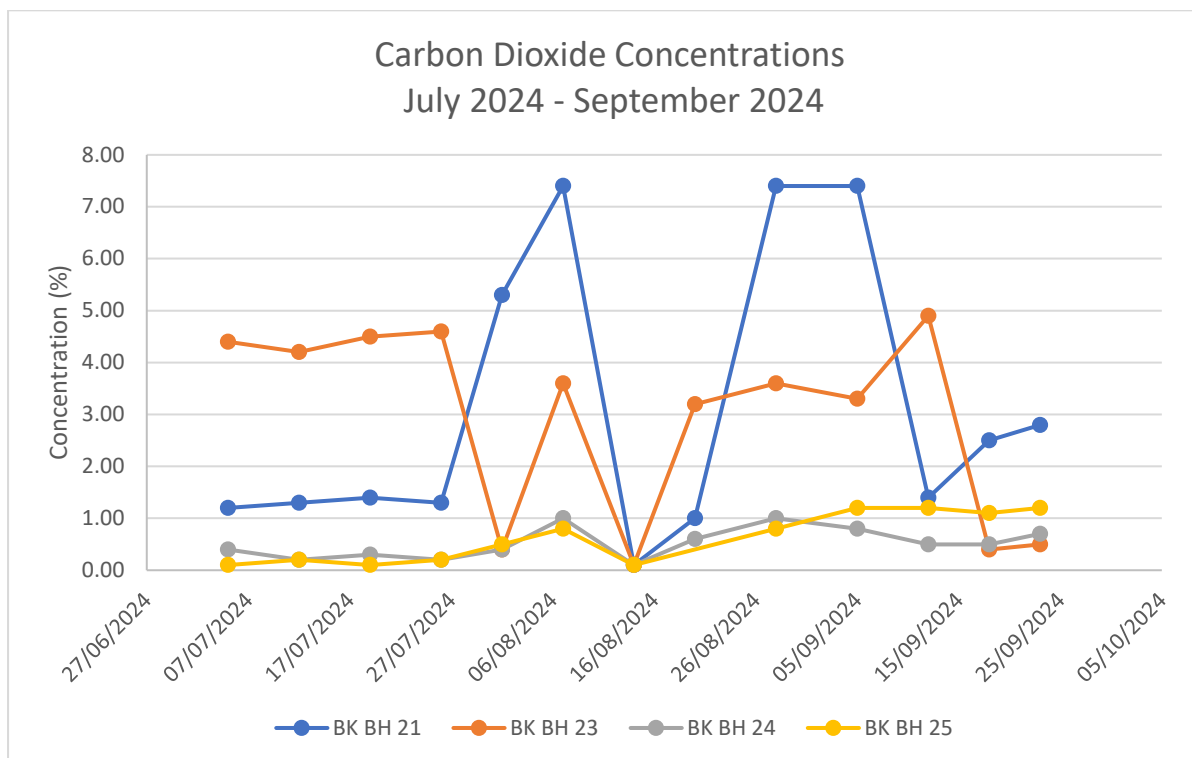
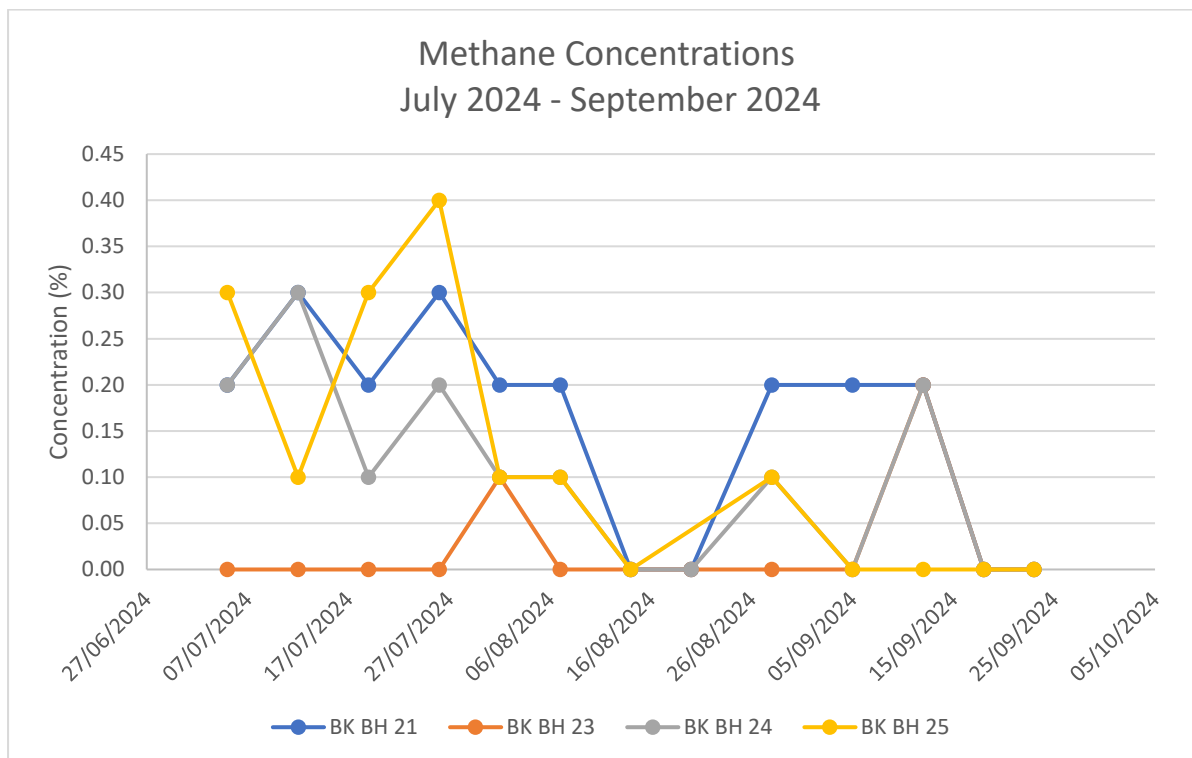


