

CAULMERT LIMITED

Engineering, Environmental & Planning
Consultancy Services

Brookhill Landfill Site

Flintshire County Council Waste Management Services

Quarterly Monitoring Review

October – December 2018

Prepared by:

Caulmert Limited

InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG

Tel: 01248 672666

Fax: 01248 672601

Email: dianabrookshaw@caulmert.com

Web: www.caulmert.com

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Project Director: Andy Stocks
Project Manager: Diana Brookshaw
Caulmert Limited: Intec, Parc Menai, Bangor, Gwynedd, LL57 4FG
Tel: 01248 672666

Author	Harry Caulfield	Date	27/12/2018
Reviewer	Diana Brookshaw	Date	31/01/2019
Approved	Diana Brookshaw	Date	31/01/2019

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3031-CAU-XX-XX-DR-O-1802.P1 – Environmental Monitoring Plan

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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) BV7273 – Variation Notice Number YP3835MJ for Brookhill Landfill 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 by this report was collected between the 1st of October and the 31st of December 2018.

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 Ltd has not attempted to verify the information.

1.2 Site Location and Surrounding Land-use

1.2.1 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.

1.2.2 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 a number of 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.

1.2.3 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.

1.2.4 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.

1.2.5 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 through 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%,
- Most special wastes (allowed until June 2004).

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- 1.2.6 The special wastes which were tipped at the site were accepted pre-June 2004 (under the 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.
- 1.2.7 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 borehole locations are shown on Drawing 3031-CAU-XX-XX-DR-O-1802.P1, enclosed. Methane, carbon dioxide, oxygen and atmospheric pressure are recorded on each visit.
- 2.1.2 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). Monitoring data gathered at in-waste gas monitoring locations is also listed in Appendix 1.

2.2 In-waste Boreholes

- 2.2.1 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.
- 2.2.2 The average methane concentration in the GV wells was 52.07 %, similar to the previous quarters average of 49.04% and higher than the first quarter of 2018 (with an average of 45.3%). The average concentration of CO₂ in this quarter was 33.41%, with a maximum concentration in the GV wells of 43.9%, in GV18 and GV46.
- 2.2.3 H₂S was detected once in GV48 with at a concentration of 2 ppm. H₂S was undetected in all other locations during this review period.

2.3 Perimeter Boreholes

Methane

- 2.3.1 None of the monitored perimeter gas boreholes were in breach of their respective methane EP limits during this review period.
- 2.3.2 In keeping with previous trends at the site, the highest methane concentrations were detected at BH8 (8.9 %) and BH9 (15.5 %). In this quarter BH8 increased in concentration, with an average of 4.52% compared to last quarters 4.16%, BH9 also showed an increase. However, average methane concentration decreased from 20.51% last quarter to 12.65 % this quarter.
- 2.3.3 All other locations had maximum concentrations below 0.8 % with BH7 containing no methane.

Carbon Dioxide

- 2.3.4 Carbon dioxide was recorded in all perimeter gas boreholes during the review period. Carbon dioxide concentrations fluctuated in most locations throughout the review period. An increasing trend was observed in BH12. The highest concentration of carbon dioxide was recorded in BH21 (9.8 %). All concentrations remained below the relevant EP compliance limits.

3.0 GROUNDWATER

3.1 Introduction

3.1.1 Borehole locations are shown on Drawing 3031-CAU-XX-XX-DR-O-1802.P1, enclosed. Groundwater levels were recorded on a monthly basis in monitoring boreholes GW1 – GW8.

3.1.2 Collected samples were analysed for the range of determinants listed below:

pH, electrical conductivity, ammoniacal nitrogen, BOD, DO, chloride and dissolved oxygen.

3.1.3 Groundwater samples are analysed quarterly for the following parameters:

Total organic carbon, alkalinity, ammoniacal nitrogen, chloride, chemical oxygen demand, electrical conductivity, dissolved oxygen, pH, sulphate, total oxidized nitrogen, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, zinc, benzene, ethylbenzene, m,p-xylene, BTEX, xylenes, toluene.

3.1.4 Table S4.4 in the EP requires that GW2A, GW3A and GW4 are controlled by individual limits for ammoniacal nitrogen, chloride, nickel, zinc, total xylenes and toluene. The EP limit for total xylenes has been set at 0.011 mg/L, as agreed in a meeting with NRW on the 16th of April 2013.

3.1.5 Time-series graphs and a results summary of the laboratory analysis data are included in Appendix 2.

3.2 Groundwater Levels

3.2.1 Groundwater levels were recorded on the 19th of October, the 30th of November and the 14th of December 2018. Time series graphs of the groundwater levels are included in Appendix 2. The Groundwater levels increased slightly across the site with the exception of GW6 which saw a slight decrease during December.

3.3 Groundwater Quality

3.3.1 Exceedances of the EP limit for ammoniacal nitrogen (1.7 mg/L) were observed in GW2A, GW3A and GW4 during the review period. Maximum concentrations of ammoniacal nitrogen in GW2A, GW3A and GW4 were 30.9 mg/L, 124 mg/L, and 7.89 mg/L respectively. These are similar to the seasonal increase observed during this quarter in the 2017 Annual Review.

3.3.2 Ammoniacal nitrogen concentrations in the remaining locations ranged from <0.2 mg/L in GW6 to 41.9 mg/L in GW8.

3.3.3 Exceedances of the EP limit for chloride (60 mg/L) were also observed in GW2A and GW3A during the review period. Maximum chloride concentrations in GW2A and GW3A were

-
- 152 mg/l and 137 mg/l respectively. Concentrations in GW2A and GW3A were similar to those seen in the previous review.
- 3.3.4 At GW4 chloride concentrations remained below the compliance limit during this review period.
- 3.3.5 Chloride concentrations in locations with no EP limits ranged from a minimum of 33.6 mg/L in GW6 to a maximum of 338 mg/L in GW1.1. Concentrations in all locations remained similar to those reported in the previous review.
- 3.3.6 Electrical conductivity was measured once during this review. Electrical conductivity was lowest in GW4 as in the previous quarter, with a conductivity of 0.539 mS/cm. Electrical conductivity values for boreholes GW6 and GW7 remained below 0.9 mS/cm during the review period, with the highest conductivity in the quarter being recorded in GW1.1 at 3.12 mS/cm. conductivities within all locations showed a decrease when compared to the previous quarter with the exception of GW1.1 which showed an increase.
- 3.3.7 Concentrations of dissolved oxygen were measured once during this review period. Dissolved oxygen concentrations were lowest at GW1, GW2A-GW4 and GW8 where detection limit values of <0.3 mg/l were recorded. The maximum of 1.91 mg/l was recorded in GW5A, slightly lower than the maximum in quarter 3 of 3.01 mg/l recorded in GW6.
- 3.3.8 The pH in the groundwater locations varied from 6.24 (GW1) to 7.5 (GW7). This is similar to the range seen in the previous quarter of 2018.
- 3.3.9 During the quarterly monitoring round, no xylenes were detected in any of the locations. Toluene was detected at 1.13 mg/l, however this value exceeds the reported concentrations for all locations at the site in 2018 (and at this location since 2009) by 3 orders of magnitude. The concentration recorded in December was 0.00353 mg/l, below the compliance limit of 0.004 mg/l. It is therefore considered that the reported value for GW3 in October is not representative of the concentration at this location, and does not indicate a new pollution event at the site. No toluene was detected in any of the other locations.
- 3.3.10 Concentrations of the metals nickel and Zinc remained below the respective EP limits throughout the review period.

Annual Suite

- 3.3.11 Mineral Oil (>C10-C40) was detected in GW3A and GW4 at 0.306 mg/l and 0.144 mg/l respectively. It is recommended that this is investigated further.
- 3.3.12 Carbon tetrachloride was detected within GW8 at a concentration of 0.00581 mg/l. None of the other annual screen parameters were detected in any of the groundwater monitoring

locations in December 2018. Carbon tetrachloride remained undetected within the leachate suggesting a possible off site source.

4.0 LEACHATE

4.1 Introduction

4.1.1 Leachate levels at leachate chambers LC1B, LC2B, LC4B and LC6 and remote leachate monitoring points R1B, R2B, R3, R4B, R5 and R6B were recorded monthly. Well locations are shown on Drawing Number 3031-CAU-XX-XX-DR-O-1802.P1, enclosed. No results for LC3 and LC5 are reported, as agreed with Natural Resources Wales on the 16th of April 2013.

4.1.2 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 public sewer and is subject to a trade effluent agreement (Discharge Consent, DC).

4.1.3 Samples collected on the 16th of October and 14th December from the leachate chambers were analyzed for the suite below:

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

4.1.4 The treated leachate discharge (Final Discharge, FD) was sampled and analysed for:

Alkalinity, Ammoniacal Nitrogen, Chromium, COD, Copper, Lead, Nickel, Nitrate as N, Nitrite as N, pH, Suspended Solids and Zinc.

4.1.5 Data summaries of leachate and discharge quality can be found in Appendix 3. Leachate levels are represented graphically, in meters above site datum (mASD) for easier comparison to site surveys and groundwater levels.

4.2 Leachate Levels

- 4.2.1 Table S4.1 in the EP requires that leachate levels must not exceed 2 m above the base of Cells 1 and 6, and 3m above the cell base of Cells 2-5.
- 4.2.2 Leachate levels recorded during this review period are summarised in Table 2 below. As discussed with NRW, the collected leachate levels reflect ‘pumped’ leachate levels, where pumps are switched off for up to 4 hours before a dip is obtained.
- 4.2.3 All cells showed fairly stable levels of leachate, with very little fluctuation across the review period. These trends will be discussed in greater detail as part of the ongoing investigation into leachate management at the site. All leachate data will be summarised in the 2018 Annual Review.

Table 3: Leachate Head Data (exceedances highlighted in yellow)

Landfill Cell	Monitoring Point	October (m above base)	November (m above base)	December (m above base)	Compliance Limit
Cell 1	BK LC 1B	2.51	2.51	2.51	2
	BK R1 B	2.60	2.61	2.60	
Cell 2	BK LC 2B	2.10	2.10	2.11	3
	BK R2B	4.80	4.77	4.78	
Cell 3	BK R3	1.21	1.19	1.18	3
Cell 4	BK LC 4B	3.14	3.15	3.16	3
	BK R4B	3.98	3.97	3.94	
Cell 6	BK LC 6B	3.63	3.66	3.64	2
	BK R6B	1.64	1.68	1.69	

- 4.2.4 As in the previous quarter of 2018, Cell 6 recorded exceedances in LC6B throughout the review period, but all reported levels for R6B were compliant.
- 4.2.5 Similarly, in Cell 2, R2B exceeded the leachate compliance limit on all monitoring occasions this quarter, however leachate head levels at LC2B were reported as compliant.
- 4.2.6 Leachate compliance limits were exceeded in all monitoring points throughout this quarter in Cells 1 and 4. Cell 5 was not monitored throughout this review period due to R5 being deemed unsuitable for monitoring. The condition of this well is under review and proposals for rectifying the matter will be presented as part of the interpretative report for the leachate extraction trial for the site.
- 4.2.7 The method of recording and reporting leachate levels for the site is currently under review, following a cessation test carried out in March and August 2018. Future planned works will also evaluate the condition of the infrastructure at the site in relation to its suitability for monitoring and extraction purposes.

4.3 Leachate Quality

- 4.3.1 Ammoniacal nitrogen concentrations ranged from 227 mg/l in LC3 to 3580 mg/l in LC5, similar concentrations to those seen in the previous review period. Concentrations decreased throughout the review period with the exception of LC3.
- 4.3.2 The maximum chloride concentration was higher than in the previous quarter, with 3190 mg/l in LC5 compared to 2620 mg/l in the LC4B last quarter. Concentrations in LC4B continued to decrease as with the previous quarter. Concentrations in other locations remained comparable to the previous review period.
- 4.3.3 Concentrations of sulphate decreased compared to the previous review, with the maximum decreasing from 23.2 mg/l in LC5 to 3.38 mg/l in LC4B. Concentrations in all other locations were below the detection limit.
- 4.3.4 COD remained very similar to the previous quarter, with the maximum of 7640 mg/l at LC5 being slightly below last quarters maximum of 8860 mg/l in the same location.
- 4.3.5 Concentrations of the metals calcium, magnesium, potassium and sodium were detected in similar concentrations as reported in previous reviews, with sodium showing a slight increase towards the end of the review period.
- 4.3.6 Leachate quality is overall comparable to that detected in previous review periods, with this quarter showing decreases in concentration in chloride and sulphate. Again, LC5 records the strongest leachate quality, and LC3 the weakest.

4.4 Final Discharge to Sewer

- 4.4.1 Ammoniacal nitrogen was low on all monitoring occasions, remaining below 2 mg/l, similar to in the previous quarter.
- 4.4.2 The 2000 mg/l limit of COD was exceeded once with a concentration of 2310 mg/l, and the suspended solids limit of 500 mg/l was exceeded with concentrations of 1440 mg/l and 508 mg/l. suspended solids were not monitored during December.
- 4.4.3 Chromium, copper, lead, nickel and zinc concentrations were significantly below the discharge limits, as observed previously.

5.0 SURFACE WATER

5.1 Introduction

5.1.1 Surface water samples are 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 and 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 north west of the site, beyond landfill gas monitoring borehole BH10.

5.1.2 As agreed with NRW, water in P2 is only sampled when there is the likelihood of an overflow to the discharge point¹. P2 was not sampled during this review period.

5.1.3 No samples have been taken from SW2 during this review period.

5.1.4 Collected samples were analysed for the range of determinants listed below:

Ammoniacal nitrogen, chloride, chemical oxygen demand (COD), pH and total suspended solids

5.1.5 In the EP, Table S4.3 requires that only location P2 be controlled by chemical quality limits. Monitoring locations are shown on Drawing Number 3031-CAU-XX-XX-DR-O-1802.P1, enclosed. A summary of the laboratory analysis data is included in Appendix 4.

5.2 Surface Water Quality

5.2.1 Ammoniacal nitrogen concentrations increased at P4 from below the detection limit (<2 mg/L) in October to 6.11 mg/L in December. Concentrations remained below the yearly maximum of 8.14 mg/L in June. Minimum values continued to decrease with concentrations below the limit of detection.

5.2.2 The concentration of chloride at P4 were relatively stable, concentrations ranged from 60.1 mg/L to 64.5 mg/L.

5.2.3 The pH values recorded in this review period at P4 ranged from 7.76 to 7.94, similar to the values recorded in the previous quarters. Suspended solids decreased from 4.2 mg/L in October to 3.7 mg/L in November and December.

¹ E-mail correspondence, 14.07.2014, Alison Soper (NRW) to Phil Mulhall (FCC).

6.0 DUST

6.1 Introduction

- 6.1.1 Dust monitoring was undertaken between the 04/12/2018 and the 08/01/2019 as required by the EP.
- 6.1.2 Location 1 was located on a bund by leachate storage tanks and opposite the transfer pad. Location 2 was on the site perimeter near the electricity meter house. Location 3 was in Oaks Farm.

