LLWYN ISAF LANDFILL SITE

Annual Environmental Report
January to December 2019

Llwyn Isaf Landfill,
Clynnog Fawr,
Gwynedd,
LL54 5DF

PERMIT NUMBER EPR/YP3138UJ

Prepared by Gwynedd Council (February 13th 2020)

INDEX

Environmental monitoring

Summary

The 2019 Annual Environmental Report for Llwyn Isaf has been prepared in accordance with the EP requirements for the site.

In summary the following trends have been noted at the site :-

LEACHATE levels remained below the EP compliance limit of 1.50m. Cells 2 and 3 have shown a similar trend in both ammoniacal nitrogen and chloride concentrations during 2019 with lower levels noted in May increasing in November. Concentrations in Cell 3 are at much higher concentration in comparison to both cell 1 and 2. In contrast, Ammoniacal nitrogen and Chloride levels have dropped in 2019 in Cell 2. The leachate concentrations continue to show significant variability but remain within the historical range.

GROUNDWATER levels continue to show seasonal fluctuations and remained within the range of historical data. Groundwater quality continued to show little or no impact from Area 2 and no impact from Area 3. One breach was noted in GW4 ammonia in May. Follow up sampling were found to be below the trigger level at this location.

SURFACEWATER quality in the River Desach showed no impact from the landfill. Results are comparable with 2018, with lower levels noted in the chloride concentrations at all surface water monitoring locations along with a drop in the electrical conductivity at the monitoring points in the River Desach (point Y, W and E).
The Infiltration basin has seen an increase in chloride concentrations, however the levels remain low, showing no impact from the landfill.

LANDFILL GAS monitoring data has shown methane and carbon dioxide concentrations in the external boreholes remained below the EP compliance limits during 2019. One breach occurred in G1A exceeding the control level. Follow up gas monitoring showed no further breaches above the trigger level at this location.

A timer was fitted at the flare in April 2018, with subsequent improvements seen in methane concentrations and a reduction in balance gas.
Surface emissions were undertaken, none of the locations recorded levels above the action threshold of 100ppm.
Yearly flare emissions and bulk gases continue to remain compliant.

Environmental Monitoring

1. LEACHATE MONITORING

Table S3.1 Leachate level limits and monitoring requirements

Monitoring point	Limit	Monitoring frequency
All leachate monitoring points	1.50meters above base of the cell	Quarterly.

Table S3.8 Leachate – other monitoring requirements

Frequency	Monitoring locations	Measurement/determinand
QUARTERLY unless a reduced frequency is agreed in writing with NRW. Not less than every 6 months	All leachate monitoring points	Leachate level.
SIX – MONTHLY	All leachate wells/abstraction wells/ sumps identified on drawing ESiD 7 of the permit application documents	As monthly plus: Electrical conductivity (EC), Cl, NH4-N, pH, mecaprop, toluene, chemical oxygen demand (COD), Biological oxygen demand (BOD), Ca, Mg, K, Na, Cd, Alkalinity, Total organic carbon (TOC), SO4, Total organic nitrogen (TON) and phenol.
ANNUALLY	All leachate wells/abstraction wells/ sumps identified on drawing ESiD 7 of the permit application documents	As Monthly / quarterly plus: Cr, Cu, Fe, Pb, Mn, Ni, Zn and Hazardous substances.

1.1 LEACHATE REVIEW

1.2.1 Leachate Levels

The leachate compliance level and monitoring frequency in 2019 were carried out on a quarterly basis in accordance with table S3.1 of the permit within all three cells in Area 3.

During 2019, all leachate levels were compliant, with levels remaining below the specified 1.50m level of leachate above the cell's base.