Table 2: In-waste landfill gas monitoring data summary

ID	Methane (% v/v)			Carbon Dioxide (% v/v)			Oxygen (% v/v)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
BHG010MA	30.00	32.40	30.80	21.40	25.90	22.90	5.50	8.50	7.50
BHG010MB	26.90	30.90	29.57	19.50	21.90	21.10	7.50	8.00	7.83
BHG01MDA	29.60	33.90	31.03	21.20	27.20	23.20	4.70	8.70	7.37
BHG01MDB	26.50	31.40	30.30	21.80	22.30	22.06	7.30	8.20	7.90
BHGV0001	0.80	62.00	31.55	0.70	34.00	17.40	0.30	23.90	11.53
BHGV0004	65.20	67.80	66.50	17.40	17.90	17.65	3.10	3.80	3.45
BHGV0006	40.50	40.50	40.50	31.00	31.00	31.00	0.00	0.00	0.00
BHGV0007	24.80	64.20	44.30	17.00	33.60	25.30	0.00	10.30	5.15
BHGV0008	3.60	3.60	3.60	6.40	6.40	6.40	17.80	17.80	17.80
BHGV0009	23.20	57.30	40.28	25.60	40.40	33.00	0.00	1.40	0.68
BHGV000B	56.80	56.80	56.80	39.50	39.50	39.50	0.00	0.00	0.00
BHGV000C	58.40	58.40	58.40	38.30	38.30	38.30	0.00	0.00	0.00
BHGV0011	17.30	48.70	38.23	31.80	34.80	33.80	0.30	2.50	1.77
BHGV0012	49.30	49.30	49.30	37.30	37.30	37.30	1.00	1.00	1.00
BHGV0013	10.60	57.30	34.13	19.70	40.70	30.33	0.00	10.50	5.05
BHGV0014	37.00	57.50	50.67	38.00	40.80	39.87	0.00	0.10	0.03
BHGV0015	50.10	58.10	56.42	40.40	41.30	40.66	0.00	0.10	0.02
BHGV0016	19.20	57.50	38.35	34.20	40.70	37.45	0.00	0.20	0.10
BHGV0017	19.70	19.90	19.80	23.50	24.20	23.85	4.10	4.10	4.10
BHGV0018	41.20	41.60	41.40	34.80	35.30	35.05	2.70	2.80	2.75
BHGV0021	52.30	60.80	57.97	35.60	36.60	36.27	0.00	0.20	0.07
BHGV0022	3.70	3.70	3.70	12.20	12.20	12.20	18.50	18.50	18.50
BHGV0023	15.40	17.10	16.25	14.50	15.20	14.85	14.00	14.10	14.05
BHGV0024	57.10	57.10	57.10	34.00	34.00	34.00	0.20	0.20	0.20
BHGV0026	37.80	56.00	46.93	33.90	40.60	37.25	0.10	0.20	0.15
BHGV0027	44.10	55.40	51.63	36.60	40.90	39.47	0.00	0.00	0.00
BHGV0028	44.50	56.40	52.43	35.10	39.80	38.23	0.00	0.00	0.00
BHGV0029	55.00	57.20	56.47	35.80	39.20	38.07	0.00	0.00	0.00
BHGV0030	56.60	56.60	56.60	40.00	40.00	40.00	0.00	0.00	0.00
BHGV0031	57.80	57.80	57.80	38.80	38.80	38.80	0.00	0.00	0.00
BHGV0032	56.90	56.90	56.90	39.00	39.00	39.00	0.20	0.20	0.20
BHGV0035	30.10	57.30	48.23	31.30	41.50	38.10	0.10	0.10	0.10
BHGV0036	1.10	57.40	29.28	12.20	41.40	26.83	0.00	11.00	5.48
BHGV0037	14.90	57.10	36.00	15.80	41.30	28.58	0.00	9.20	4.60
BHGV0038	18.90	58.00	38.45	23.60	39.60	31.63	0.10	4.80	2.45
BHGV0039	1.10	35.60	18.58	2.40	23.00	12.78	5.40	21.70	13.40
BHGV0040	29.20	54.30	41.78	31.90	38.60	35.33	0.40	0.80	0.63
BHGV0042	32.30	53.50	43.03	24.20	26.50	25.28	0.50	2.20	1.48
BHGV0043	57.90	61.40	59.45	32.90	33.30	33.15	0.00	0.00	0.00
BHGV0044	0.10	44.10	22.10	0.70	29.70	15.20	0.00	22.10	11.03

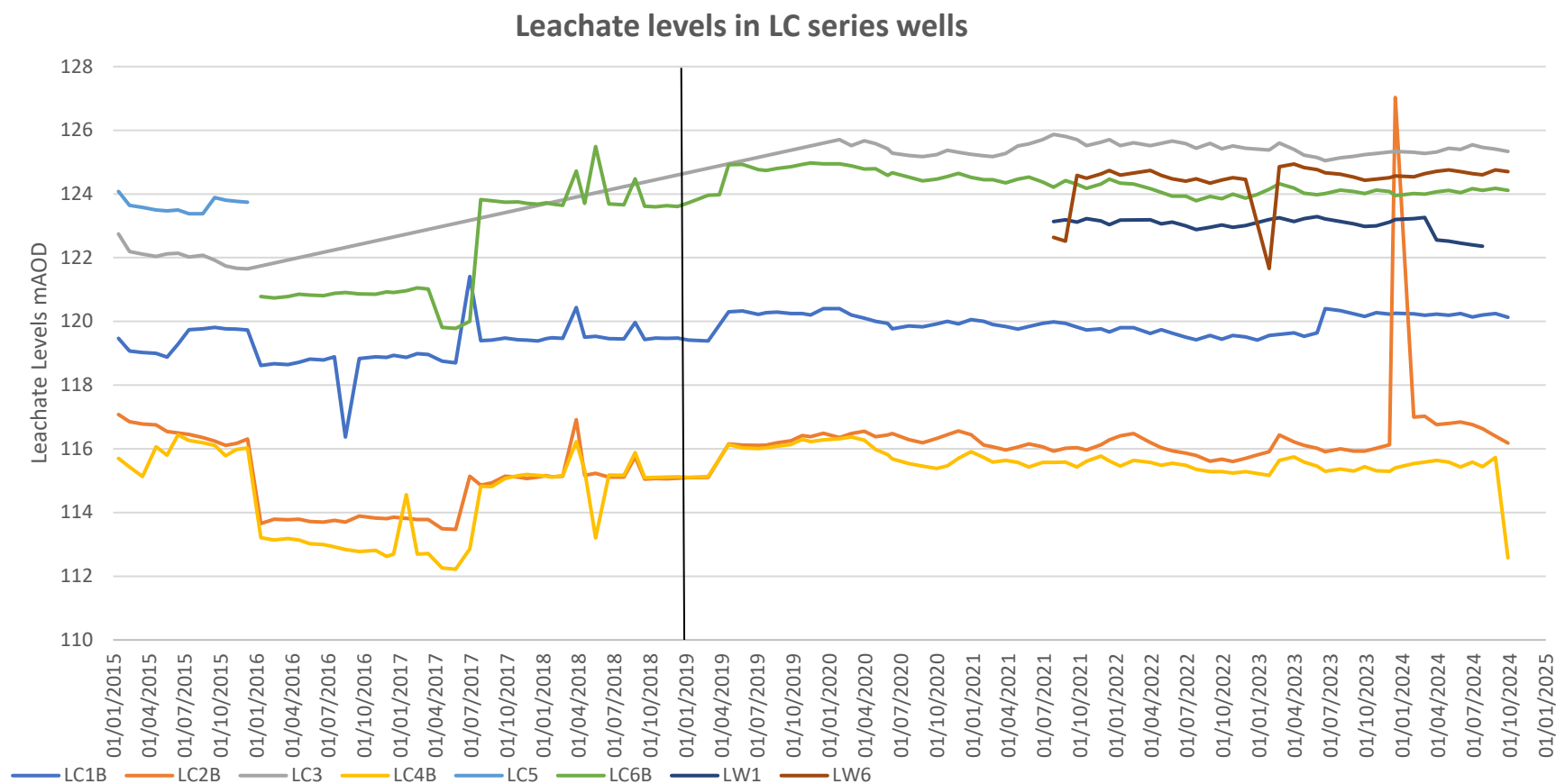
ID	Methane (% v/v)			Carbon Dioxide (% v/v)			Oxygen (% v/v)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
BHGV0045	53.90	60.60	58.37	35.80	36.50	36.27	0.00	0.10	0.03
BHGV0046	56.50	56.50	56.50	40.60	40.60	40.60	0.00	0.00	0.00
BHGV0047	22.80	22.80	22.80	29.30	29.30	29.30	0.00	0.00	0.00
BHGV0048	59.40	60.20	59.80	41.20	41.90	41.55	0.00	0.10	0.05
BHGV0049	31.30	56.10	43.73	35.50	38.00	36.85	0.00	0.50	0.28
BHGV0202	53.90	53.90	53.90	33.00	33.00	33.00	0.30	0.30	0.30
BHLC0003	3.50	4.50	4.00	6.70	7.80	7.25	19.10	19.10	19.10
BHLC001B	9.70	9.80	9.75	5.70	6.00	5.85	18.80	18.90	18.85
BHLC002R	43.80	44.70	44.25	23.10	23.90	23.50	0.50	0.70	0.60
BHLC004B	24.40	57.20	40.90	23.30	40.40	31.88	0.10	7.60	3.85
BHLC006B	47.70	47.70	47.70	39.20	39.20	39.20	0.00	0.00	0.00
BHPW0001	30.10	30.10	30.10	27.50	27.50	27.50	0.00	0.00	0.00
BHPW0003	69.30	69.30	69.30	32.20	32.20	32.20	0.00	0.00	0.00
BHPW0004	34.00	35.20	34.58	24.00	32.00	27.95	0.00	7.30	3.65
BHR00001	36.90	65.20	51.13	22.20	33.00	27.63	0.00	7.30	3.65
BHR00003	56.30	56.30	56.30	41.10	41.10	41.10	0.00	0.00	0.00
BHR0002B	59.40	59.40	59.40	36.30	36.30	36.30	0.00	0.00	0.00
BHR0004B	27.10	53.70	42.30	32.90	36.90	35.26	1.20	2.00	1.53
BHR0006B	46.90	58.80	54.83	31.40	38.10	35.87	0.00	0.40	0.13