6.2 Dust Results

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

Table 4: Results from dust monitoring at Brookhill

Monitoring Locations	Total Suspended Solids (mg/l)	Result (mg/m ² /day)	Compliance Limit (mg/m ² /day)
Location 1	11	7.76	200
Location 2	<10	<8.82	200
Location 3	<10	<8.82	200

- 6.2.2 No exceedances of the environmental permit were noted during this quarter.

7.0 CONCLUSIONS

7.1 Landfill Gas

- 7.1.1 Landfill gas concentration was monitored at locations around the site perimeter on a weekly basis. During this review period, none of the monitored perimeter gas boreholes were in breach of their respective methane or carbon dioxide EP limits.
- 7.1.2 During this review period methane concentrations remained below 0.8 % in many of the boreholes on site. The highest concentrations were, as expected, in BH8 and BH9. These boreholes have individually set EP limits, which were not exceeded during this review period.
- 7.1.3 The maximum carbon dioxide concentration was recorded in BH21 at 9.8%.

7.2 Groundwater

- 7.2.1 Exceedances of the EP limit for ammoniacal nitrogen (1.7 mg/L) were observed in GW2A, GW3A and GW4 during the review period. The EP limit for chloride was also exceeded in GW2A and GW3A. The recorded concentrations are currently being reviewed in the context of background water quality in other boreholes around the site.
- 7.2.2 The concentrations of most other determinants were similar to those recorded in the previous quarter around the site excluding toluene which was recorded at 1.13 mg/l and 0.00353 mg/l. It is considered likely that the concentration of 1.13 mg/l recorded at GW3A in October 2018 is not representative of the toluene concentrations at this location, and may reflect sample contamination.

7.3 Leachate

- 7.3.1 Leachate levels remained similar to those reported in the previous quarter. Exceedances of the EP limits for leachate levels were similar to those in the second quarter of 2018. LC2B and R3 remained below the compliance limit. All other locations continued to exceed their respective limits. The leachate extraction strategy and level monitoring and reporting is undergoing review as required by CAR_NRW0031800 in order to maintain leachate levels within the EP compliance limits.
- 7.3.2 Leachate quality was comparable to that detected during previous reviews and suggests that a medium/strong leachate is present.

7.4 Surface Water

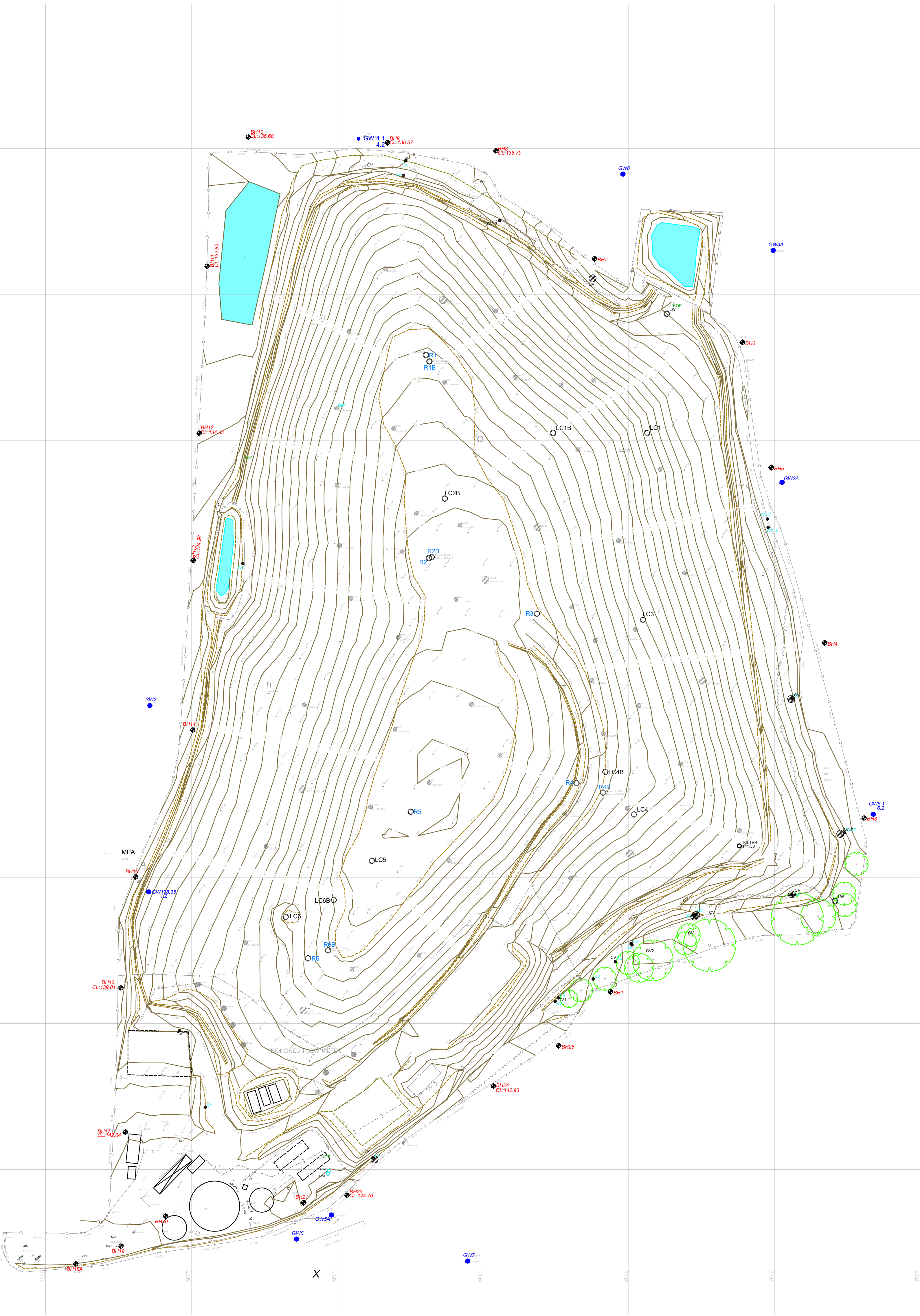
- 7.4.1 Only P4 was sampled during this review period. Ammoniacal nitrogen concentrations increased slightly during this review period but remained below previously recorded maxima.
- 7.4.2 Suspended Solid concentrations decreased when compared previous reviews. All other substances showed similar concentrations to the previous review period.

7.5 Fugitive emissions (dust)

7.5.1 No locations exceeded the EP compliance limits during this review period.

NOTES
1. SURVEY INFORMATION PROVIDED BY STAFSURV,
REF: 9193aRev1 Brookhill 06-04-2017

- LEGEND
- **BH14** GAS BOREHOLE
 - **GW5** GROUND WATER MONITORING BOREHOLE
 - ⊕ **LC5** LEACHATE WELL
 - **SW2** SURFACE WATER MONITORING POINT
 - **CV** COAL VENT



P1	ISSUED FOR COMMENT	EJD	DB	DB	30.1.18
REV	MODIFICATIONS	BY	CH	AP	DATE

FLINTSHIRE COUNTY
COUNCIL WASTE
MANAGEMENT SERVICES

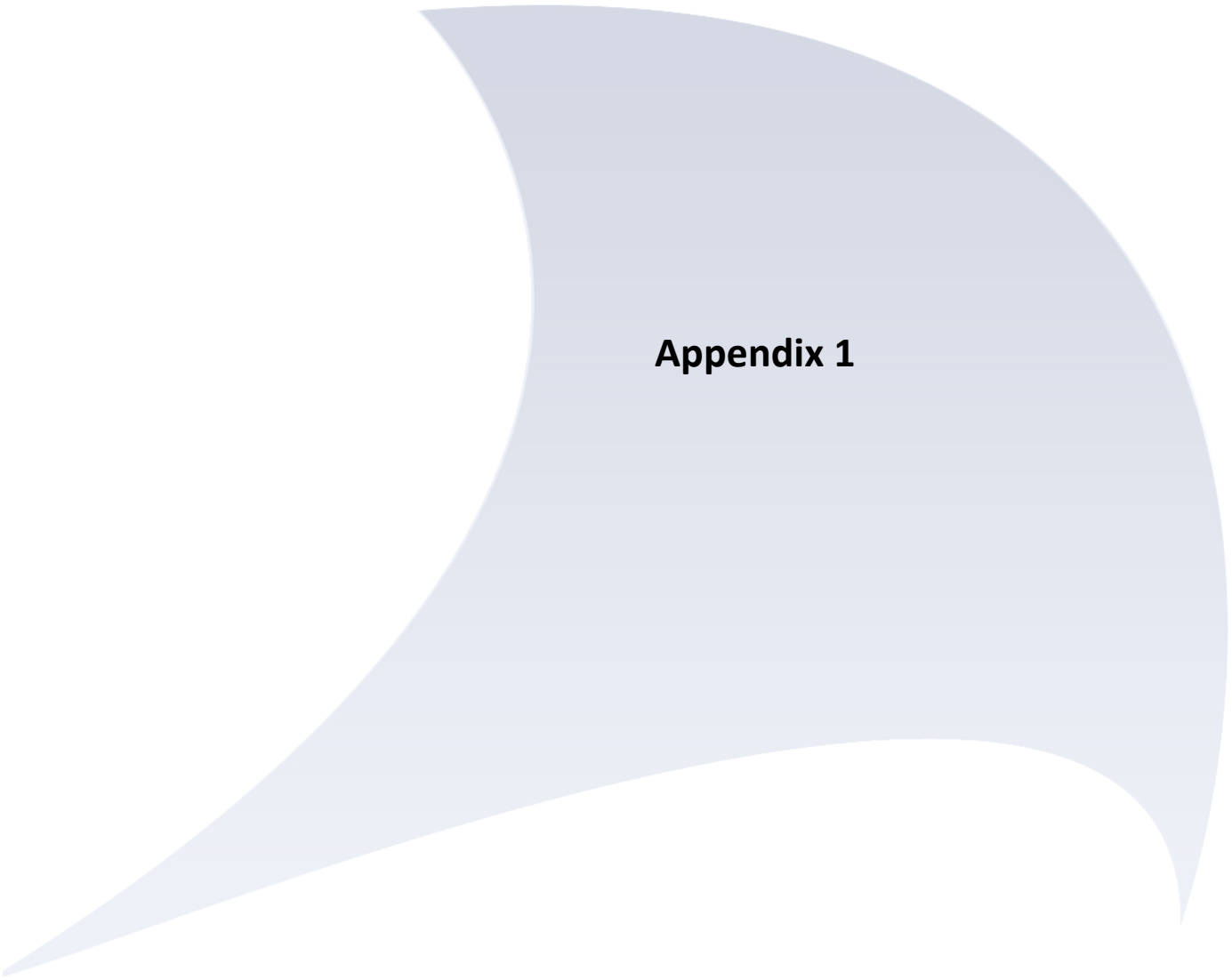
BROOKHILL LANDFILL SITE

ENVIRONMENTAL
MONITORING PLAN

DRAWN BY	EJD	DATE	30.01.2018
CHECKED BY	DB	SCALE	A1 1:750
APPROVED BY	DB	ISSUE	S1
		REVISION	P1

DRAWING NUMBER
3031-CAU-XX-XX-DR-O-1802





Appendix 1

APPENDIX 1 – LANDFILL GAS

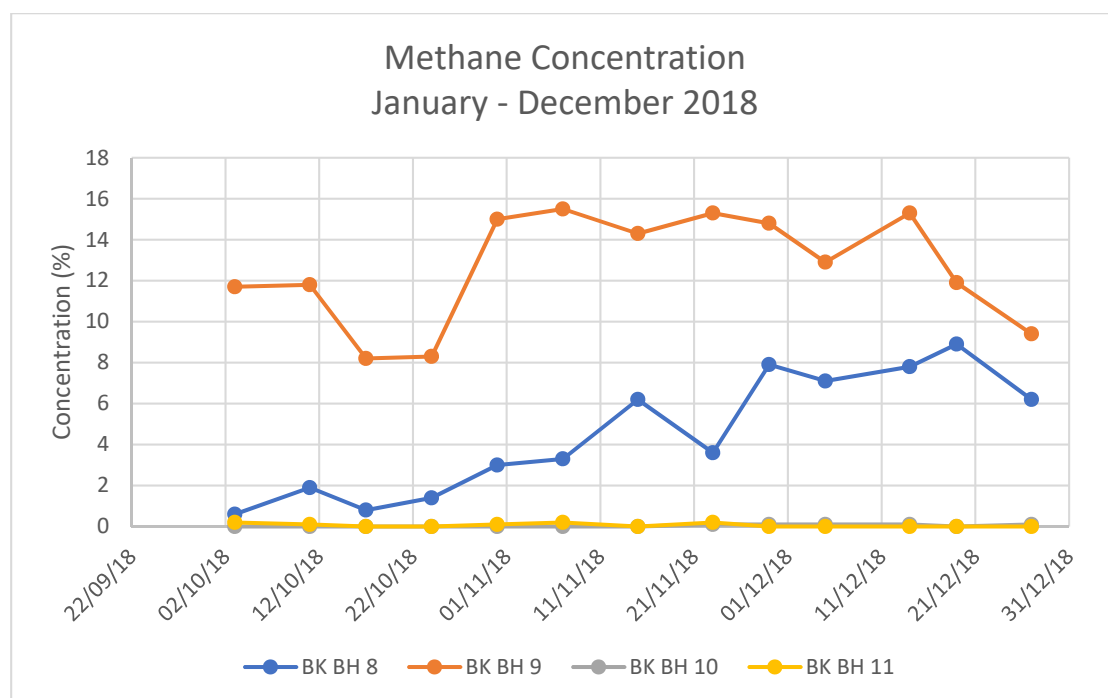
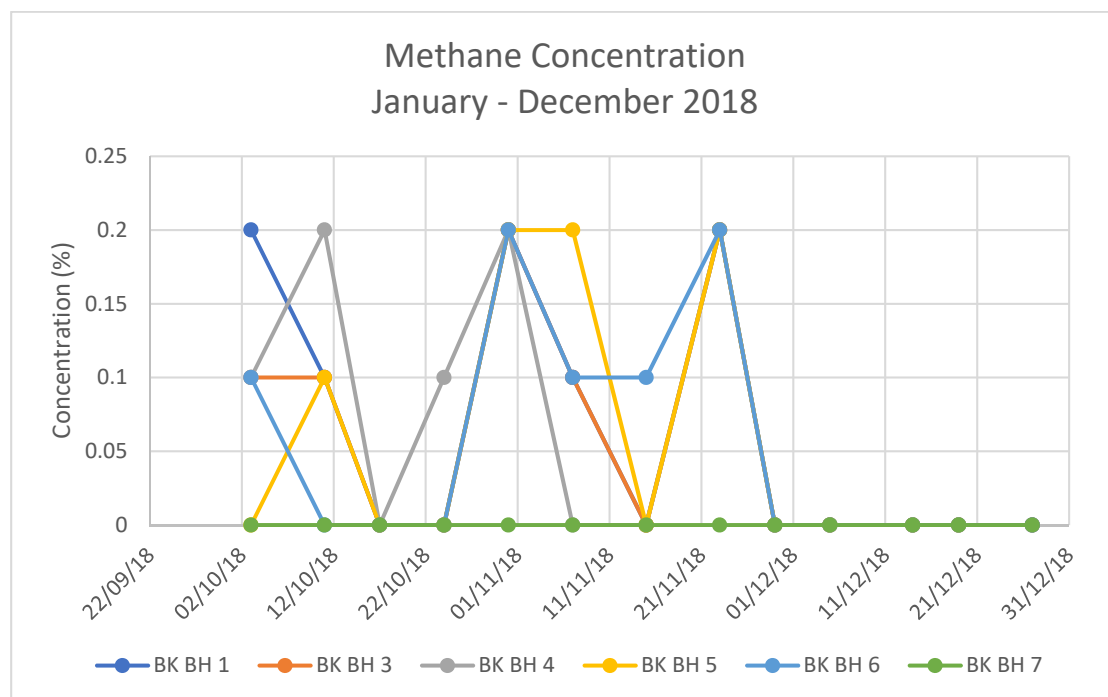
Table 1: Perimeter Landfill Gas Monitoring Data Summary