The leachate monitoring points are shown in drawing 1 – Site Layout Plan

Table 1 – Leachate level data for 2019 (m above base)

Date	Monitoring point					
	CELL 1		CELL 2		CELL 3	
	LM1/1	LM1/2	LM2/1	LM2/2	LM3/1	LM3/2
21/01/19	0.08	0	0.64	1.36	1.04	0.69
29/04/19	0.08	0	0.69	1.42	1.15	0.78
27/07/19	0.08	0	0.68	1.44	1.22	0.88
07/10/19	0.08	0	0.72	1.46	1.34	1.00

1.2.2 Leachate quality

Leachate sampling was carried out in accordance with Table S3.8 of the permit. Samples of leachate were collected individually from the cells in Area 3 on a six-monthly basis.

A summary of selected results for pH, Electrical conductivity, Ammoniacal nitrogen, chloride and COD in 2019 are presented in Table 2

Table 2 – Selected Leachate Quality Data for 2019

Cell	pH		Electrical conductivity (µs/cm)		Ammoniacal nitrogen (mg/l)		Chloride (mg/l)		COD (mg/l)	
	May	Nov	May	Nov	May	Nov	May	Nov	May	Nov
1	7.5	7.7	6670	6230	462	428	702	687	393	329
2	7.2	7.7	4500	4640	284	294	432	474	274	231
3	7.9	8.0	23500	23100	2000	2110	2350	2530	4710	4600

Graphs for Ammoniacal nitrogen and chloride since 2013 are shown in Appendix 1.

CELL 1 – Chloride concentrations have fallen slightly towards the end of 2019 from 702mg/l recorded in May to 687mg/l in November. These figures are similar to the results obtained during the latter part of 2018 (Nov '18, 701mg/l). Ammoniacal nitrogen concentrations have followed a similar trend, falling towards the end of 2019 from 462mg/l in May to 428mg/l in November; an increase on the 2018 values (162 – 415mg/l).
Over a 5 year period (2015 – 2019), maximum ammoniacal nitrogen (2330mg/l) and chloride (2730mg/l) levels were both recorded in January 2016. Minimum levels for both ammoniacal nitrogen (162mg/l) and chloride (242mg/l) were recorded in May 2018.

CELL 2 – Levels taken during May and November 2019 for both Chloride and Ammoniacal nitrogen have shown stability during the year. During 2019 there has been a significant reduction in both the ammoniacal nitrogen levels and Chloride levels compared with 2018 results. Ammoniacal nitrogen in 2018 ranged between 1650 – 1690mg/l to levels below 300mg/l in 2019 (284mg/l in May and 294mg/l in November 2019). Chloride levels also fell; from 2018 levels of between 2170 – 2210mg/l to levels of between 432 – 474mg/l in 2019. Over a period of 5 years (2015 – 2019), maximum ammoniacal levels were recorded in November 2016 (1780mg/l) with minimum levels recorded in November 2017 (205mg/l). Maximum chloride concentrations of 2170mg/l were recorded in November 2018; the minimum level of 242mg/l was recorded in May 2017.

CELL 3 – During 2019 both chloride and ammoniacal nitrogen levels have shown large increases in concentration compared to 2018 levels. In May 2018, both ammoniacal nitrogen and chloride showed a 5 year low, with ammoniacal nitrogen levels of 217mg/l and chloride levels of 388mg/l. The increase in concentration of both ammoniacal nitrogen and chloride 2019 remains below the 5 year high recorded in May 2016 (ammoniacal nitrogen, 2490mg/l and chloride 2590mg/l) with a range of between 2000 – 2110mg/l ammoniacal nitrogen and 2350 – 2530mg/l chloride recorded in 2019.

Between 2015 and 2019, maximum ammoniacal nitrogen and chloride levels were recorded in Cell 1, 2 and 3 during 2016. A 5 year low for both ammoniacal nitrogen and chloride was recorded in both cells 1 and 3 in May 2018. Cell 2 5 year low were recorded in 2017.

The annual extended suite analytical suite comprising additional metals and hazardous organic substances as required by the EP for Area 3 was carried out in May 2019. Most of the hazardous organic substances were found at concentrations below the detection limits. Hazardous organic substances above the detection limit (Table 3) include some pesticides and hydrocarbons.