ID	Carbon Monoxide (ppm)			Hydrogen Sulphide (ppm)			Relative Pressure (mb)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
BHG010MA	0.00	0.00	0.00	0.00	8.00	5.33	-11.35	3.70	-1.32
BHG010MB	1.00	4.00	3.00	0.00	2.00	1.33	-15.07	3.31	-2.82
BHG01MDA	0.00	7.00	4.67	1.00	4.00	3.00	171.34	183.40	175.36
BHG01MDB	1.00	4.00	2.60	0.00	1.00	0.80	171.01	180.86	174.29
BHGV0001	0.00	7.00	3.50	0.00	3.00	1.50	-7.72	1.10	-2.54
BHGV0004	1.00	1.00	1.00	0.00	1.00	0.50	-10.08	-9.87	-9.98
BHGV0006	0.00	0.00	0.00	1.00	1.00	1.00	-9.52	-9.52	-9.52
BHGV0007	0.00	4.00	2.25	0.00	2.00	1.00	-7.52	3.31	-2.07
BHGV0008	17.00	17.00	17.00	3.00	3.00	3.00	-11.61	-11.61	-11.61
BHGV0009	2.00	10.00	6.50	0.00	3.00	1.75	-21.52	2.82	-5.71
BHGV000B	0.00	0.00	0.00	3.00	3.00	3.00	3.82	3.82	3.82
BHGV000C	0.00	0.00	0.00	3.00	3.00	3.00	4.19	4.19	4.19
BHGV0011	0.00	10.00	6.67	0.00	2.00	1.33	-8.05	3.23	-0.53
BHGV0012	0.00	0.00	0.00	0.00	0.00	0.00	-13.30	-13.30	-13.30
BHGV0013	0.00	0.00	0.00	0.00	2.00	1.00	-13.73	4.00	-4.82
BHGV0014	0.00	0.00	0.00	0.00	2.00	1.33	-13.36	3.96	-1.81
BHGV0015	0.00	1.00	0.20	0.00	2.00	1.60	-13.60	3.94	0.36
BHGV0016	0.00	15.00	7.50	0.00	2.00	1.00	-12.93	4.03	-3.56
BHGV0017	0.00	0.00	0.00	0.00	0.00	0.00	-13.81	-6.78	-10.30
BHGV0018	0.00	1.00	0.50	0.00	0.00	0.00	-12.28	-10.31	-11.30
BHGV0021	0.00	5.00	3.33	0.00	2.00	1.33	-10.34	3.56	-1.07
BHGV0022	0.00	0.00	0.00	1.00	1.00	1.00	-1.73	-1.73	-1.73
BHGV0023	0.00	0.00	0.00	1.00	1.00	1.00	-9.99	-9.90	-9.95
BHGV0024	0.00	0.00	0.00	1.00	1.00	1.00	-9.60	-9.60	-9.60
BHGV0026	1.00	8.00	4.75	1.00	3.00	2.25	-9.23	3.38	-2.88
BHGV0027	1.00	8.00	5.67	1.00	3.00	2.33	-9.25	3.72	-0.60
BHGV0028	0.00	2.00	1.33	0.00	3.00	2.00	-9.73	3.70	-0.78
BHGV0029	0.00	0.00	0.00	1.00	3.00	2.33	-6.29	3.73	0.39
BHGV0030				3.00	3.00	3.00	4.28	4.28	4.28
BHGV0031				3.00	3.00	3.00	3.42	3.42	3.42
BHGV0032				3.00	3.00	3.00	3.23	3.23	3.23
BHGV0035	1.00	41.00	27.67	0.00	2.00	1.33	-5.37	3.26	0.38
BHGV0036	0.00	11.00	5.50	0.00	2.00	1.00	-12.65	3.91	-2.73
BHGV0037	0.00	11.00	5.50	0.00	2.00	1.00	-14.84	3.87	-3.44
BHGV0038	0.00	9.00	4.50	0.00	2.00	1.00	-4.81	3.82	-0.36
BHGV0039	0.00	8.00	4.00	0.00	2.00	1.00	-7.67	3.52	-0.26
BHGV0040	0.00	10.00	5.25	0.00	3.00	1.50	-14.03	3.72	-5.08
BHGV0042	0.00	4.00	2.00	0.00	2.00	1.00	-27.91	3.73	-11.45
BHGV0043	0.00	6.00	3.00	0.00	2.00	1.25	-13.15	1.10	-5.29
BHGV0044	0.00	5.00	2.50	0.00	2.00	1.00	-0.60	0.88	0.46
BHGV0045	1.00	6.00	4.33	0.00	2.00	1.33	-1.30	2.86	1.47