Location	Data	CH4 (%v/v)	Trigger (%v/v)	CO2 (%v/v)	Trigger (%v/v)
BK BH 1	Min	0.00	1	0.10	8.8
	Max	0.20		1.40	
	Average	0.06		0.80	
	Count	13.00		13.00	
BK BH 3	Min	0.00	1	0.90	3.1
	Max	0.20		2.20	
	Average	0.05		1.48	
	Count	13.00		13.00	
BK BH 4	Min	0.00		1.80	
	Max	0.20		5.00	
	Average	0.07		3.74	
	Count	12.00		12.00	
BK BH 5	Min	0.00	1	0.80	1.5
	Max	0.20		1.40	
	Average	0.06		1.17	
	Count	12.00		12.00	
BK BH 6	Min	0.00	1	0.50	1.5
	Max	0.20		1.40	
	Average	0.05		1.06	
	Count	13.00		13.00	
BK BH 7	Min	0.00	1	1.00	10
	Max	0.00		1.30	
	Average	0.00		1.22	
	Count	13.00		13.00	
BK BH 8	Min	0.60	32.2	1.30	3.6
	Max	8.90		3.50	
	Average	4.52		2.42	
	Count	13.00		13.00	
BK BH 9	Min	8.20	29.6	5.30	10.4
	Max	15.50		9.20	
	Average	12.65		7.72	
	Count	13.00		13.00	
BK BH 10	Min	0.00	1	1.10	3.9
	Max	0.10		1.50	
	Average	0.04		1.35	
	Count	13.00		13.00	
BK BH 11	Min	0.00	1	0.20	6.5
	Max	0.20		2.30	
	Average	0.06		1.26	
	Count	13.00		13.00	
BK BH 12	Min	0.00	1	1.10	6.6
	Max	0.20		3.60	
	Average	0.05		2.59	
	Count	13.00		13.00	
BK BH 13	Min	0.00	1	1.20	9.4
	Max	0.20		4.20	
	Average	0.05		2.86	
	Count	13.00		13.00	

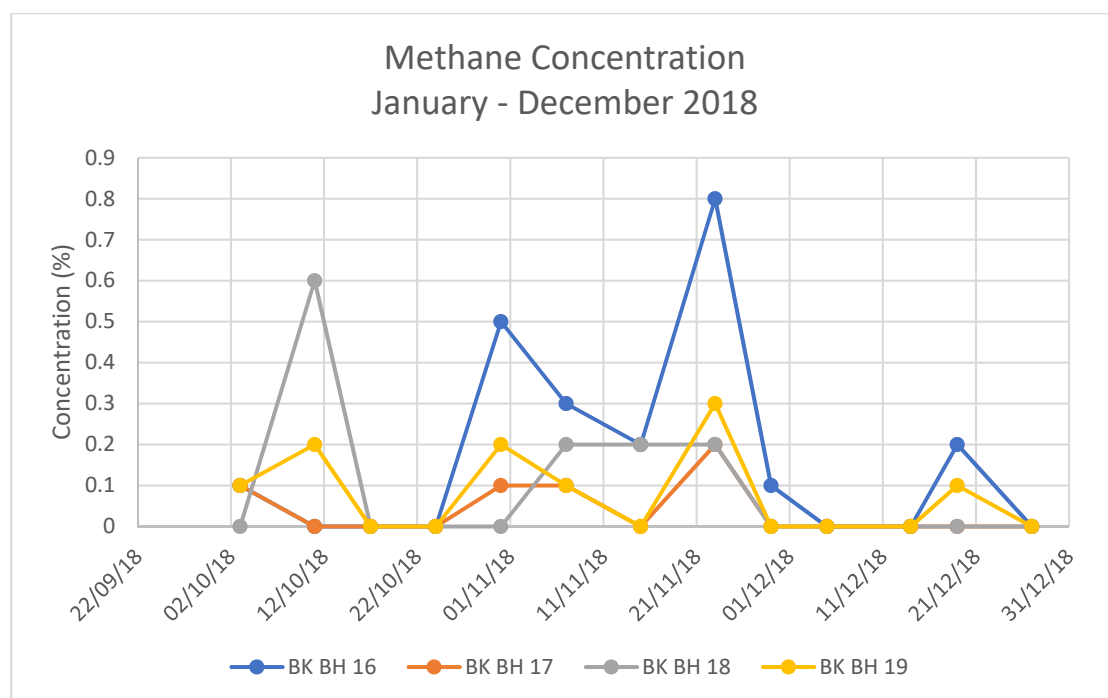
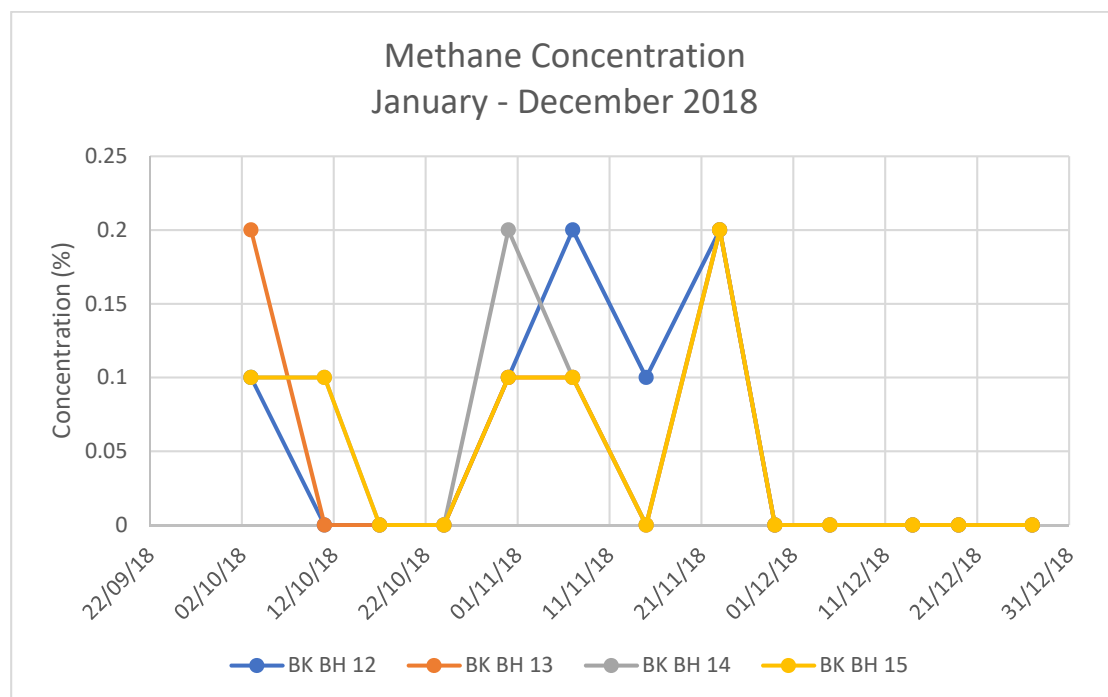
APPENDIX 1 – LANDFILL GAS

Location	Data	CH4 (%v/v)	Trigger (%v/v)	CO2 (%v/v)	Trigger (%v/v)
BK BH 14	Min	0.00	1	0.10	3.5
	Max	0.20		1.40	
	Average	0.05		0.80	
	Count	13.00		13.00	
BK BH 15	Min	0.00	1	0.90	17.6
	Max	0.20		2.20	
	Average	0.05		1.48	
	Count	13.00		13.00	
BK BH 16	Min	0.00	1	1.80	11.4
	Max	0.80		5.00	
	Average	0.17		3.74	
	Count	13.00		12.00	
BK BH 17	Min	0.00	1	0.80	12.9
	Max	0.20		1.40	
	Average	0.04		1.17	
	Count	13.00		12.00	
BK BH 18	Min	0.00	6.8	0.50	21.2
	Max	0.60		1.40	
	Average	0.09		1.06	
	Count	13.00		13.00	
BK BH 19	Min	0.00	1	1.00	11.2
	Max	0.30		1.30	
	Average	0.08		1.22	
	Count	13.00		13.00	
BK BH 20	Min	0.00	1	1.30	
	Max	0.10		3.50	
	Average	0.05		2.42	
	Count	2.00		13.00	
BK BH 21	Min	0.00	1	5.30	11.4
	Max	0.20		9.20	
	Average	0.05		7.72	
	Count	11.00		13.00	
BK BH 23	Min	0.00	1	1.10	7.3
	Max	0.20		1.50	
	Average	0.05		1.35	
	Count	13.00		13.00	
BK BH 24	Min	0.00	1	0.20	1.5
	Max	0.20		2.30	
	Average	0.05		1.26	
	Count	13.00		13.00	
BK BH 25	Min	0.00	1	1.10	9.9
	Max	0.20		3.60	
	Average	0.06		2.59	
	Count	13.00		13.00	

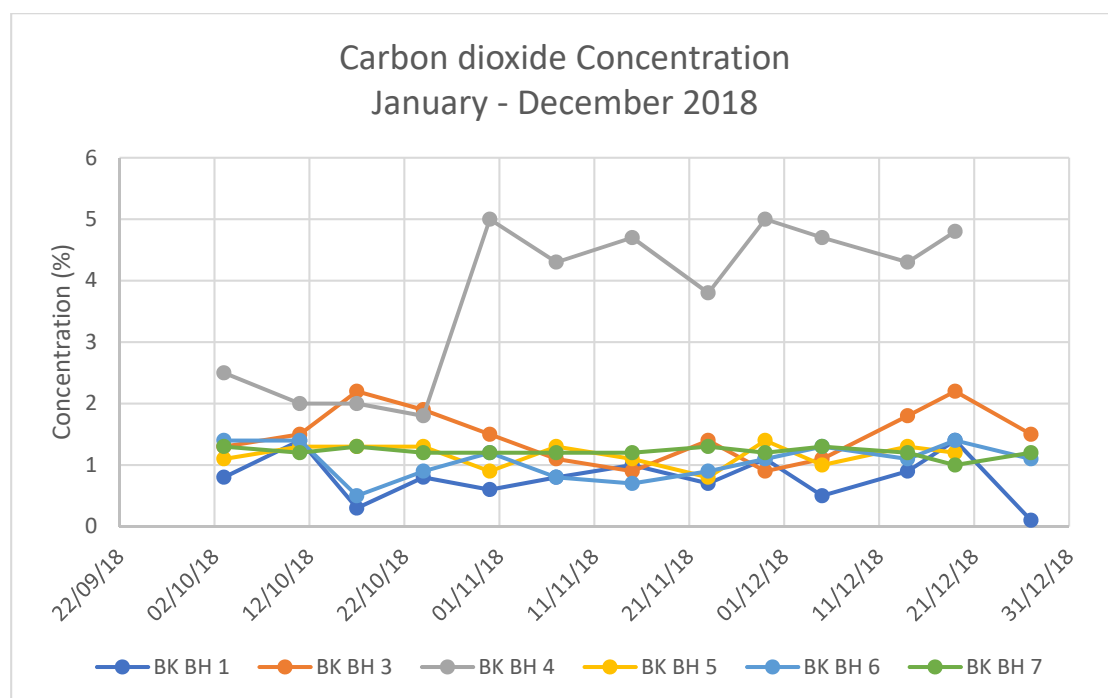
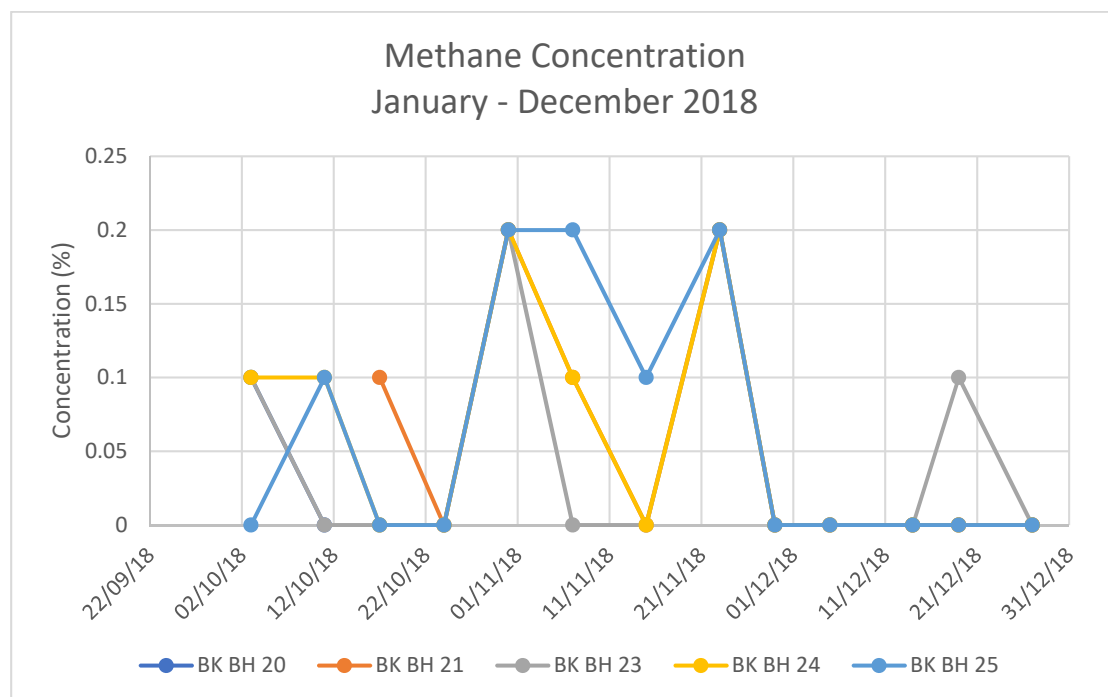
APPENDIX 1 – LANDFILL GAS