Table 3 - Summary of the Leachate Organic Hazardous Substances Screen 2019 (substances above detection limit)

Hazardous organic substance	Concentration (µg/l)		
	Cell 1	Cell 2	Cell 3
Pesticides			
Mecaprop	6.89	4.08	57.9
Chlopyralid	<2	<2	9.81
Hydrocarbon Band			
EH >C6 – C40	127	<100	1770
EH>C6 – C8	<100	<100	<100
EH>C8 – C10	<100	<100	153
EH>C16 – C24	<100	<100	256
EH>C24 – C40	<100	<100	196
EH>C10 – C16	127	<100	1160
BTEX			
Toluene	2.16	2.62	25.5
Ethyl Benzene	<1	3.78	<1
m&p-Xylene	<1	3.65	1.96
o-Xylene	<1	4.26	1.01
Benzene	<1	2.33	1.94
Other Organics			
1,2,4-Trimethylbenzene	<1	4.55	<1
1,4-Dichlorobenzene	<1	1.56	<1
MTBE	<1	1.47	<1

A total of 648.44 tonnes of leachate (701.74 tonnes in 2018) was extracted from Area 3 during 2019. Leachate was removed from a sump in the base of each cell via an upslope riser. The extracted leachate was stored on-site in the leachate collection tank prior to removal off-site by tanker for disposal.

Details of the overflow of the leachate tank which occurred in October 2019 following a float electrical malfunction are detailed in Appendix 9 - Leachate Tank Incident.

2. GROUNDWATER MONITORING

Area 2 requirements

Frequency	Monitoring locations	Measurement/determinand
MONTHLY	M10, BH1, M18, M19, M20, M21, M22, M30, M31, M33, M34, M35, and soakaway NS	Water level, temperature, pH, Cl, EC, NH4-N, Dissolved oxygen (DO)
QUARTERLY		As monthly plus: Alkalinity, Ca, Cd, Cr, Ni, Pb, K, Mg, Na, SO4, Fe, Mn, Zn, Cu, TOC and TON.

Area 3 requirements

(Table S3.10 groundwater – other monitoring requirements)

Frequency	Monitoring locations	Measurement/determinand
SIX – MONTHLY	M17, M36, M47, DAS, GW2, GW3, GW4 and GW5	Water Level, EC, DO, Cl, NH4-N, Hg (diss), Zn, Mecaprop, Ca, Mg, K, Na, Cd, alkalinity, TOC, SO4, TON and phenol.
ANNUALLY	M17, M36, M47, DAS, GW2, GW3, GW4 and GW5	As six-monthly plus: Cr, Cu, Fe, Pb, Mn, Ni, Zn, hazardous substance suite.

(Table S3.4 Trigger levels for emissions into groundwater and monitoring requirements)

Borehole	Compliance limits					
	Ammoniacal nitrogen	Chloride	Mecaprop	Mercury	Zinc	Toluene
	mg/l	mg/l	µg/l	µg/l	mg/l	µg/l
GW3	0.54	21	0.04	0.1	0.133	3
GW4	0.48	21	0.04	0.1	0.156	3
M36	0.49	22	0.04	0.1	0.094	3

2.1 GROUNDWATER REVIEW

2.1.1 Groundwater Levels

Data from January to December 2019 are summarised in Table 4.
The highest groundwater levels are to the south of the site, with water levels falling towards the north/northeast towards the River Desach and also falling to the north west of the site. During 2019 the largest variations in groundwater levels were seen in Area 2 groundwater monitoring boreholes, which are monitored on a monthly basis. Area 3 is monitored every 6 months during May and November with changes in levels less apparent due to the monitoring frequency.