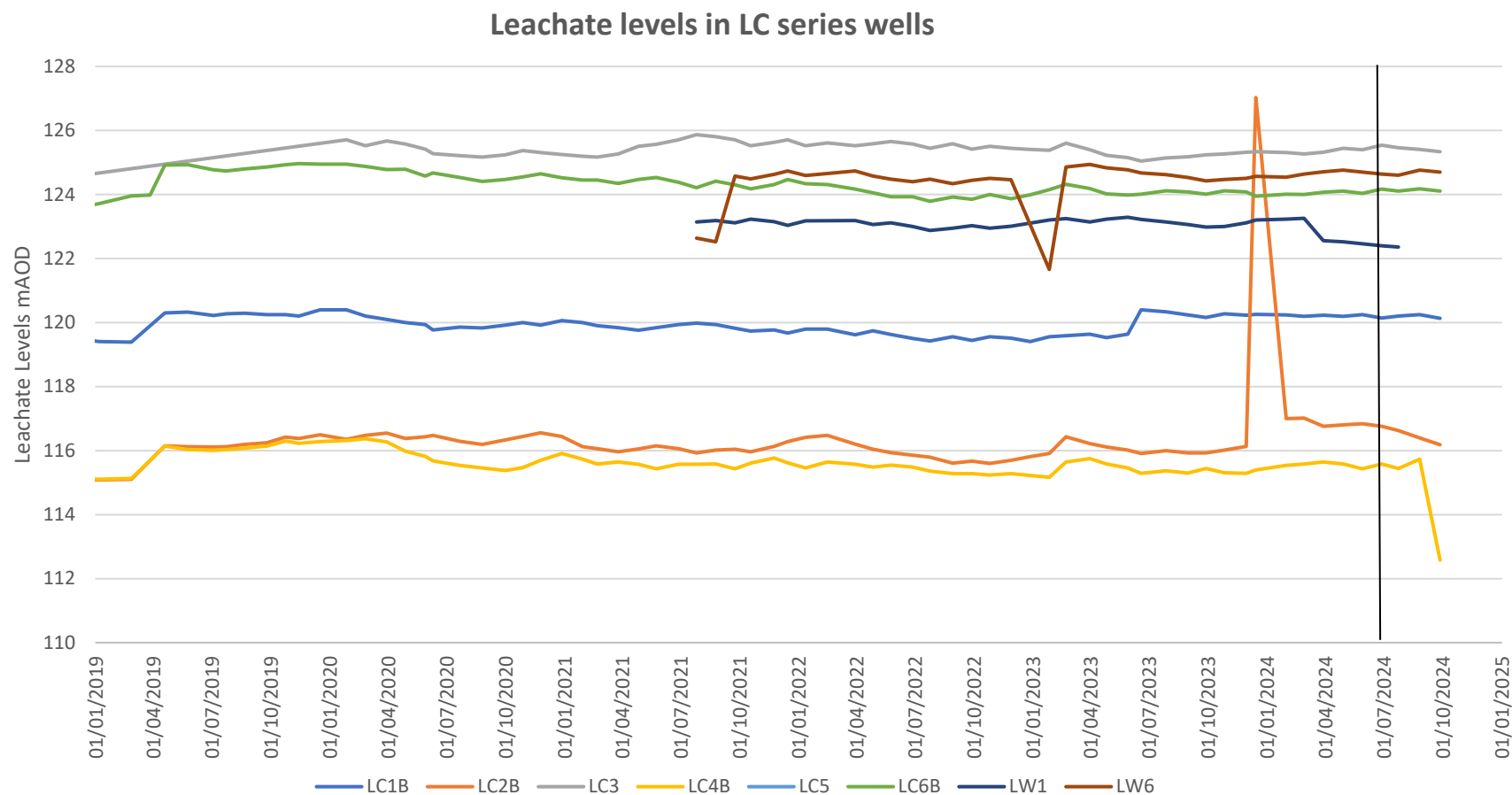
ID	Carbon Monoxide (ppm)			Hydrogen Sulphide (ppm)			Relative Pressure (mb)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
BHGV0046	7.00	7.00	7.00	3.00	3.00	3.00	3.52	3.52	3.52
BHGV0047	0.00	0.00	0.00	1.00	1.00	1.00	-4.76	-4.76	-4.76
BHGV0048	0.00	1.00	0.50	1.00	1.00	1.00	2.08	2.10	2.09
BHGV0049	0.00	0.00	0.00	0.00	71.00	35.75	-10.43	2.86	-3.75
BHGV0202				3.00	3.00	3.00	3.47	3.47	3.47
BHLC0003	0.00	0.00	0.00	0.00	0.00	0.00	-11.49	-8.53	-10.01
BHLC001B	0.00	0.00	0.00	0.00	0.00	0.00	-0.09	0.62	0.27
BHLC002R	2.00	2.00	2.00	1.00	1.00	1.00	-12.25	-12.14	-12.20
BHLC004B	0.00	0.00	0.00	0.00	2.00	1.00	-13.09	4.01	-3.07
BHLC006B	1.00	1.00	1.00	1.00	1.00	1.00	-5.89	-5.89	-5.89
BHPW0001	0.00	0.00	0.00	0.00	0.00	0.00	-10.68	-10.68	-10.68
BHPW0003	0.00	0.00	0.00	0.00	0.00	0.00	-9.83	-9.83	-9.83
BHPW0004	0.00	0.00	0.00	0.00	25.00	12.75	-5.52	1.02	-1.96
BHR00001	0.00	4.00	2.00	0.00	2.00	1.00	-10.80	3.35	-3.65
BHR00003	8.00	8.00	8.00	3.00	3.00	3.00	3.77	3.77	3.77
BHR0002B				2.00	2.00	2.00	3.40	3.40	3.40
BHR0004B	0.00	1.00	0.14	0.00	2.00	1.14	-14.13	3.84	-2.09
BHR0006B	1.00	1.00	1.00	2.00	3.00	2.67	-0.42	0.91	0.47

APPENDIX 2

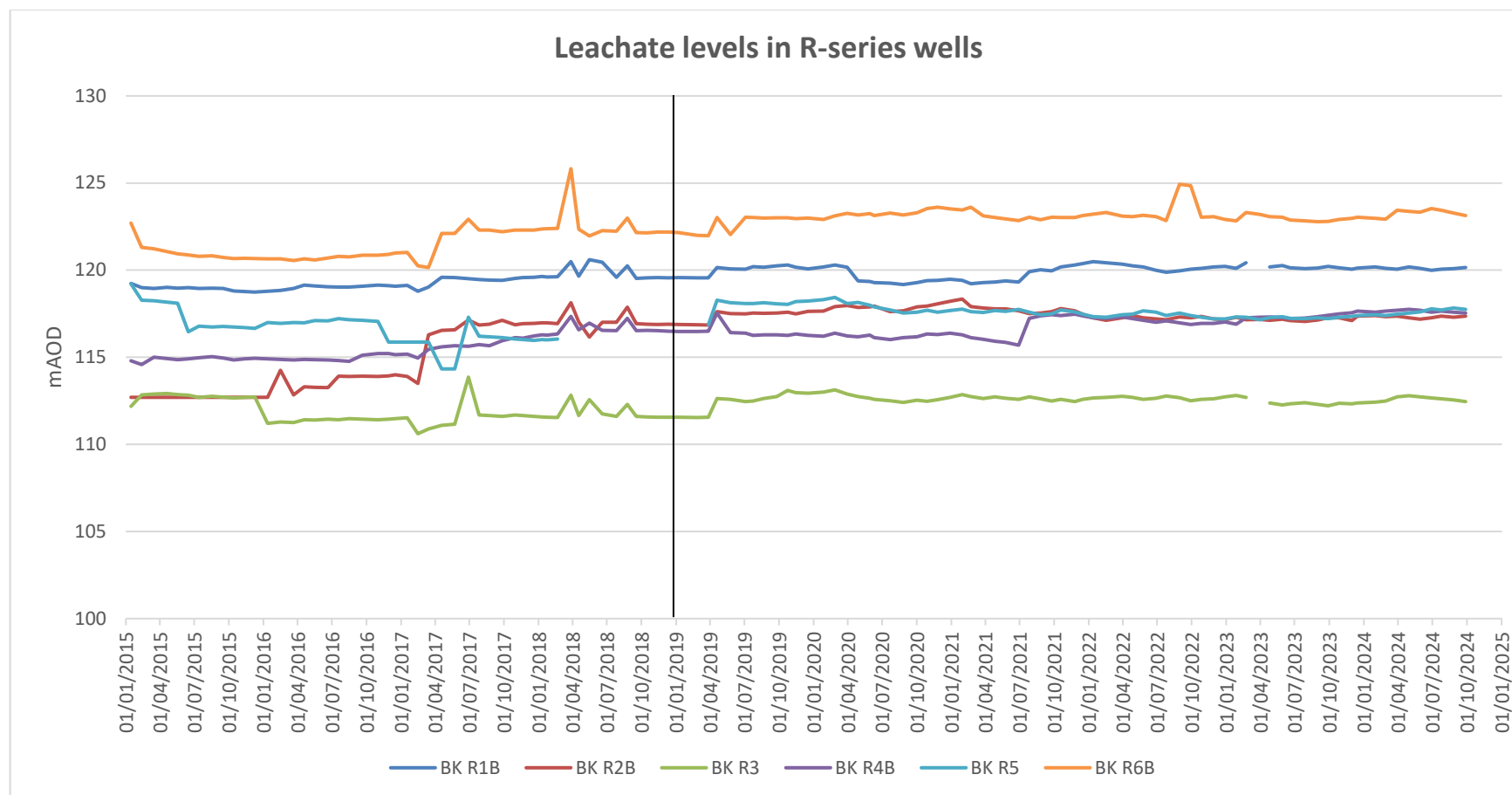
Leachate Levels and Quarterly Suite Data