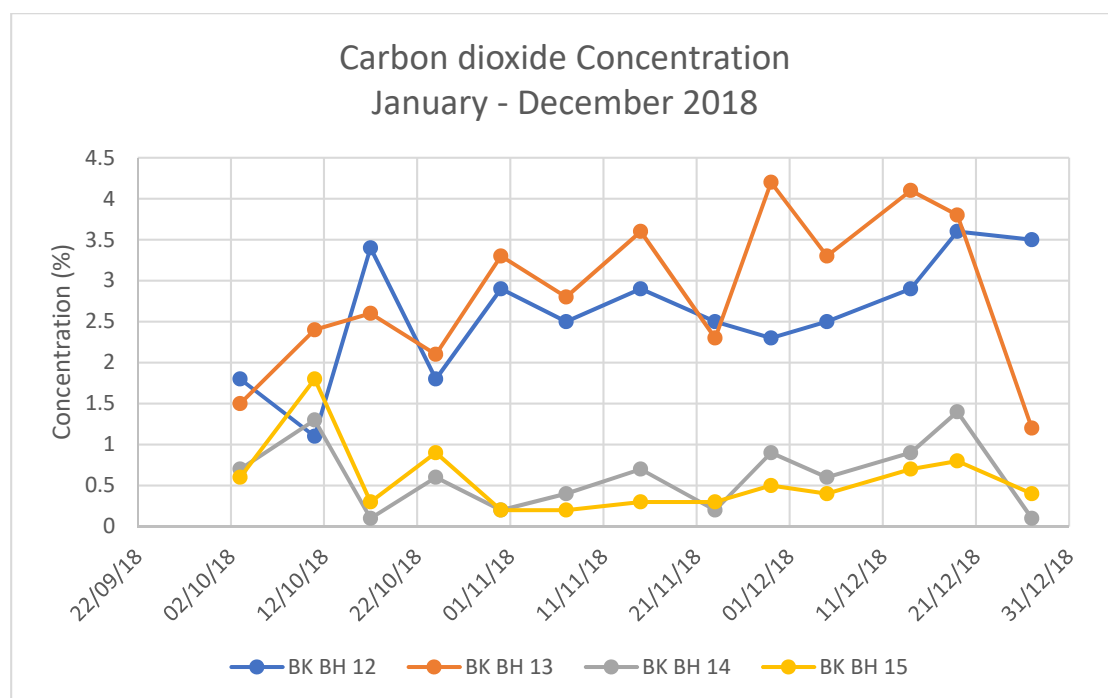
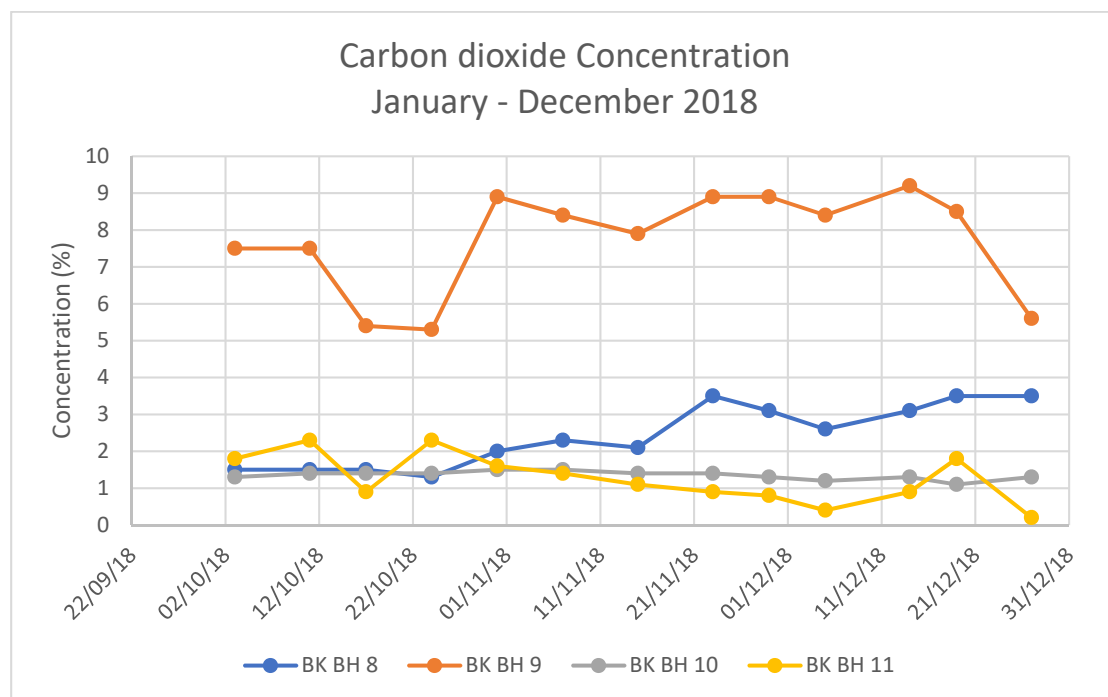
APPENDIX 1 – LANDFILL GAS



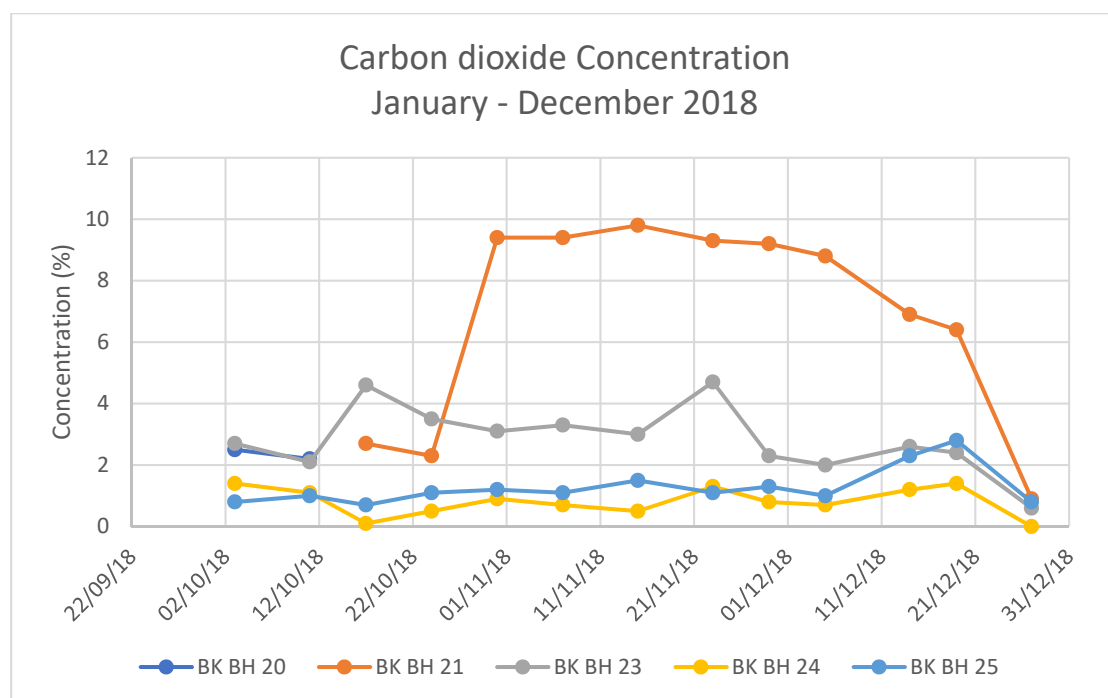
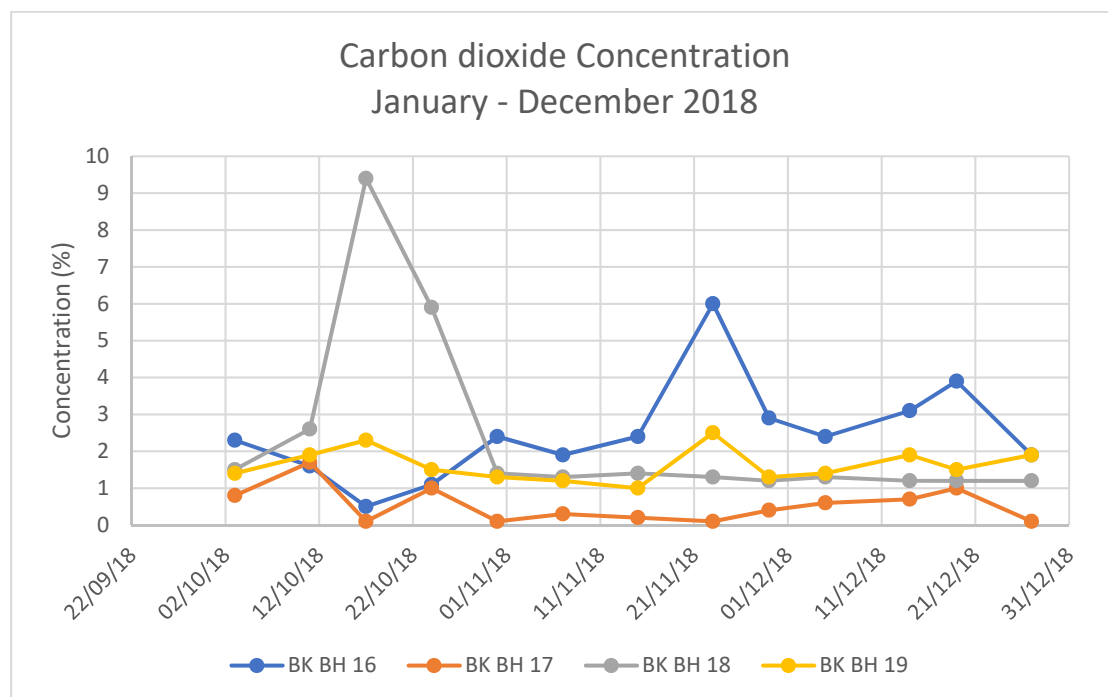
APPENDIX 1 – LANDFILL GAS



APPENDIX 1 – LANDFILL GAS



APPENDIX 1 – LANDFILL GAS



APPENDIX 1 – LANDFILL GAS

Table 2: In waste landfill gas monitoring data summary

Monitoring Point	CH4 (%)			CO2 (%)			O2 (%)			Balance (%)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
G010MA	54	54	54.00	37.2	37.2	37.20	0.2	0.2	0.20	8.6	8.6	8.60
G010MB	46.7	46.7	46.70	33	33	33.00	0.6	0.6	0.60	19.7	19.7	19.70
G01MDA	48.2	54.1	51.15	34.4	37.4	35.90	0	0.2	0.10	8.3	17.4	12.85
G01MDB	46.4	46.4	46.40	33.8	33.8	33.80	0.5	0.5	0.50	19.3	19.3	19.30
GV10	34.9	34.9	34.90	21.7	21.7	21.70	2.5	2.5	2.50	40.9	40.9	40.90
GV11	24.3	24.3	24.30	25.4	25.4	25.40	0.1	0.1	0.10	50.2	50.2	50.20
GV12	59.2	59.2	59.20	39.1	39.1	39.10	0.3	0.3	0.30	1.4	1.4	1.40
GV13	11.4	11.4	11.40	19.4	19.4	19.40	7	7	7.00	62.2	62.2	62.20
GV14	52.2	52.2	52.20	38.7	38.7	38.70	0.1	0.1	0.10	9	9	9.00
GV15	55.5	55.5	55.50	38.8	38.8	38.80	0.4	0.4	0.40	5.3	5.3	5.30
GV16	28.9	28.9	28.90	18.2	18.2	18.20	11.1	11.1	11.10	41.8	41.8	41.80
GV17	56.5	56.5	56.50	37.3	37.3	37.30	0.3	0.3	0.30	5.9	5.9	5.90
GV18	59.7	59.7	59.70	39.8	39.8	39.80	0.2	0.2	0.20	0.3	0.3	0.30
GV202	42.5	42.5	42.50	29	29	29.00	0.7	0.7	0.70	27.8	27.8	27.80
GV21	61.5	61.5	61.50	35.2	35.2	35.20	1.1	1.1	1.10	2.2	2.2	2.20
GV23	0	42.1	27.53	2.4	31.8	21.90	0	19.1	6.37	26.1	78.5	44.20
GV24	66.6	66.6	66.60	35.2	35.2	35.20	0.6	0.6	0.60	0	0	0.00
GV26	57.3	57.3	57.30	36.2	36.2	36.20	0.2	0.2	0.20	6.3	6.3	6.30
GV27	58.9	58.9	58.90	37.3	37.3	37.30	0.2	0.2	0.20	3.6	3.6	3.60
GV28	0.2	0.2	0.20	8	8	8.00	17.8	17.8	17.80	74	74	74.00
GV29	55.6	55.6	55.60	32.8	32.8	32.80	0.8	0.8	0.80	10.8	10.8	10.80
GV3	65.3	65.3	65.30	32.3	32.3	32.30	0.3	0.3	0.30	2.1	2.1	2.10
GV30	52.5	52.5	52.50	36.7	36.7	36.70	0.2	0.2	0.20	10.6	10.6	10.60
GV301	56	56	56.00	33.6	33.6	33.60	1.8	1.8	1.80	8.6	8.6	8.60
GV31	52.3	52.3	52.30	34	34	34.00	0.6	0.6	0.60	13.1	13.1	13.10
GV32	59.6	59.6	59.60	40.7	40.7	40.70	0.1	0.1	0.10	0	0	0.00
GV33	57.9	58.3	58.10	39.5	40.1	39.80	0.3	0.6	0.45	1.3	2	1.65
GV35	60.2	61.2	60.70	40.4	40.4	40.40	0.2	0.4	0.30	0	0	0.00
GV36	35.3	35.3	35.30	32.6	32.6	32.60	0.8	0.8	0.80	31.3	31.3	31.30
GV37	22.9	22.9	22.90	21.7	21.7	21.70	2.7	2.7	2.70	52.7	52.7	52.70