Table 4 - Summary of Ground Water Levels for 2019

Borehole	Borehole Datum (m AOD)	Groundwater Levels (m AOD)		
		Min	Mean	Max
GW3	134.42	127.76		128.42
GW4	138.07	127.91		128.67
GW5	134.21	129.39		130.50
M10	134.91	124.37	125.48	126.59
BH1	132.64	124.14	125.67	126.67
M17	129.29	126.95		128.09
M18	132.50	127.44	128.06	128.59
M19	127.41	122.64	122.87	123.01
M20	128.77	122.78	123.01	123.13
M21	130.98	122.93	123.41	124.18
M22	127.33	122.97	123.06	123.11
M31	128.90	122.99	123.59	124.13
M33	134.16	125.50	126.60	127.69
M34	131.18	124.62	125.34	126.35
M35	127.62	120.64	123.44	124.90
M36	138.29	128.79		129.89
M47	139.20	129.36		130.57
DAS	140.68	135.91		136.08

Groundwater levels in Area 2 are monitored monthly and in Area 3 every six months.

2.1.2 Groundwater quality

Although Area 2 and Area 3 are regulated under separate EP's and this report, as with previous ones, discusses these areas separately, some of the monitoring locations may not intuitively belong in the operational areas under which they are being discussed give their location in relation to the two landfill sites.

Analytical results for ammoniacal nitrogen and chloride (site leachate indicators) are presented graphically in Appendix 2. A summary of the data for the reporting period January to December 2019 is provided in Table 5.

Table 5 - Selected Groundwater Quality for 2019

Borehole	pH			Electrical conductivity (µS/cm)			Ammoniacal Nitrogen (mg/l)			Chloride (mg/l)		
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Area 3 EP												
Upgradient												
GW5	6.5		7.0	159		177	<0.41		<0.41	6.95		7.30
M47	7.0		7.5	88.3		264	<0.41		<0.41	7.30		11.00
Downgradient												
GW3 *	7.2		7.4	338		351	<0.41		<0.41	9.50		11.00
GW4 *	6.6		7.2	159		171	<0.41		1.61	9.89		14.10
M17	6.7		7.4	205		213	<0.41		<0.41	18.30		22.90
M36 *	6.8		7.4	169		180	<0.41		<0.41	10.70		12.20
Other Boreholes												
DAS	7.2		7.7	348		376	<0.41		0.8	5.43		6.40
Area 2 EP												
BH1	7.2	7.6	8.4	169	302	405	<0.41	<0.41	<0.41	1.10	11.06	22.50
M18	6.8	7.3	7.9	183	204	216	<0.41	<0.41	<0.41	3.50	10.10	15.80
M19**	6.2	6.5	7.1	78.6	80.0	82.5	<0.41	<0.41	<0.41	8.16	9.36	11.00
M20**	7.7	8.0	8.3	442	471	494	2.69	5.25	6.91	8.84	15.65	18.30
M21**	7.6	7.8	8.2	399	457	507	<0.41	0.42	0.47	15.20	18.46	22.30
M22**	7.4	7.8	8.1	290	296	301	<0.41	<0.41	<0.41	15.30	16.07	17.00
M31	6.2	7.5	8.4	99.4	271	312	<0.41	<0.41	<0.41	2.00	11.37	15.90
M34	7.1	7.5	8.4	108	253	305	<0.41	<0.41	<0.41	2.60	9.60	14.30
M35												
Other boreholes												
M10	7.4	7.7	8.2	175	195	238	<0.41	0.55	1.78	3.10	6.42	8.18
M33	6.8	7.4	8.0	108	122	144	<0.41	0.44	0.61	5.80	8.83	12.90

Note : Six monthly data Area 3 (GW5, M47, GW3, GW4, M17, M36 and DAS) and monthly for Area 2.
**Boreholes with EP trigger levels*
***samples were only collected from these boreholes on a monthly basis in 2019 between January and May.*

Area 3 Monitoring

Upgradient boreholes

Boreholes GW2, GW5 and M47 are situated to the south of, and upgradient of, Area 3 and therefore provide an indication of background groundwater quality. Borehole GW2 continued to remain dry during 2019. Data for the remaining two boreholes, GW5 and M47 indicate:-

- Ammoniacal nitrogen at both locations remained below detection limit (<0.41mg/l).
- Chloride concentrations remain within the 2018 range, remaining at relatively low concentrations (7.70 – 11.70mg/l).