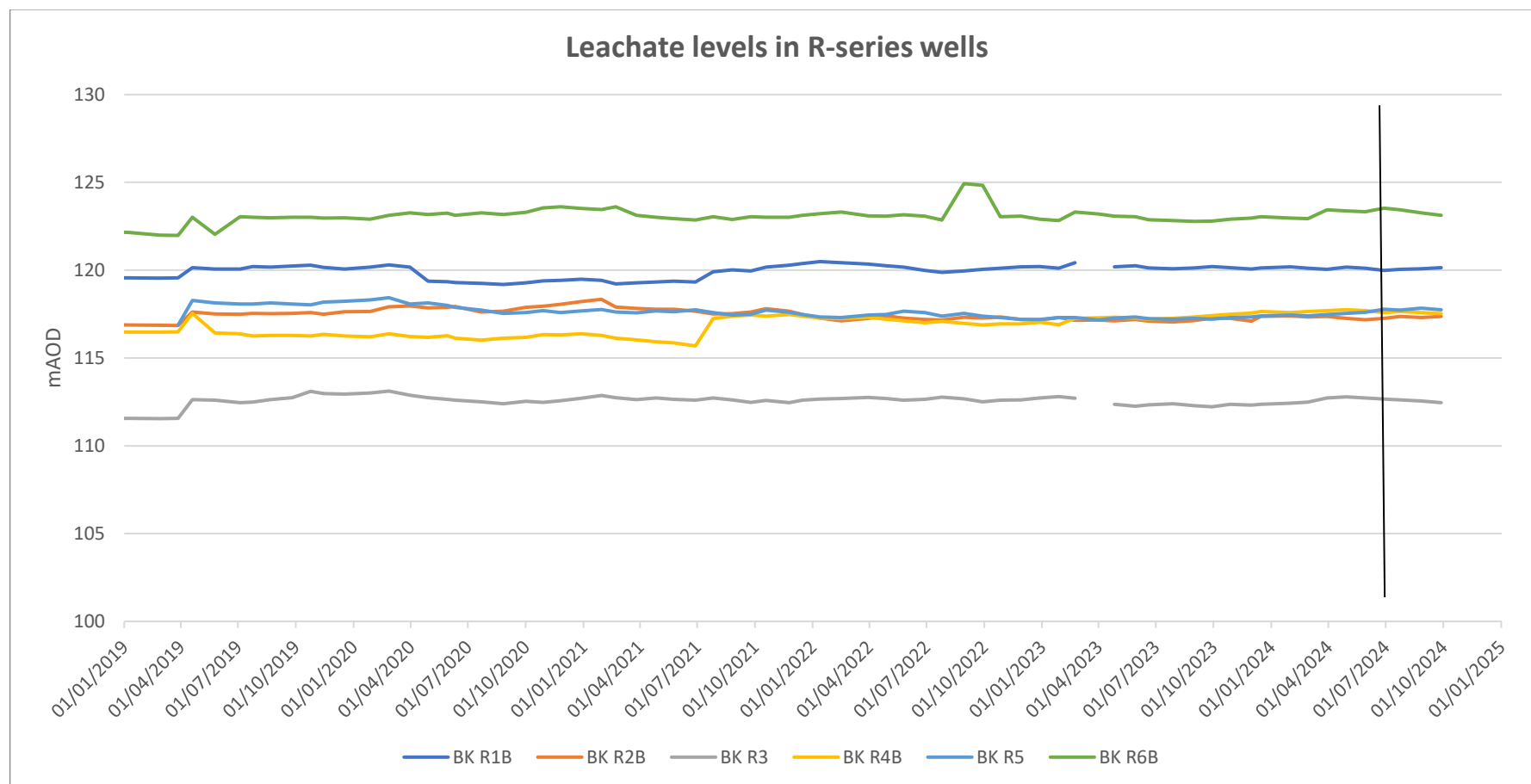
Graph 1: Leachate levels as mAOd at LC series wells since 2015. Points after the black line reflect rest leachate levels.