APPENDIX 1 – LANDFILL GAS

Monitoring Point	CH4 (%)			CO2 (%)			O2 (%)			Balance (%)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
GV38	64.5	64.5	64.50	37.4	37.4	37.40	0	0	0.00	0	0	0.00
GV39	64.7	64.7	64.70	36.3	36.3	36.30	0	0	0.00	0	0	0.00
GV4	32.1	32.1	32.10	21.5	21.5	21.50	6.7	6.7	6.70	39.7	39.7	39.70
GV40	50.8	50.8	50.80	32.7	32.7	32.70	2.9	2.9	2.90	13.6	13.6	13.60
GV41	59.9	60.2	60.05	40.2	40.4	40.30	0.1	0.2	0.15	0	0	0.00
GV42	11.1	11.1	11.10	5.7	5.7	5.70	16.1	16.1	16.10	67.1	67.1	67.10
GV43	32.9	32.9	32.90	23.8	23.8	23.80	0.8	0.8	0.80	42.5	42.5	42.50
GV44	43	43	43.00	32.3	32.3	32.30	0	0	0.00	24.7	24.7	24.70
GV45	37.8	37.8	37.80	30.4	30.4	30.40	0.2	0.2	0.20	31.6	31.6	31.60
GV46	60.8	60.8	60.80	40.8	40.8	40.80	0.1	0.1	0.10	0	0	0.00
GV47	33.3	33.3	33.30	27.7	27.7	27.70	0	0	0.00	39	39	39.00
GV48	61	62.2	61.60	37	38.2	37.60	0.6	0.7	0.65	0.1	0.2	0.15
GV49	50.8	51	50.90	37.4	37.4	37.40	0	0.1	0.05	11.6	11.7	11.65
GV6	1.7	1.7	1.70	5.2	5.2	5.20	18.5	18.5	18.50	74.6	74.6	74.60
GV7	18.8	18.8	18.80	22.4	22.4	22.40	0.8	0.8	0.80	58	58	58.00
GV8	34.3	34.3	34.30	27.2	27.2	27.20	0.2	0.2	0.20	38.3	38.3	38.30
GV9	61.6	61.6	61.60	36.2	36.2	36.20	0.2	0.2	0.20	2	2	2.00
GVA	23.2	23.2	23.20	20.3	20.3	20.30	6.1	6.1	6.10	50.4	50.4	50.40
GVB	55.9	55.9	55.90	35.8	35.8	35.80	0.2	0.2	0.20	8.1	8.1	8.10
GVC	58.9	58.9	58.90	39.2	39.2	39.20	0.1	0.1	0.10	1.8	1.8	1.80
GW0034	55.7	56.5	56.10	29.1	29.6	29.35	0	0.1	0.05	14.3	14.7	14.50
LC1B	8	8	8.00	8.1	8.1	8.10	17.6	17.6	17.60	66.3	66.3	66.30
LC2B	0.8	0.8	0.80	6.6	6.6	6.60	18.1	18.1	18.10	74.5	74.5	74.50
LC2R	44	44	44.00	32	32	32.00	0.1	0.1	0.10	23.9	23.9	23.90
LC3	4	4	4.00	6.6	6.6	6.60	18.1	18.1	18.10	71.3	71.3	71.30
LC4	27.9	27.9	27.90	22.1	22.1	22.10	4	4	4.00	46	46	46.00
LC4B	34.5	34.5	34.50	29	29	29.00	6.8	6.8	6.80	29.7	29.7	29.70
LC5	6.7	6.7	6.70	17	17	17.00	9.3	9.3	9.30	67	67	67.00
LC6	5.1	5.1	5.10	14.6	14.6	14.60	9.9	9.9	9.90	70.4	70.4	70.40
LC6B	51.2	52.6	51.90	34.8	35.7	35.25	0.5	0.9	0.70	12.1	12.2	12.15
M010MA	56.6	56.6	56.60	40	40	40.00	0.2	0.2	0.20	3.2	3.2	3.20

APPENDIX 1 – LANDFILL GAS

Monitoring Point	CH4 (%)			CO2 (%)			O2 (%)			Balance (%)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
M010MB	59.8	59.8	59.80	36.8	36.8	36.80	0.4	0.4	0.40	3	3	3.00
M050MA	57.6	57.6	57.60	36.9	36.9	36.90	0.4	0.4	0.40	5.1	5.1	5.10
M050MB	52.7	52.7	52.70	37	37	37.00	0.1	0.1	0.10	10.2	10.2	10.20
PRG017	55.7	55.7	55.70	37.9	37.9	37.90	0.3	0.3	0.30	6.1	6.1	6.10
PRG039	64.7	64.7	64.70	35.8	35.8	35.80	0	0	0.00	0	0	0.00
PRG041	60.1	60.1	60.10	41	41	41.00	0.1	0.1	0.10	0	0	0.00
PRG042	11.1	11.1	11.10	5.7	5.7	5.70	16	16	16.00	67.2	67.2	67.20
PRG044	3.6	3.6	3.60	19.4	19.4	19.40	1.7	1.7	1.70	75.3	75.3	75.30
PRG045	37	37	37.00	30.8	30.8	30.80	0.2	0.2	0.20	32	32	32.00
PRG046	60.3	60.3	60.30	41	41	41.00	0.3	0.3	0.30	0	0	0.00
PRG048	56.2	56.2	56.20	37.3	37.3	37.30	1.4	1.4	1.40	5.1	5.1	5.10
PRG049	51.7	51.7	51.70	38.5	38.5	38.50	0	0	0.00	9.8	9.8	9.80
PRL06B	51	51	51.00	35.5	35.5	35.50	1.6	1.6	1.60	11.9	11.9	11.90
PRLOC4	14.4	14.4	14.40	15.3	15.3	15.30	13.1	13.1	13.10	57.2	57.2	57.20
PRR3	21.3	21.3	21.30	18.9	18.9	18.90	10.7	10.7	10.70	49.1	49.1	49.10
PRR6B	51.8	51.8	51.80	38.7	38.7	38.70	0	0	0.00	9.5	9.5	9.50
PW1	25.5	25.5	25.50	13	13	13.00	12.3	12.3	12.30	49.2	49.2	49.20
PW2	10.7	10.7	10.70	11.5	11.5	11.50	14.5	14.5	14.50	63.3	63.3	63.30
PW3	7.9	7.9	7.90	18.7	18.7	18.70	4.5	4.5	4.50	68.9	68.9	68.90
PW4	15.4	15.4	15.40	22	22	22.00	0.5	0.5	0.50	62.1	62.1	62.10
PW5	8.7	8.7	8.70	16.6	16.6	16.60	10.6	10.6	10.60	64.1	64.1	64.10
R1	42.1	42.1	42.10	29.8	29.8	29.80	1	1	1.00	27.1	27.1	27.10
R1B	39.4	39.7	39.55	30.3	30.4	30.35	1	1.2	1.10	29	29	29.00
R2B	60.7	60.7	60.70	36	36	36.00	0.9	0.9	0.90	2.4	2.4	2.40
R3	30.5	62	46.25	22.1	33.9	28.00	0.1	2.9	1.50	4	44.5	24.25
R4B	55.4	55.6	55.50	38.5	38.8	38.65	0.1	0.2	0.15	5.7	5.7	5.70
R5	17.3	17.3	17.30	22.3	22.3	22.30	0.4	0.4	0.40	60	60	60.00
R6B	51.7	51.7	51.70	39.1	39.1	39.10	0	0	0.00	9.2	9.2	9.20

APPENDIX 1 – LANDFILL GAS

Monitoring Point	Baro (mb)			Rel Pressure			CO (ppm)			H2S (ppm)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
G010MA	1007	1007	1007.00	-19.07	-19.07	-19.07	0	0	0.00	0	0	0.00
G010MB	1007	1007	1007.00	-18.79	-18.79	-18.79	0	0	0.00	0	0	0.00
G01MDA	1007	1016	1011.50	-70.36	199.68	64.66	0	3	1.50	0	0	0.00
G01MDB	1007	1007	1007.00				1	1	1.00	0	0	0.00
GV10	1008	1008	1008.00	-1.9	-1.9	-1.90	0	0	0.00	0	0	0.00
GV11	1008	1008	1008.00	-7.27	-7.27	-7.27	0	0	0.00	0	0	0.00
GV12	1007	1007	1007.00	-10.93	-10.93	-10.93	0	0	0.00	0	0	0.00
GV13	1007	1007	1007.00	-0.85	-0.85	-0.85	1	1	1.00	0	0	0.00
GV14	1007	1007	1007.00	-11.29	-11.29	-11.29	2	2	2.00	0	0	0.00
GV15	1007	1007	1007.00	-11.01	-11.01	-11.01	2	2	2.00	0	0	0.00
GV16	1007	1007	1007.00	0.16	0.16	0.16	0	0	0.00	0	0	0.00
GV17	1007	1007	1007.00	-11.57	-11.57	-11.57	0	0	0.00	0	0	0.00
GV18	1007	1007	1007.00	-10.81	-10.81	-10.81	1	1	1.00	0	0	0.00
GV202	1006	1006	1006.00	-10.14	-10.14	-10.14	0	0	0.00	0	0	0.00
GV21	1006	1006	1006.00	-1.1	-1.1	-1.10	0	0	0.00	0	0	0.00
GV23	1007	1007	1007.00	-12.04	0.02	-6.40	0	0	0.00	0	0	0.00
GV24	1007	1007	1007.00	-13.1	-13.1	-13.10	2	2	2.00	0	0	0.00
GV26	1006	1006	1006.00	-11.14	-11.14	-11.14	0	0	0.00	0	0	0.00
GV27	1006	1006	1006.00	-11.36	-11.36	-11.36	0	0	0.00	0	0	0.00
GV28	1006	1006	1006.00	-2.94	-2.94	-2.94	0	0	0.00	0	0	0.00
GV29	1006	1006	1006.00	-11.8	-11.8	-11.80	0	0	0.00	0	0	0.00
GV3	1008	1008	1008.00	-11.68	-11.68	-11.68	0	0	0.00	0	0	0.00
GV30	1006	1006	1006.00	-9.77	-9.77	-9.77	0	0	0.00	0	0	0.00
GV301	1007	1007	1007.00	-10.49	-10.49	-10.49	0	0	0.00	0	0	0.00
GV31	1006	1006	1006.00	-10.29	-10.29	-10.29	0	0	0.00	0	0	0.00

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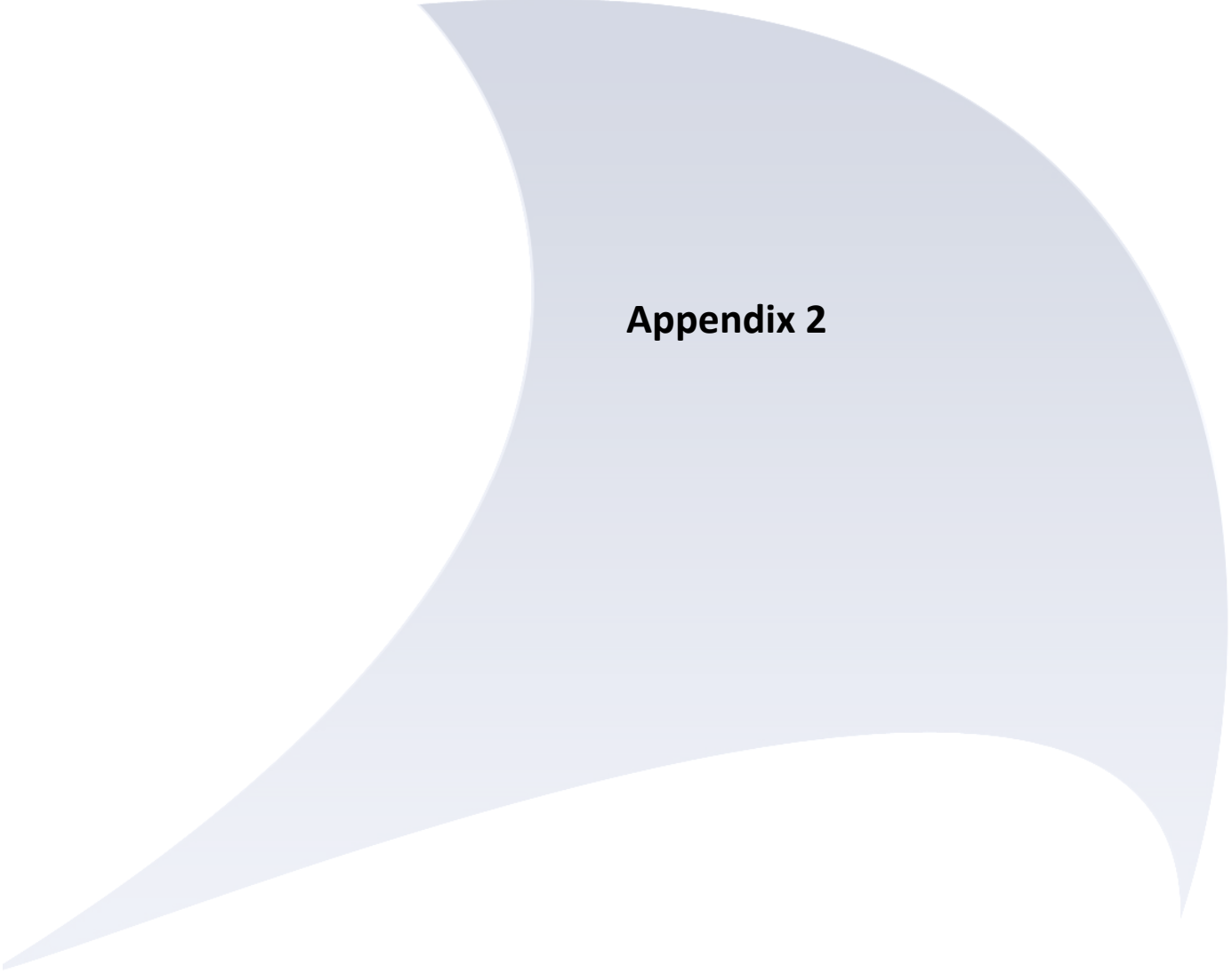
Monitoring Point	Baro (mb)			Rel Pressure			CO (ppm)			H2S (ppm)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
GV32	1006	1006	1006.00	-2.58	-2.58	-2.58	1	1	1.00	0	0	0.00
GV33	1006	1006	1006.00	-5.87	-2.21	-4.04	1	1	1.00	0	0	0.00
GV35	1006	1006	1006.00	-2.85	-2.2	-2.53	0	0	0.00	0	0	0.00
GV36	1007	1007	1007.00	-3.24	-3.24	-3.24	0	0	0.00	0	0	0.00
GV37	1007	1007	1007.00	-1.61	-1.61	-1.61	0	0	0.00	0	0	0.00
GV38	1007	1007	1007.00	-2.14	-2.14	-2.14	0	0	0.00	0	0	0.00
GV39	1008	1008	1008.00	-5.33	-5.33	-5.33	0	0	0.00	0	0	0.00
GV4	1008	1008	1008.00	-0.97	-0.97	-0.97	0	0	0.00	0	0	0.00
GV40	1008	1008	1008.00	-11.32	-11.32	-11.32	0	0	0.00	0	0	0.00
GV41	1006	1006	1006.00	-7.55	-5.84	-6.70	1	2	1.50	0	0	0.00
GV42	1008	1008	1008.00	0.87	0.87	0.87	0	0	0.00	0	0	0.00
GV43	1008	1008	1008.00	-10.24	-10.24	-10.24	0	0	0.00	0	0	0.00
GV44	1008	1008	1008.00	-11.7	-11.7	-11.70	0	0	0.00	0	0	0.00
GV45	1006	1006	1006.00	-4.73	-4.73	-4.73	0	0	0.00	0	0	0.00
GV46	1006	1006	1006.00	-7.11	-7.11	-7.11	2	2	2.00	0	0	0.00
GV47	1007	1007	1007.00	1.62	1.62	1.62	0	0	0.00	0	0	0.00
GV48	1007	1007	1007.00	-11.65	-5.77	-8.71	0	1	0.50	2	2	2.00
GV49	1006	1006	1006.00	-4.45	-1.7	-3.08	0	0	0.00	0	0	0.00
GV6	1008	1008	1008.00	-3.37	-3.37	-3.37	4	4	4.00	0	0	0.00
GV7	1008	1008	1008.00	-8.08	-8.08	-8.08	0	0	0.00	0	0	0.00
GV8	1008	1008	1008.00	-11.42	-11.42	-11.42	0	0	0.00	0	0	0.00
GV9	1008	1008	1008.00	-11.92	-11.92	-11.92	0	0	0.00	0	0	0.00
GVA	1007	1007	1007.00	-11.67	-11.67	-11.67	9	9	9.00	0	0	0.00
GVB	1006	1006	1006.00	-11.26	-11.26	-11.26	0	0	0.00	0	0	0.00
GVC	1006	1006	1006.00	-8.02	-8.02	-8.02	1	1	1.00	0	0	0.00