Downgradient boreholes

Boreholes GW3, GW4, M17 and M36 are located downgradient of Area 3. Compliance limits for mercury, zinc, ammoniacal nitrogen, chloride, mecaprop and toluene have been set for boreholes GW3, GW4 and M36. Details of the EP compliance limits are shown in *Table S3.4*

The data for the reporting during 2019, shows :-

- Ammoniacal nitrogen levels were below the detection limit (0.41mg/l) and the EP compliance limits at GW3 and M36. Levels of 1.61mg/l were detected in GW4 in May.

Repeat sampling in July recorded levels 0f 0.48mg/l, the compliance level set for this borehole. Details of breach notification are detailed in Appendix 8 of the report.

- Chloride concentrations at GW3 (9.50 -11.00mg/l), GW4 (9.89 – 14.10mg/l) and M36 (10.70 – 12.20mg/l) remained within the historical data range and all locations remained below the EP compliance limit.
- Mecaprop concentrations were below the laboratory detection limit (0.04ug/l) and EP compliance limits at GW3, GW4 and M36.
- Mercury concentrations were below the EP compliance limit (0.10ug/l) in GW3, GW4 and M36.
- Zinc concentrations remained below the detection limit in GW3 and M36, levels of between <18 – 70.8 ug/l were noted in GW4. All three boreholes remained below the EP compliance limits.

- Toluene concentrations were below the laboratory detection limit (1ug/l) in GW3 and GW4, levels of between <1 – 12.3 ug/l were noted in M36.

No upward trend was observed in any of the boreholes with similar results seen in 2018 and 2019. Overall, groundwater quality downgradient of Area 3 for 2019 show no impact from Area 3. Mecaprop levels were below the laboratory detection limits. With the exception of the ammoniacal nitrogen breach in GW4 in May, and toluene in M36 in November, no further breaches were noted. Chloride, mercury and zinc were below the specified EP compliance limits for the groundwaters in GW3, GW4 and M36.

Other boreholes
Borehole DAS is situated within and close to the perimeter of Area 2. Historically ammonical nitrogen and chloride concentrations at this borehole have been elevated compared to other boreholes at the site but groundwater quality has improved since 2015. Contamination at this borehole is most likely to be the result of the borehole being within the waste deposits of the unlined closed landfill (Area 2). During the reporting period both the ammoniacal nitrogen and the chloride levels have remained lower than the elevated pre – 2015 data. Chloride concentrations (5.43-6.40mg/l) have fallen to within the range measured at the other borehole at the site whilst ammoniacal nitrogen continues to fall, with the highest reading at 0.80mg/l recorded in May 2019.

Area 2 Monitoring

Downgradient boreholes
Boreholes BH1, M18, M19, M20, M21, M22, M30, M31, M34 and M35 are downgradient of the unlined closed landfill (Area 2).

With the exception of M20, where levels of ammoniacal nitrogen are higher, ranging between 269 – 6.91 mg/l (data only available from January to May 2019) all of the remaining boreholes recorded values of between <0.41 – 0.47mg/l. The largest range in chloride levels were recorded in BH1 ranging between 1.10 – 22.50mg/l. All boreholes continue to remain within the boundary of historical data. However, M35 has shown a marked improvement since 2015, with significant reduction in chloride concentration at this location.

Previous reports have noted that the water quality at these locations are likely to reflect some impact from the unlined landfill, Area 2.

Boreholes within Area 2 boundary
Boreholes M10 and M33 are located within the northern part of Area 2.

The majority of the samples taken at both locations in 2019 were below the detection limit of <0.41mg/l for ammoniacal nitrogen. Ammoniacal nitrogen levels at both M10 and M33 peaked in early 2019, M10 in February (1.78 mg/l) and M33 in April (0.61mg/l). As of May the remaining monthly results at both boreholes remained below the detection limit for ammoniacal nitrogen.

Chloride levels in M10 remained low ranging between 3.1 - 8.18mg/l. Slightly higher values were detected in M33,with the highest value recorded in February, 12.8 mg/l falling to a low in November to a level of 5.80mg/l.

At both M10 and M33 the 2019 readings have shown a slight improvement compared with the previous year.