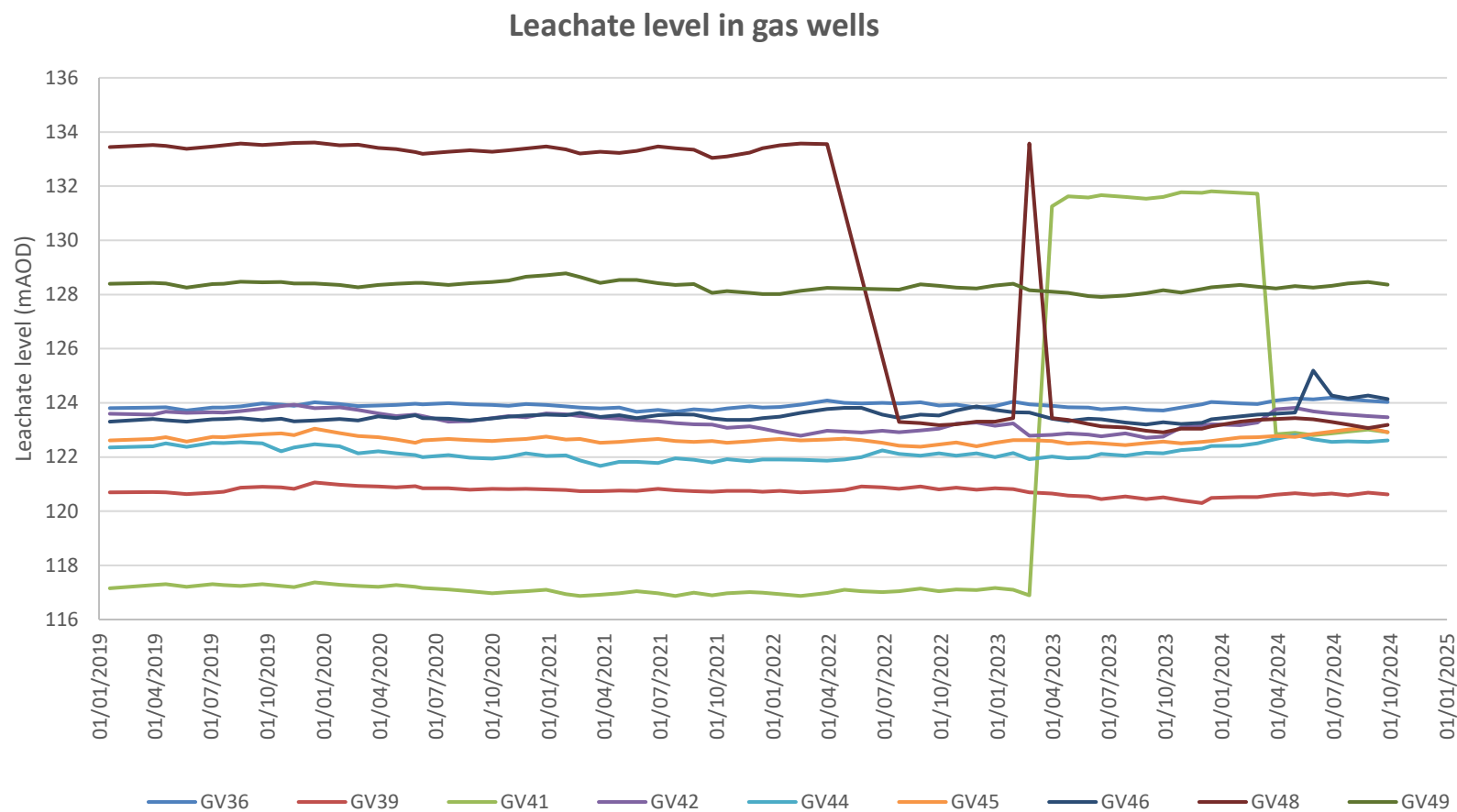
Graph 2: Leachate Levels as mAO at LC Series Wells since January 2019. Points after the black line reflect the current review period.



Graph 3: Leachate Levels as mAOD at Remote Leachate Monitoring Points. Points after the black line reflect rest leachate levels.



Graph 4: Leachate Levels as mAOd at Remote Leachate Monitoring Points since January 2019. Points after the black line reflect the current review period.



Graph 5: Leachate Levels as mAOd at in-waste gas wells.

Table 2: Leachate quality quarterly monitoring data

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6	LW1	LW6
Carbon									
Organic Carbon, Total	mg/l	3823	3145	2069	3657	3195	4034	4049	4079
Inorganics									
Alkalinity, Total as CaCO ₃	mg/l	9502	11530	4924	9121	8566	16991	16977	16724
Ammonia (as N)	mg/l	1650	2170	1009	1588	1350	2673	2646	2656
BOD, Unfiltered	mg/l	280.0	194.0	223.0	251.0	166.0	850.0	622.0	764.0
Chloride	mg/l	1794	2172	1413	1765	2342	3396	3327	3366
COD, unfiltered	mg/l	4310	3710	2100	3500	3130	6490	6450	6190
pH	pH Units	7.6	7.8	7.6	7.6	7.8	7.5	7.5	7.5
Sulphate	mg/l	95.5	99.3	126.0	68.9	64.6	179.0	186.0	186.0
Total Oxidised Nitrogen as NO ₃	mg/l	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Metals									
Calcium (diss.filt)	mg/l	95.3	34.9	117.0	91.7	52.1	32.7	31.5	32.0
Magnesium (diss.filt)	mg/l	73.8	26.6	64.0	75.3	88.9	46.0	46.7	45.6
Potassium (diss.filt)	mg/l	844	805	481	741	690	758	749	724
Sodium (diss.filt)	mg/l	1211	1453	698	798	1069	1963	1993	1879
Sample Date	27/09/2024								

Table 4: Final discharge monitoring data

Parameter	Units	EP Compliance Limit	Final Discharge						
			05/07/2024	11/07/2024	18/07/2024	08/08/2024	22/08/2024	29/08/2024	26/09/2024
Alkalinity, Total as CaCO3	mg/l	-	1235.00	958.00	854.00	2047.00	2209.00	1385.00	1402.00
Organic Carbon, Total	mg/l	-	1045.00				307.00		652.00
COD	mg/l	2000	800.00	1070.00	928.00	1860.00	1520.00	680.00	1320.00
Nitrate as N	mg/l	-	778.00	7.30	7.90	5.40	4.80	6.80	905.00
Nitrite as N	mg/l	-	4.38	1.37	0.85	3.65	0.07	0.00	3.71
pH	pH Units	>5 and <10	7.80	7.70	8.40	8.30	8.40	9.00	9.00
Suspended solids, Total	mg/l	500	288.00	420.00	296.00	99.60	224.00	192.00	232.00
Chromium (diss.filt)	ug/l	2000	52.00	48.90	51.10	46.40	42.50	514.00	51.80
Copper (diss.filt)	ug/l	2000	171.00	86.30	99.30	144.00	76.70	78.00	97.80
Lead (diss.filt)	ug/l	2000	8.80	10.80	0.00	9.00	0.00	0.00	35.40
Nickel (diss.filt)	ug/l	2000	120.00	145.00	129.00	144.00	150.00	157.00	149.00
Zinc (diss.filt)	ug/l	2000	244.00	221.00	176.00	296.00	180.00	128.00	164.00
Iron (Dis.Filt)	ug/l	-	3221.00				2966.00		5968.00
Sodium (Dis.Filt)	mg/l	-	2382.00				1807.00		1585.00
BOD	mg/l	-	133.00				659.00		137.00
Chloride	mg/l	-	1881.00				1990.00		1843.00
TPH / Oil & Greases	mg/l	-							43.00
Ammonia as N	mg/l	50	1.2	0.41	0.38	0.81	0.31	0.17	87.5