APPENDIX 1 – LANDFILL GAS

Monitoring Point	Baro (mb)			Rel Pressure			CO (ppm)			H2S (ppm)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
GW0034	1007	1007	1007.00	-2.8	-0.34	-1.57	0	0	0.00	0	0	0.00
LC1B	1008	1008	1008.00	-3.85	-3.85	-3.85	0	0	0.00	0	0	0.00
LC2B	1006	1006	1006.00	-1.9	-1.9	-1.90	0	0	0.00	0	0	0.00
LC2R	1008	1008	1008.00	-8.05	-8.05	-8.05	0	0	0.00	0	0	0.00
LC3	1007	1007	1007.00	-0.83	-0.83	-0.83	0	0	0.00	0	0	0.00
LC4	1007	1007	1007.00	0	0	0.00	14	14	14.00	0	0	0.00
LC4B	1007	1007	1007.00	-1.16	-1.16	-1.16	2	2	2.00	0	0	0.00
LC5	1006	1006	1006.00	0.05	0.05	0.05	0	0	0.00	0	0	0.00
LC6	1006	1006	1006.00	0.06	0.06	0.06	0	0	0.00	0	0	0.00
LC6B	1006	1006	1006.00	-11.27	-5.83	-8.55	0	0	0.00	0	0	0.00
M010MA	1007	1007	1007.00	-11.07	-11.07	-11.07	2	2	2.00	0	0	0.00
M010MB	1007	1007	1007.00	-10.96	-10.96	-10.96	0	0	0.00	0	0	0.00
M050MA	1007	1007	1007.00	-11.65	-11.65	-11.65	0	0	0.00	0	0	0.00
M050MB	1007	1007	1007.00	-12.08	-12.08	-12.08	0	0	0.00	0	0	0.00
PRG017	1007	1007	1007.00	-11.36	-11.36	-11.36	0	0	0.00	0	0	0.00
PRG039	1008	1008	1008.00	0.07	0.07	0.07	0	0	0.00	0	0	0.00
PRG041	1006	1006	1006.00	-7.65	-7.65	-7.65	1	1	1.00	0	0	0.00
PRG042	1008	1008	1008.00	0.12	0.12	0.12	0	0	0.00	0	0	0.00
PRG044	1007	1007	1007.00	0.53	0.53	0.53	0	0	0.00	0	0	0.00
PRG045	1006	1006	1006.00	0.07	0.07	0.07	0	0	0.00	0	0	0.00
PRG046	1006	1006	1006.00	-1.11	-1.11	-1.11	2	2	2.00	0	0	0.00
PRG048	1007	1007	1007.00	0.05	0.05	0.05	0	0	0.00	0	0	0.00
PRG049	1006	1006	1006.00	-0.98	-0.98	-0.98	0	0	0.00	0	0	0.00
PRL06B	1006	1006	1006.00	0.04	0.04	0.04	0	0	0.00	0	0	0.00
PRL0C4	1007	1007	1007.00	1.19	1.19	1.19	2	2	2.00	0	0	0.00

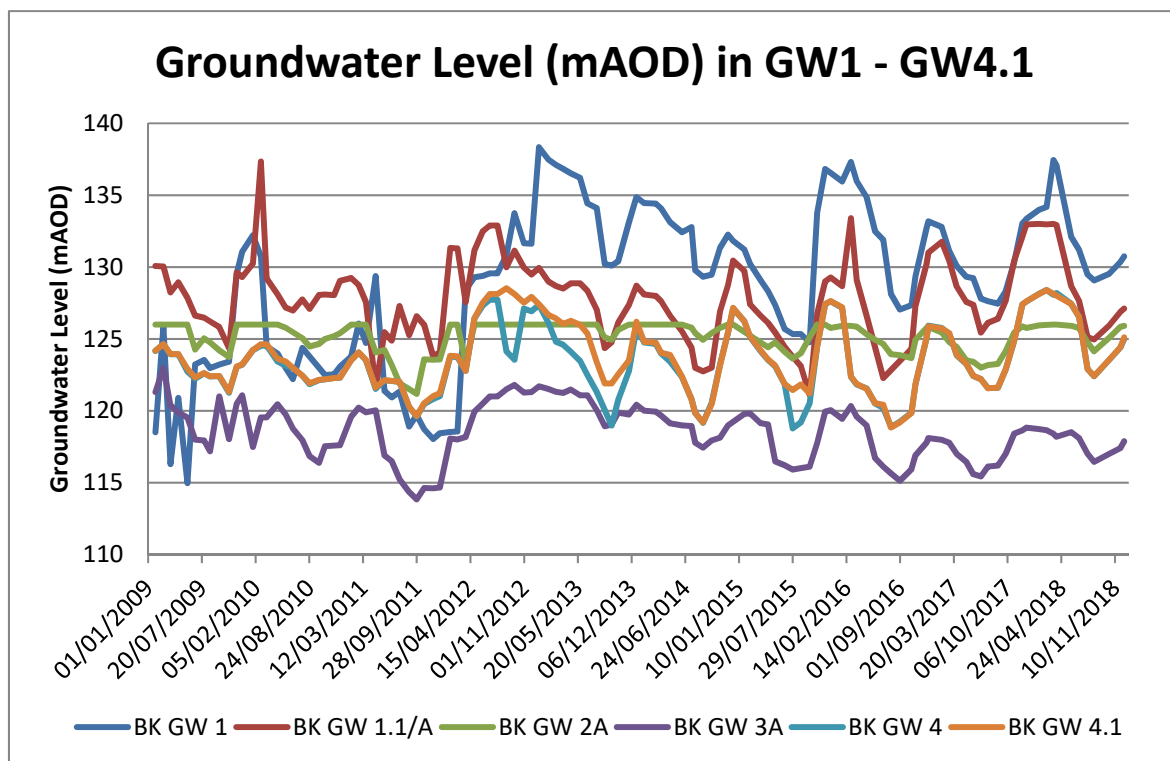
APPENDIX 1 – LANDFILL GAS

Monitoring Point	Baro (mb)			Rel Pressure			CO (ppm)			H2S (ppm)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
PRR3	1006	1006	1006.00	0.12	0.12	0.12	0	0	0.00	0	0	0.00
PRR6B	1005	1005	1005.00	0.04	0.04	0.04	0	0	0.00	0	0	0.00
PW1	1007	1007	1007.00	-11.43	-11.43	-11.43	0	0	0.00	0	0	0.00
PW2	1006	1006	1006.00	-11.55	-11.55	-11.55	0	0	0.00	0	0	0.00
PW3	1006	1006	1006.00	-10.83	-10.83	-10.83	0	0	0.00	0	0	0.00
PW4	1006	1006	1006.00	-8.73	-8.73	-8.73	0	0	0.00	0	0	0.00
PW5	1006	1006	1006.00	-9.93	-9.93	-9.93	0	0	0.00	0	0	0.00
R1	1007	1007	1007.00	-1.43	-1.43	-1.43	0	0	0.00	0	0	0.00
R1B	1007	1007	1007.00	-8.36	-0.27	-4.32	0	0	0.00	0	0	0.00
R2B	1006	1006	1006.00	-0.99	-0.99	-0.99	0	0	0.00	0	0	0.00
R3	1006	1006	1006.00	-10.96	0.2	-5.38	0	0	0.00	0	0	0.00
R4B	1007	1007	1007.00	-11.22	-10.52	-10.87	1	2	1.50	0	0	0.00
R5	1006	1006	1006.00	-0.96	-0.96	-0.96	0	0	0.00	0	0	0.00
R6B	1006	1006	1006.00	-9.8	-9.8	-9.80	1	1	1.00	0	0	0.00

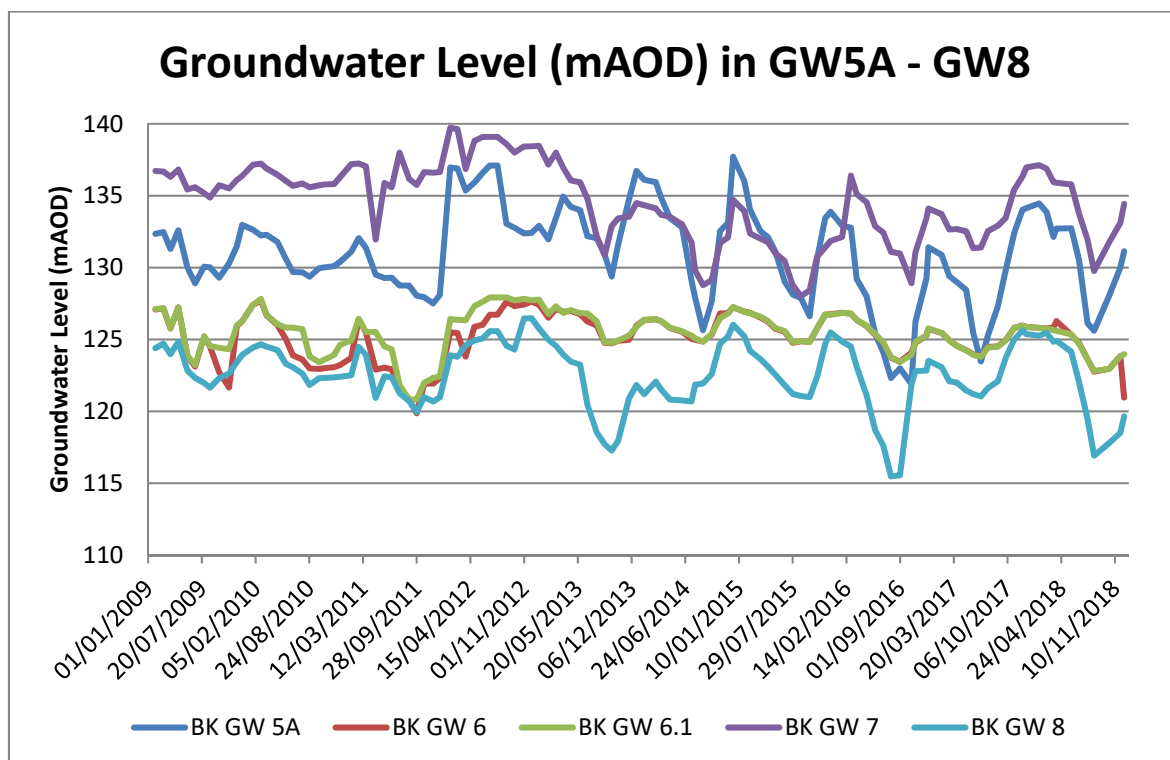


Appendix 2

APPENDIX 2 - GROUNDWATER



Graph 1: Groundwater level as mAOD at locations GW1 – GW4.1



Graph 2: Groundwater level as mAOD at locations GW5 – GW8

APPENDIX 2 - GROUNDWATER

Table 1: Monthly monitoring data (exceedances highlighted)

Locations	Parameter	Ammoniacal N	BOD (unfiltered)	Chloride	Conductivity	Dissolved Oxygen	pH
	Unit	mg/L as N	mg/L	mg/L	mS/cm	mg/L	pH units
GW1	19/10/2018	3.35	3.83	167			
	30/11/2018	6.19	<1	300	1.56	<0.3	6.24
	14/12/2018	7.32		250			
GW1.1	19/10/2018	16.6	10.3	338			
	30/11/2018	2.65	5.3	61.5	3.12	1.65	7.23
	14/12/2018	0.396		60.5			
GW2A	Limit	1.7	N/A	60	N/A	N/A	N/A
	19/10/2018	30.9	291	152			
	30/11/2018	24.5	12.2	136	1.67	<0.3	7.17
	14/12/2018	13.1		110			
GW3A	Limit	1.7	N/A	60	N/A	N/A	N/A
	19/10/2018	124	494	134			
	30/11/2018	75.4	2580	127	1.75	<0.3	6.95
	14/12/2018	50.8	81.9	137			

Locations	Parameter	Ammoniacal N	BOD (unfiltered)	Chloride	Conductivity	Dissolved Oxygen	pH
	Unit	mg/L as N	mg/L	mg/L	mS/cm	mg/L	pH units
GW4	Limit	1.7	N/A	60	N/A	N/A	N/A
	19/10/2018	6.67	6.07	49.1			
	30/11/2018	6.89	8.22	51.4	0.539	<0.3	6.79
	14/12/2018	7.89	4.11	55.9			
GW5A	19/10/2018	1.38	4.96	94.3			
	30/11/2018	<0.2	<1	99.1	0.97	1.91	6.88
	14/12/2018	0.873		131			
GW6	19/10/2018	<0.2	<1	35.1			
	30/11/2018	<0.2	<1	33.6	0.704		7.46
	14/12/2018	1.42	2.64	34.3			
GW7	19/10/2018	1.84	4.15	148			
	30/11/2018	2.43	9.55	141	0.749	1.25	7.5
	14/12/2018	2.35		141			
GW8	19/10/2018	6.97	11.5	61.4			
	30/11/2018	38.2	677	170	1.47	<0.3	6.67
	14/12/2018	41.9		159			

APPENDIX 2 - GROUNDWATER

Table 2: Quarterly monitoring data (exceedances highlighted)