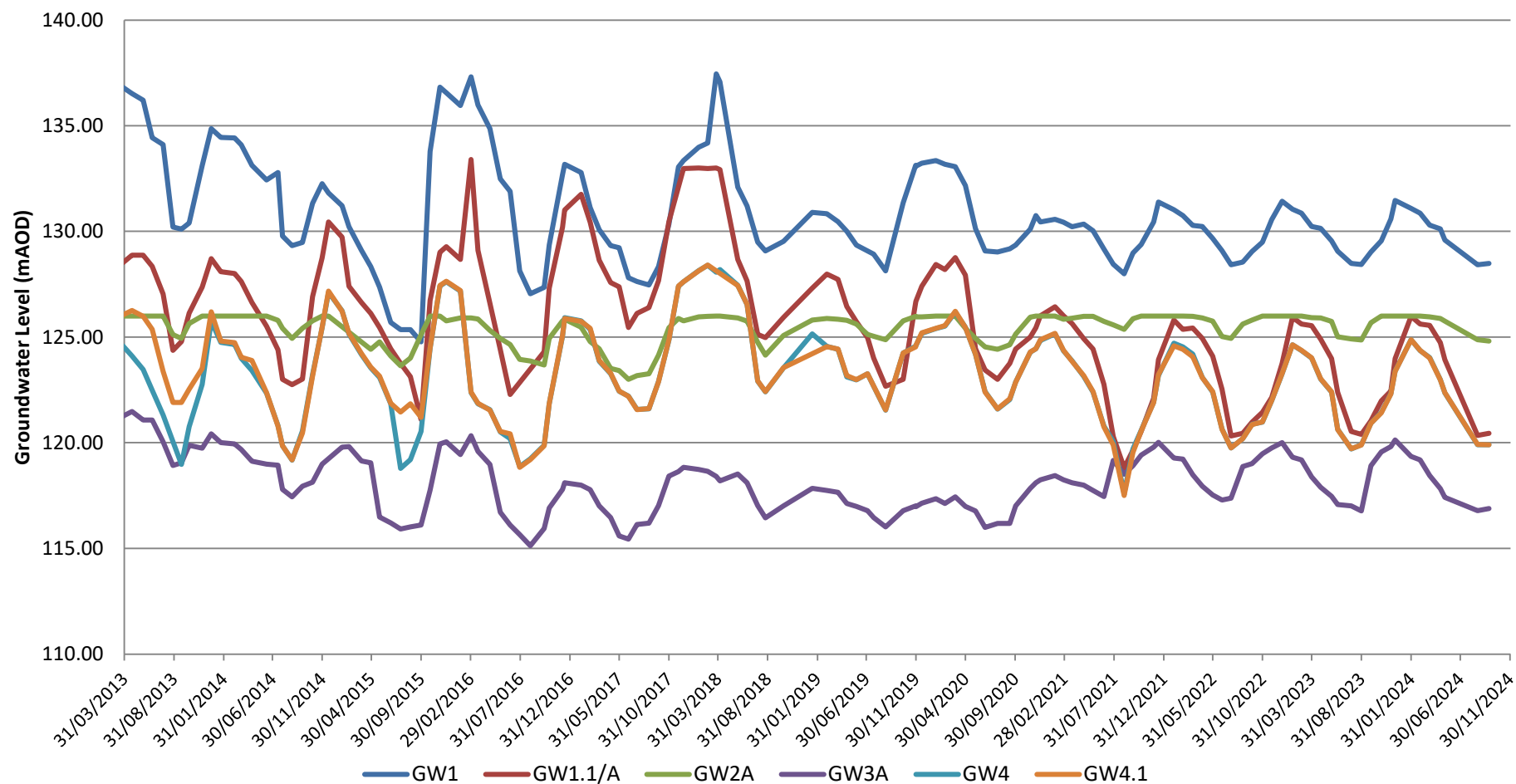
APPENDIX 3

Groundwater Time Series Graphs and Quarterly Suite Data

Table 1: Groundwater Levels

Parameter		GW1	GW1.1/A	GW2A	GW3A	GW4	GW4.1	GW5A	GW6	GW6.1	GW7	GW8
Dip to Groundwater (mBGL)	25/07/2024	9.85	18.44	1.05	6.03	16.64	16.65	20.23	5.03	5.04	14.15	17.06
	22/08/2024	9.92	18.65	1.12	6.21	16.52	16.51	19.95	4.61	4.62	13.85	16.68
	26/09/2024	9.86	18.55	1.19	6.12	16.52	16.52	19.82	4.34	4.32	13.75	16.58
	Average	9.88	18.55	1.12	6.12	16.56	16.56	20.00	4.66	4.66	13.92	16.77
Groundwater Level (mAOD)	25/07/2024	128.49	120.55	124.95	116.97	119.79	119.78	127.77	123.79	123.78	130.84	114.02
	22/08/2024	128.42	120.34	124.88	116.79	119.91	119.92	128.05	124.21	124.2	131.14	114.4
	26/09/2024	128.48	120.44	124.81	116.88	119.91	119.91	128.18	124.48	124.50	131.24	114.50
	Average	128.46	120.44	124.88	116.88	119.87	119.87	128.00	124.16	124.16	131.07	114.31