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8	GW2A, GW3A, GW4 EP limit
Date Sampled		14/12/18	14/12/18	14/12/18	14/12/18	14/12/18	14/12/18	14/12/18	14/12/18	14/12/18	
Carbon											
Organic Carbon, Total	mg/l	11.6	38.6	9.91	27.2	15.7	4.82	4.14	4.74	32.6	
Inorganics											
Alkalinity, Total as CaCO ₃	mg/l	267	430	405	716	185	240	316	206	555	
Ammoniacal Nitrogen as NH ₃	mg/l	7.32	0.396	13.1	50.8	7.89	0.873	1.42	2.35	41.9	1.7
BOD, unfiltered	mg/l	-	-	-	81.9	4.11	-	2.64	-	-	
Chloride	mg/l	250	60.5	110	137	55.9	131	34.3	141	159	60
COD, unfiltered	mg/l	265	99.4	93.7	436	125	29.6	49.3	37.8	118	
Sulphate	mg/l	478	1320	380	74.2	44.8	152	73.9	5.8	25.4	
Total Oxidised Nitrogen as NO ₃	mg/l	<0.3	24.5	0.819	3.01	0.642	70.4	3.76	0.645	0.499	
Filtered (Dissolved) Metals											
Cadmium (diss.filt)	mg/l	<0.00008	0.000152	<0.00008	<0.00008	<0.00008	0.000317	<0.00008	<0.00008	<0.00008	
Calcium (Dis.Filt)	mg/l	219	705	219	142	59.7	114	99	31.2	105	
Chromium (diss.filt)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper (diss.filt)	mg/l	<0.0003	0.0112	<0.0003	<0.0003	<0.0003	0.00445	0.00094	<0.0003	<0.0003	
Iron (Dis.Filt)	mg/l	33.2	<0.019	4.65	5.31	6.44	0.0722	<0.019	0.119	0.15	
Lead (diss.filt)	mg/l	<0.0002	<0.0002	<0.0002	<0.0002	0.000281	<0.0002	<0.0002	<0.0002	<0.0002	
Magnesium (Dis.Filt)	mg/l	58	64.7	47.7	47.7	13.5	29.8	29.7	30.4	37.4	
Manganese (diss.filt)	mg/l	7.04	0.0539	4.92	2.33	0.915	0.305	0.0485	0.576	0.518	
Nickel (diss.filt)	mg/l	0.0311	0.0062	0.0279	0.0269	0.00954	0.0251	0.00122	0.00192	0.0215	0.15
Potassium (Dis.Filt)	mg/l	32.3	135	37.5	34.6	14.6	15.8	20.5	25.3	36.7	
Sodium (Dis.Filt)	mg/l	98.9	41.5	66.7	110	25.9	78.4	19.2	66.6	112	
Zinc (diss.filt)	mg/l	0.0136	0.0305	0.00332	0.00175	0.00576	0.0352	0.00635	0.0025	<0.001	0.254
TPH Criteria Working Group (TPH CWG)											
Benzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Ethylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
m,p-Xylene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
o-Xylene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Sum of detected BTEX	mg/l	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	
Sum of detected Xylenes	mg/l	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	0.011
Toluene	mg/l	<0.001	<0.001	<0.001	0.00353	<0.001	<0.001	<0.001	<0.001	<0.001	0.004

APPENDIX 2 - GROUNDWATER

Table 3: Groundwater Quality (Hazardous Suite). Detected hazardous substances are highlighted

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
Inorganics										
Cyanide, Free	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cyanide, Total	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Filtered (Dissolved) Metals										
Chromium (diss.filt)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury (diss.filt)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
TPH Criteria Working Group (TPH CWG)										
Benzene	mg/l	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Ethylbenzene	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
m,p-Xylene	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
o-Xylene	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Sum of detected BTEX	mg/l	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
Mineral Oil / Oils & Greases										
Mineral oil >C10 C40 (aq)	mg/l	<0.1	<0.1	<0.1	0.306	0.144	<0.2	<0.1	<0.2	<0.2
Semi-Volatile Organic Compounds (SVOCs)										
1,2,4-Trichlorobenzene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
1,2-Dichlorobenzene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
1,3-Dichlorobenzene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
1,4-Dichlorobenzene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2,4,5-Trichlorophenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2,4,6-Trichlorophenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001

APPENDIX 2 - GROUNDWATER

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
2,4-Dichlorophenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2,4-Dimethylphenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2,4-Dinitrotoluene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2,6-Dinitrotoluene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2-Chloronaphthalene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2-Chlorophenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2-Methylnaphthalene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2-Methylphenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2-Nitroaniline (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
2-Nitrophenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
3-Nitroaniline (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
4-Bromophenylphenylether (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
4-Chloro-3-methylphenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
4-Chloroaniline (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
4-Chlorophenylphenylether (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
4-Methylphenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
4-Nitroaniline (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
4-Nitrophenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Acenaphthene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Acenaphthylene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Anthracene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Azobenzene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Benzo(a)anthracene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Benzo(a)pyrene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Benzo(b)fluoranthene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Benzo(g,h,i)perylene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001

APPENDIX 2 - GROUNDWATER

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
Benzo(k)fluoranthene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
bis(2-Chloroethoxy)methane (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
bis(2-Chloroethyl)ether (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
bis(2-Ethylhexyl) phthalate (aq)	mg/l	<0.004	<0.008	<0.004	<0.004	<0.004	<0.002	<0.002	<0.004	<0.002
Butylbenzyl phthalate (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Carbazole (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Chrysene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Dibenzo(a,h)anthracene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Dibenzofuran (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Diethyl phthalate (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Dimethyl phthalate (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Fluoranthene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Fluorene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Hexachlorobenzene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Hexachlorobutadiene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Hexachlorocyclopentadiene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Hexachloroethane (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Indeno(1,2,3-cd)pyrene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Isophorone (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Naphthalene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
n-Dibutyl phthalate (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
n-Dioctyl phthalate (aq)	mg/l	<0.01	<0.02	<0.01	<0.01	<0.01	<0.005	<0.005	<0.01	<0.005
Nitrobenzene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
n-Nitroso-n-dipropylamine (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Pentachlorophenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Phenanthrene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001

APPENDIX 2 - GROUNDWATER

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
Phenol (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Pyrene (aq)	mg/l	<0.002	<0.004	<0.002	<0.002	<0.002	<0.001	<0.001	<0.002	<0.001
Volatile Organic Compounds (VOCs)										
1,1,1,2-Tetrachloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloropropene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

APPENDIX 2 - GROUNDWATER

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
4-Bromofluorobenzene**	%	92.7	97	94.5	92.7	94.3	95.5	95.3	92.8	94.8
4-Chlorotoluene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-iso-Propyltoluene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon disulphide	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00581
Carbontetrachloride	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromofluoromethane**	%	108	110	110	110	111	110	110	110	108
Dibromomethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ethylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexachlorobutadiene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
m,p-Xylene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

APPENDIX 2 - GROUNDWATER

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
Methyl tertiary butyl ether (MTBE)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Propylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Amyl methyl ether (TAME)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/l	<0.001	<0.001	<0.001	0.00353	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene-d8**	%	100	99.8	100	99.1	99.1	100	100	100	101
trans-1,2-Dichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,3-Dichloropropene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl chloride	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Combined Pesticides / Herbicides										
Aldrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
alpha-HCH	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Atrazine	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Azinphos ethyl	mg/l	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Azinphos methyl	mg/l	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
beta-HCH	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Carbophenothion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chlorfenvinphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001

APPENDIX 2 - GROUNDWATER

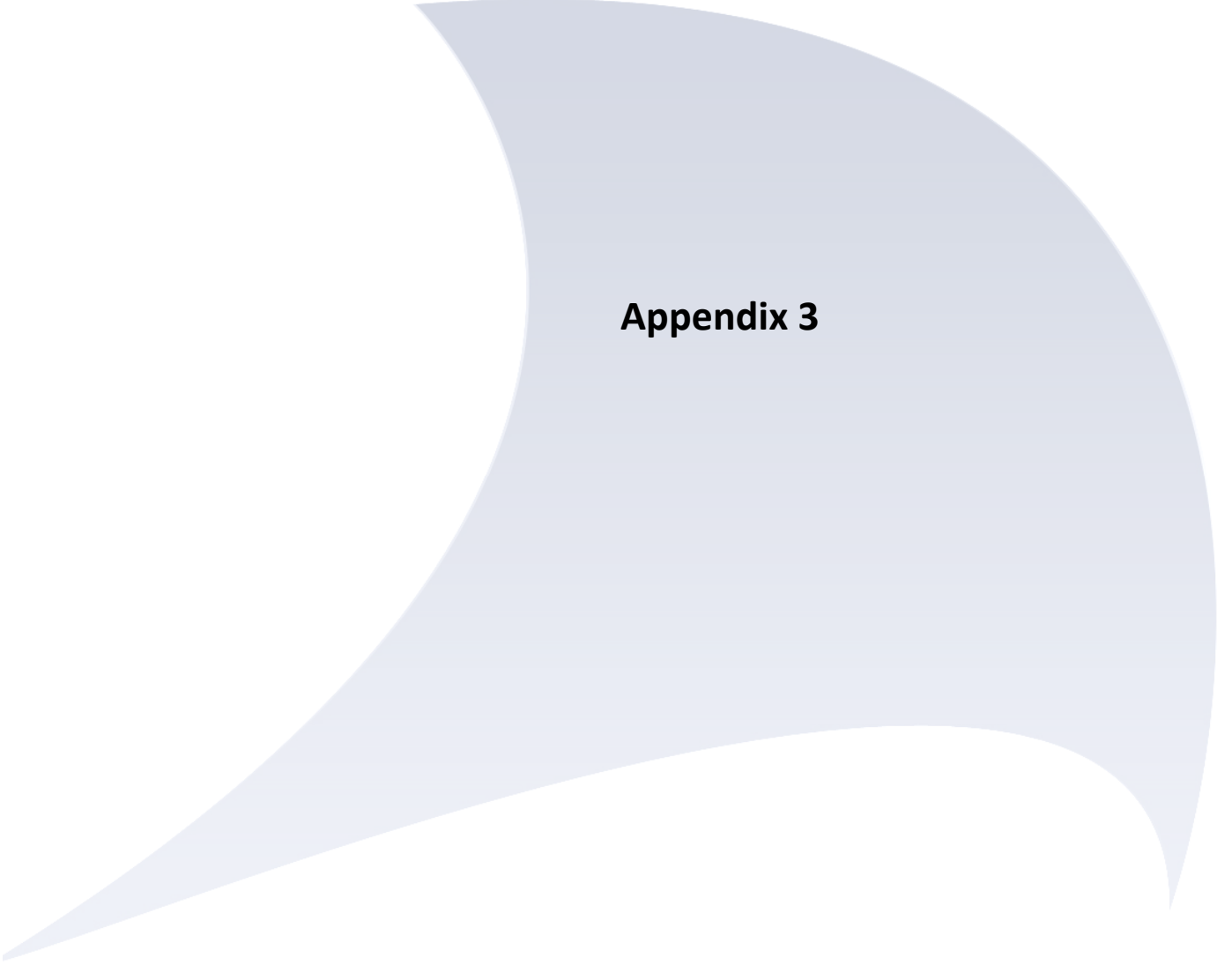
Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
Chlorothalonil	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chlorpyrifos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Chlorpyrifos-methyl	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
cis-Chlordane	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Diazinon	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Dichlorvos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Dieldrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Dimethoate	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Disulfoton	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Endosulphan I	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Endosulphan II	mg/l	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Endosulphan Sulphate	mg/l	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Endrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Ethion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Etriphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Fenitrothion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Fenthion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
gamma-HCH (Lindane)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Heptachlor	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Heptachlor epoxide	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Hexachlorobenzene	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Isodrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Malathion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Methyl Parathion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Mevinphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
o,p'-DDD (TDE)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001

APPENDIX 2 - GROUNDWATER

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
o,p'-DDE	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
o,p'-DDT	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p'-DDD (TDE)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p'-DDE	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p'-DDT	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
p,p'-Methoxychlor	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Parathion	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Pendimethalin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Permethrin I	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Permethrin II	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Phosalone	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Pirimiphos-methyl	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Propetamphos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Quintozene (PCNB)	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Simazine	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Tecnazene	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Telodrin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
trans-Chlordane	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Triadimefon	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Triallate	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Triazophos	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Trifluralin	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Miscellaneous Organics										
Dibutyl tin	mg/l	<0.000005	<0.000005	<0.000005	<0.000075	<0.00003	<0.00001	<0.00001	<0.00001	<0.00001
Surrogate	%	95.3	82.5	86.2	83.4	86.7	99	95.5	104	95.2
Tetrabutyl tin	mg/l	<0.000002	<0.000002	<0.000002	<0.00003	<0.000012	<0.000004	<0.000004	<0.000004	<0.000004

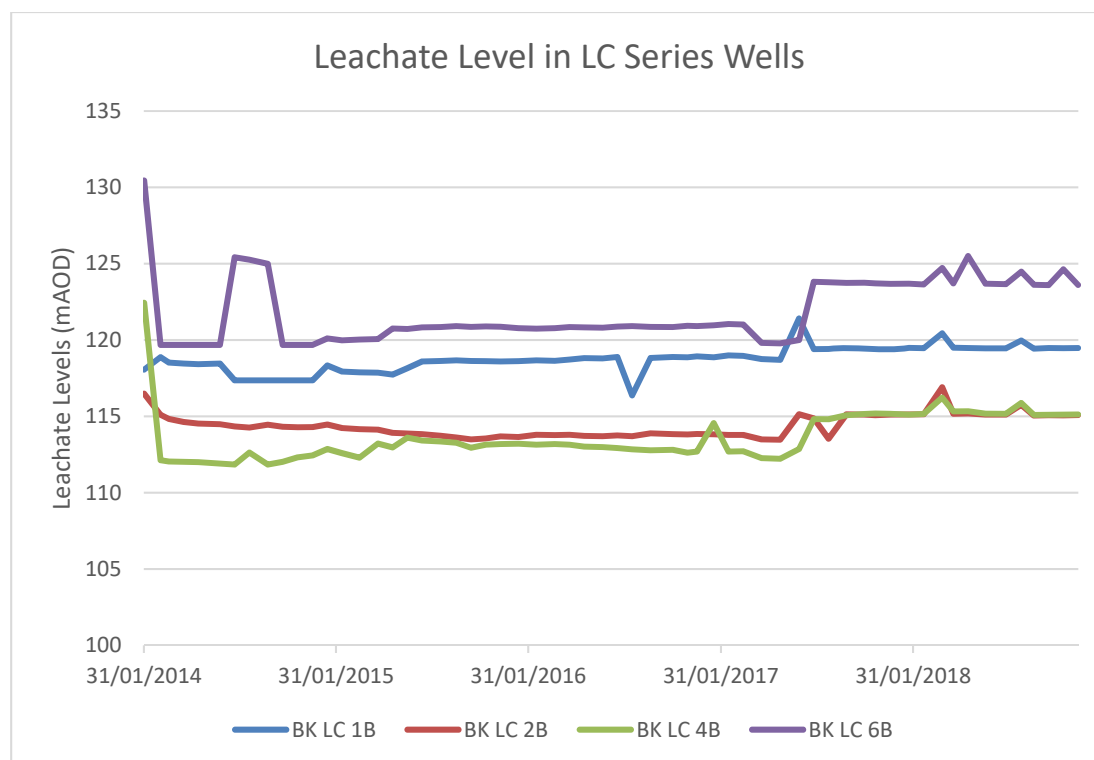
APPENDIX 2 - GROUNDWATER

Sample Description		GW1	GW1.1	GW2A	GW3A	GW4	GW5A	GW6	GW7	GW8
Date Sampled		15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017	15/12/2017
Tributyl tin	mg/l	<0.000001	<0.000001	<0.000001	<0.000015	<0.000006	<0.000002	<0.000002	<0.000002	<0.000002
Triphenyl tin	mg/l	<0.000001	<0.000001	<0.000001	<0.000015	<0.000006	<0.000002	<0.000002	<0.000002	<0.000002