Groundwater Levels (mAOD) in GW1 - GW4.1



Groundwater Levels (mAOD) in GW5A - GW8

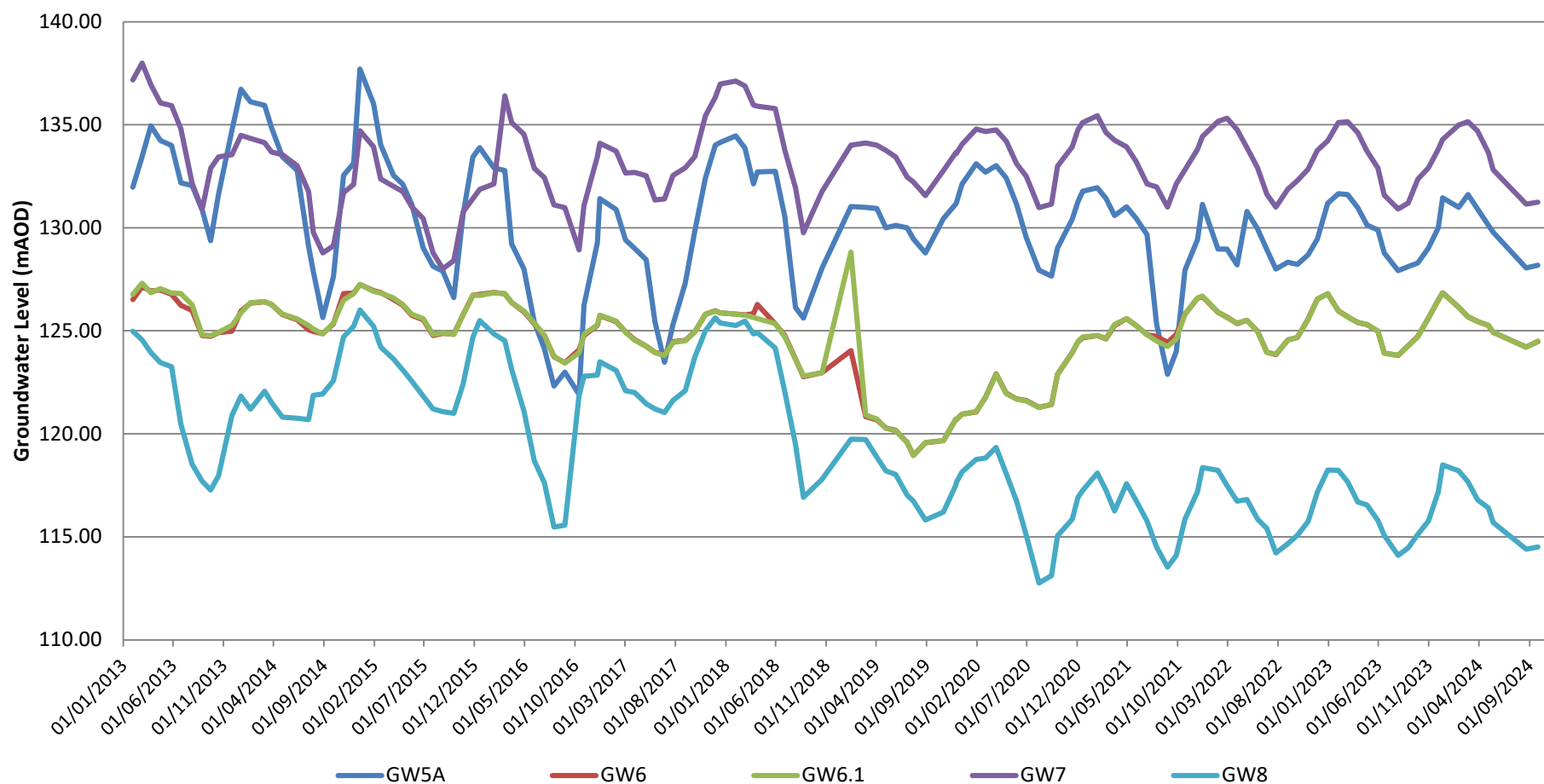


Table 2: Groundwater Quality – Monthly Parameters

Parameter	Date	GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Ammonia (as N)	EP Compliance Limit	-	-	1.7	1.7	1.7	-	-	-	-
	26/07/2024	0.09	0.14	3.30	2.70	2.10	0.07	0.29	2.50	5.90
	23/08/2024	0.07	0.02	2.70	7.50	5.20	0.01	0.03	2.40	7.50
	29/09/2024	0.21	0.15	2.50	1.50	5.70	0.07	0.06	6.80	8.90
Chloride (mg/l)	EP Compliance Limit	-	-	60.00	60.00	60.00	-	-	-	-
	26/07/2024	21.10	20.40	73.30	57.20	60.80	131.00	28.00	80.60	135.00
	23/08/2024	21.50	21.30	75.80	124.00	139.00	166.00	27.30	79.00	108.00
	29/09/2024	17.40	17.10	74.00	53.70	140.00	409.00	27.60	79.30	108.00
Dissolved Oxygen (mg/l)	26/07/2024	9.60	4.80	9.70	2.90	4.40	4.20	2.70	1.30	<0.30
	23/08/2024	4.60	7.90	3.20	5.40	5.80	5.90	5.70	3.60	5.10
	29/09/2024	5.60	6.00	4.40	6.10	0.50	6.10	7.20	0.80	3.80
Electrical Conductivity (mS/cm)	26/07/2024	3084	3081	1178	1011	2475	1487	792	637	1247
	23/08/2024	3384	3390	1226	1322	1295	1734	786	648	1294
	29/09/2024	2477	2486	1221	1044	1305	3489	794	690	1283
pH (pH units)	26/07/2024	7.00	7.10	6.70	6.80	6.80	6.50	6.90	7.70	6.20
	23/08/2024	7.00	7.00	6.70	6.40	6.20	6.50	6.80	7.50	6.50
	29/09/2024	7.00	7.00	6.70	6.90	6.20	6.60	7.00	7.40	6.60

Table 3: Groundwater Quality – Quarterly Suite

Sample Description		EP Compliance Limit GW2A, GW3A, GW4	GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Carbon											
Organic Carbon, Total	mg/l	-	129.00	123.00	64.70	63.20	89.30	89.80	51.20	67.70	104.00
Inorganics											
Alkalinity, Total as CaCO3	mg/l	-	459	455	423	382	311	369	316	259	406
COD, unfiltered	mg/l	-	67	53	52	2	24	49	4	99	22
Sulphate	mg/l	-	743.0	719.0	54.6	55.3	131.0	116.0	60.9	32.2	69.0
Total Oxidised Nitrogen as NO3	mg/l	-	9.80	9.60	8.00	7.10	0.17	186.00	3.70	<0.07	1.80
Filtered (Dissolved) Metals											
Cadmium	mg/l	-	1.10	1.30	0.90	<0.90	<0.90	<0.90	<0.90	1.10	<0.90
Calcium	mg/l	-	469.0	467.0	124.0	108.0	74.1	217.0	90.1	15.4	77.9
Chromium	ug/l		3.00	2.90	1.50	2.00	<1.0	6.30	2.20	2.50	1.30
Copper	mg/l		11.0	10.9	<0.8	1.4	<0.8	86.5	2.0	1.6	1.1
Iron	ug/l		86.2	87.2	2139.0	473.0	27717.0	165.0	29.4	723.0	1395.0
Lead	ug/l		<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1	<4.1
Magnesium	mg/l	-	38.2	40.1	28.2	28.1	33.4	81.8	27.3	29.3	29.9
Manganese	mg/l	-	32.40	35.40	2767.0	1548.0	2238.0	122.0	31.8	79.6	443.0
Nickel	ug/l	0.15 mg/l	<1.5	<1.5	4.5	<1.5	17.1	69.4	<1.5	<1.5	14.0
Potassium	mg/l	-	51.3	55.4	29.5	23.9	21.5	32.8	14.7	23.2	30.6
Sodium	mg/l	-	16.9	18.0	46.3	35.9	72.9	246.0	17.5	56.8	94.5
Zinc	ug/l	0.254 mg/l	23.9	24.9	8.3	6.1	9.2	20.8	3.6	9.2	12.4
Volatile Organic Compounds (VOCs)											
Sum of detected BTEX	mg/l	-	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Date Sampled		29/09/2024									

APPENDIX 4

Surface Water Time Series Graphs and Quarterly Suite Data

Table 1: Surface Water Quality

Parameter	EP Compliance Limit	P4		
		26/07/2024	23/08/2024	27/09/2024
Ammoniacal Nitrogen (mg/l)	1.6	0.20	0.63	2.30
Chloride (mg/l)	250	51.40	54.00	44.50
Chemical Oxygen Demand (mg/l)	100	49.00	40.00	67.00
pH (pH units)	>6 and <9	7.80	7.50	7.80
Suspended Solids (mg/l)	100	23.20	42.00	132.00

APPENDIX 5

Dust Monitoring Results

Flintshire County Council - Deposited Dust Monitoring

Analysis of matter collected in atmospheric deposit gauge during the period of:

From: 24/09/2024 To: 22/10/2024
No. of days 28

Collector: MW Analysis: i2 Analytical Reviewed: MW

Gauge Bowl No.	Make
Location 1	i2 Analytical
Location 2	i2 Analytical
Location 3	i2 Analytical



Factor (mg deposit to mg/m2) 24.7

Monitoring Location	Sample Volume (ml)	Total Suspended Solids (mg)	mg/m2/day
Location 1			0.00
Location 2	4960	<10	<8.82
Location 3	4970	14.3	12.61

Comments:

Location 1 dust gauge collection bottle had insufficient water to get a result, presumably this gauge has been knocked over?

- Dust analysis carried out by i2 analytical
- Approximately 100ml of water added to each sample for 'flushing' of dust gauge

Location 1: Site Operations - located near to leachate storage tanks

Location 2: Location changed due to access issues with fencing surrounding the LTP. Dust gauge located next to electricity meter housing. Young trees around gauge starting to mature,

Location 3: Oaks Farm (near road), trees starting to overhang area which may affect results in the future? Algal growth noted.

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