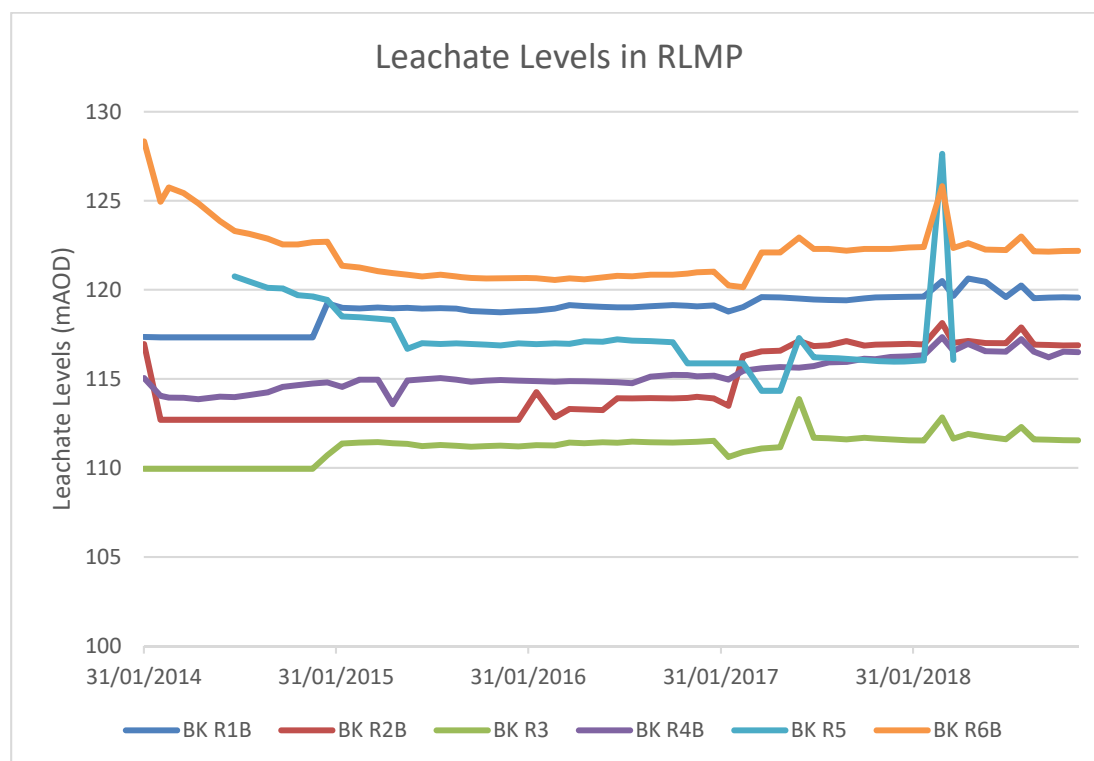


Appendix 3

APPENDIX 3



Graph 1: Leachate Levels as mASD at LC Series Wells



Graph 2: Leachate Levels as mASD at Remote Leachate Monitoring Points

APPENDIX 3

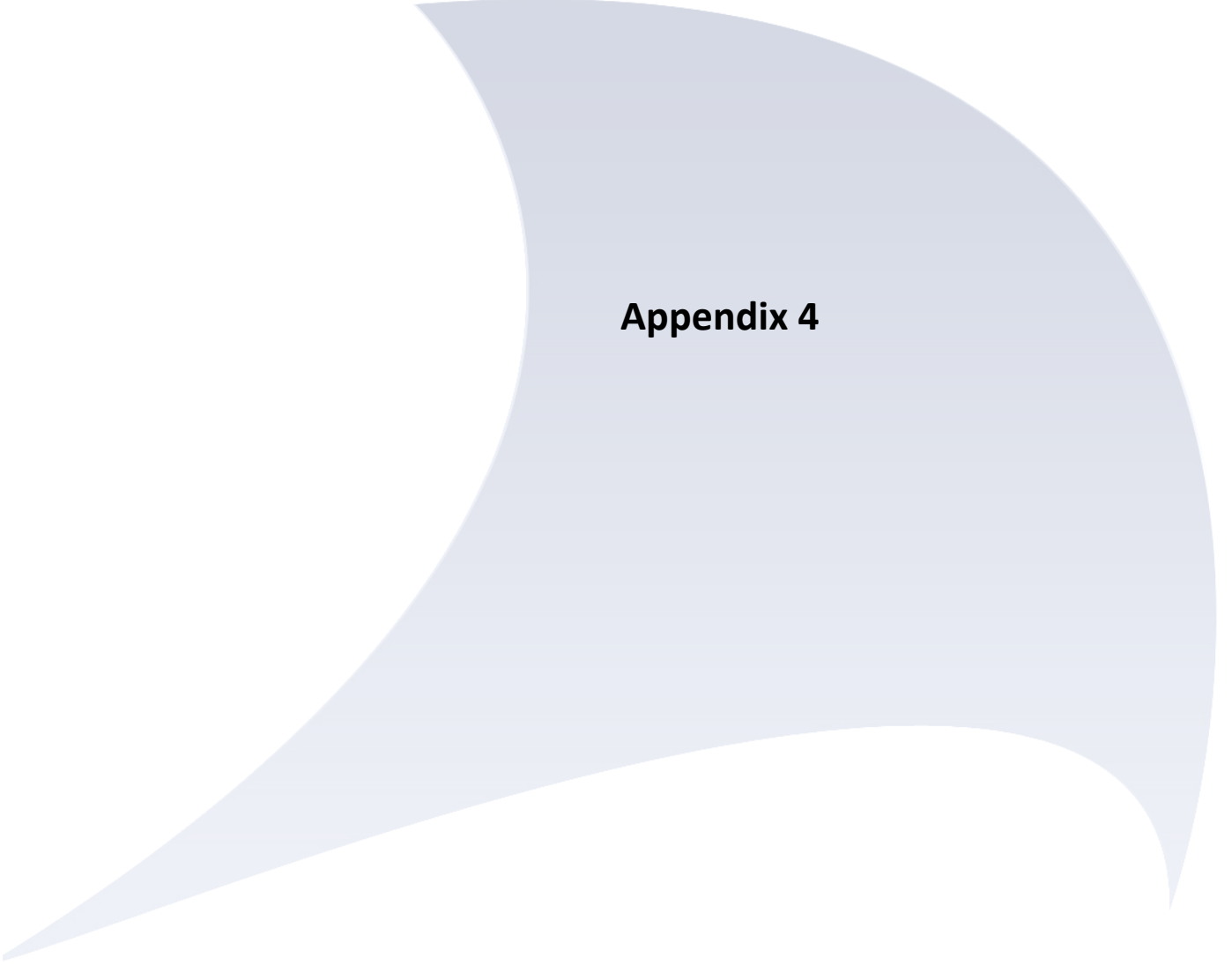
Table 2: Monitoring data from leachate chambers

Parameters	Units	LC1B	LC2B	LC3	LC4B	LC5	LC6
Carbon							
Organic Carbon, Total	mg/l	752	1070	439	782	2790	786
Inorganics							
Alkalinity, Total as CaCO ₃	mg/l	8350	8950	5550	8400	13500	8270
Ammoniacal Nitrogen as NH ₃	mg/l	1730	1910	1020	1620	2970	1260
BOD, Unfiltered	mg/l						
Chloride	mg/l	1990	2360	1440	2520	3190	1830
COD, unfiltered	mg/l	2190	3160	1380	2200	7640	3850
pH	pH Units	7.72	7.94	7.69	8.43	8.05	7.85
Sulphate	mg/l	<2	<2	<2	3.38	<0.5	<0.5
Total Oxidised Nitrogen as NO ₃	mg/l	0.175	0.139	0.142	<0.02	<0.02	<0.02
Filtered (Dissolved) Metals							
Calcium (diss.filt)	mg/l	23.6	29.8	108	52.2	28	63.3
Magnesium (diss.filt)	mg/l	86	92.9	84.5	92.2	52	72.8
Potassium (diss.filt)	mg/l	832	821	498	750	662	497
Sodium (diss.filt)	mg/l	1530	1690	1080	2370	2340	1630

APPENDIX 3

Table 3: Final Discharge (FD) monitoring data (exceedances highlighted)

Final Discharge	Alkalinity, Total as CaCO ₃	Ammoniacal Nitrogen as N	COD, unfiltered	Nitrate as N	Nitrite as N	pH	Suspended solids, Total	Chromium (diss.filt)	Copper (diss.filt)	Lead (diss.filt)	Nickel (diss.filt)	Zinc (diss.filt)
Date Unit Compliance Limit	mg/L	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	-	50	2000	-	-	>5<10	500	2	2	2	2	2
16/10/2018	660	0.672	2310	951	0.585	8	1440	-	-	-	-	-
30/11/2018	385	1.36	1060	857	0.985	7.52	508	-	-	-	-	-
14/12/2018	267	1.96	1210	-	0.0548	-	-	0.0562	0.00951	0.00861	0.204	0.0951

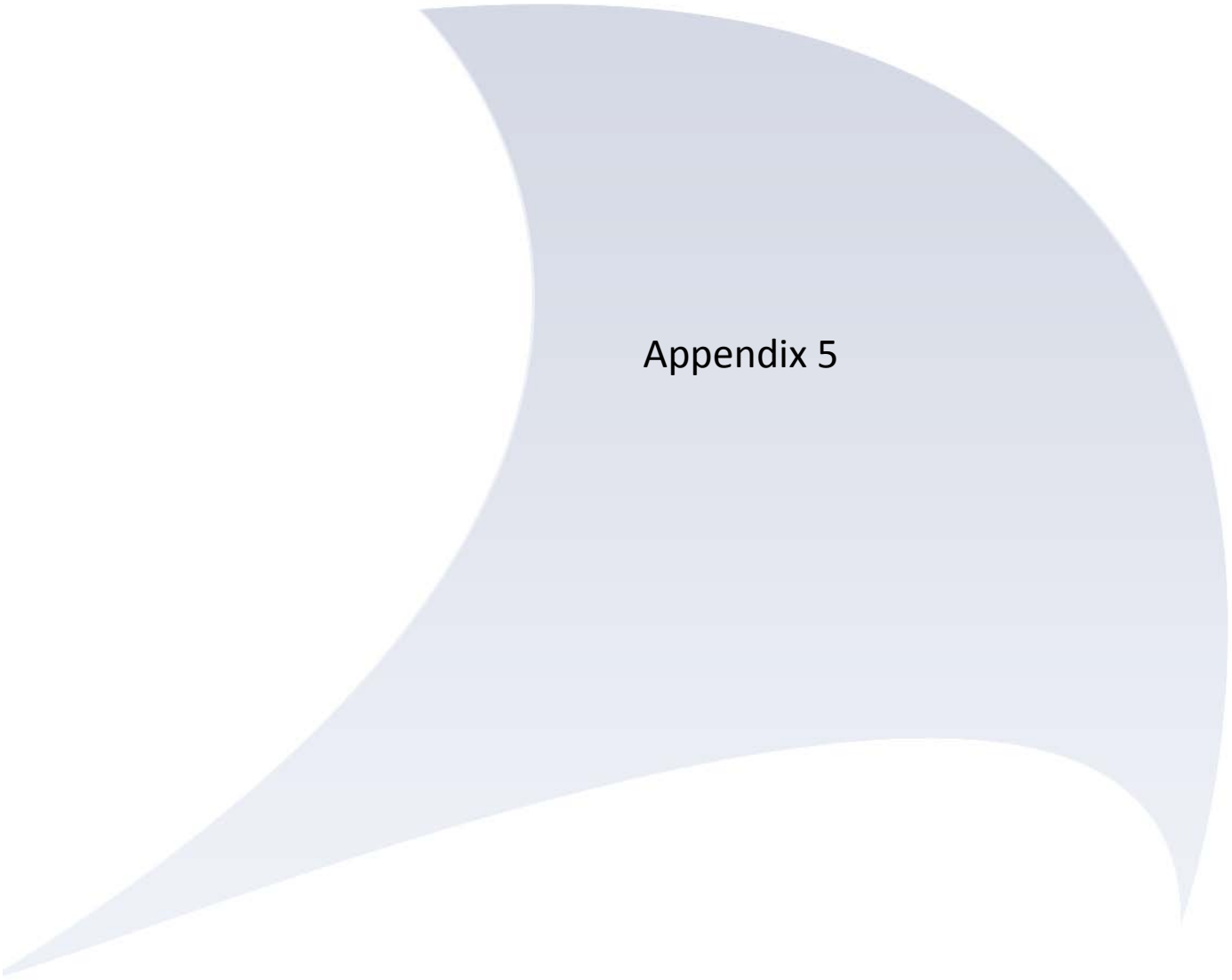


Appendix 4

APPENDIX 4 – SURFACE WATER

Table 1: Monthly monitoring data

Location	Parameter	Ammoniacal N	Chloride	COD	pH	Suspended Solids
	Date Units	mg/l as N	mg/l	mg/l	pH Units	mg/l
Trigger Limit (P2)		1.6	250	100	>6 - <9	100
P4	19/10/2018	<0.2	64.5	73.9	7.76	4.2
P4	30/11/2018	0.7	61.9	66.3	7.94	3.7
SW2	14/12/2018	6.11	60.1	73.2	7.83	3.7



Appendix 5

Flintshire County Council Deposited Dust Monitoring

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

From: 04/12/2018 To: 08/01/2019
No. of days 35

Collector: MW

Gauge Bowl No. Location 1 OES1
Location 2 OES2
Location 3 OES3

Factor (mg deposit to mg/m²) 24.7

Monitoring Location	Sample Volume (ml)	Total Suspended Solids (mg/l)	mg/m ² /day
Location 1	1200	11	7.76
Location 2	2300	<10	<7.06
Location 3	2200	<10	<7.06

Comments:

► Dust analysis carried out by Concept Life Sciences Laboratories, Manchester

Location 2 location changed to access issues with new fencing surrounding LTP. Dust gauge now located near to electricity meter house.

Location 1: Site Operations - located opposite "new" transfer pad

Location 2: Industrial Estate Boundary - located on perimeter near electricity meter house

Location 3: Oaks Farm



Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG

Tel: 01248 672671

Fax: 01248 672601

Email: contact@caulmert.com

Web: www.caulmert.com