Soakaway

A summary of the monitoring results taken from the Soakaway NS for 2019 are shown in Table 6.

Table 6 - Selected Water Quality Data for Soakaway NS for 2019

	pH			Electrical Conductivity (µs/cm)			Ammoniacal nitrogen (mg/l)			Chloride (mg/l)		
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
NS	7.2	7.6	7.9	92.6	104.6	130	<0.06	0.07	0.09	3.7	9.1	13.4

Ammoniacal nitrogen levels remained low, with a maximum level of 0.09mg/l recorded. Chloride concentrations continued to remain low and varied between 3.7 – 13.1 mg/l, showing little variation on the 2018 results. The results from the soakaway indicate no evidence of contamination by leachate in the surface water runoff.

Data plots for Area 2 boreholes and the soakaway are shown in Appendix 3.

An extended analytical suite for hazardous organic substances in groundwater boreholes GW3, GW4, GW5, M17, M36, M47 and DAS was carried out in May 2019. The data is summarised in Table 7. The substances detected include a hydrocarbon band downgradient of the site at M17 and a pesticide at DAS, which is likely to monitor perched leachate in Area 2.
Further analysis has been scheduled to establish whether this is an isolated occurrence in M17, or the result of a possible vehicle fuel spill from the nearby road.

Table 7 - Summary of groundwater Organic Hazardous Substances Screen 2019 (substances above detection limit)

Hazardous organic Substance	**upgradient**		**downgradient**				**Within Area 2 perimiter**
	GW5	**M47**	**GW3**	**GW4**	**M17**	**M36**	**DAS**
Pesticides (µg/l)							
Mecoprop *	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.25
Hydrocarbon Band (µg/l)							
EH>C10-C16	<10	<10	<10	<10	40	<10	<10
EH>C16-C24	11	<10	<10	<10	1560	<10	<10
EH>C24-C40	<10	<10	<10	<10	903	<10	<10
EH>C6-C40	11	<10	<10	<10	2500	<10	<10

*Mecoprop has been re-classified as a non-hazardous organic substance.

3. SURFACE WATER MONITORING

3.1 SURFACEWATER REVIEW

The surface waters are monitored at the following locations, show on drawing 1:-

SW B – Tributary of the River Desach, to the north of the site

SW C – River Desach, to the north east of the site

SW D – Discharge point, from the surface water attenuation lagoon, into the River Desach. The attenuation lagoon is fed from the landfill's surface water drainage system, along with an interceptor and much of the surface water on Area 2 installed in September 2012. Emission limits have been set at this location for pH, chloride, ammoniacal nitrogen, suspended solids and BOD.

SW D2 – A sample from a lake located to the north of the site.

SW E – River Desach, approximately 300m downstream of sample point SW C

SW W – River Desach, to the east of the site.

SW Y – River Desach, located upstream of the site to the south east of the site.

Infiltration Basin – Located east of the site near to SW W. Draining surface water collected from Area 3 of the landfill.

Monitoring is carried out in accordance to the requirement of the Environmental Permit

(Table S3.3 Point source emissions to water (other than sewer) – emission limits and monitoring requirements)

Emission point	Parameter	Limit	Reference period	Monitoring Frequency
Point D	Ammoniacal nitrogen	0.3 mg/l	Spot sample	Every two months
	Dissolved oxygen	80% (minimum)		
	BOD	4 mg/l		
	Suspended Solids	25 mg/l		

(Table S3.9 Surface water – other monitoring requirements)

Frequency	Monitoring locations	Measurement/determinand
EVERY TWO MONTHS	SW D (discharge)	NH4-N, DO, BOD and suspended solids
SIX-MONTHLY	Infiltration Basin	EC, pH, Cl, NH4-N, Cd.
SIX-MONTHLY	SWY, SWW, SWD (Discharge), SWB, SWC, SWD2, SWY	EC, pH, Alkalinity, Cl, NH4-N, TOC, BOD, COD, DO
ANNUALLY	SWY, SWW, SWD (Discharge), SWB, SWC, SWD2, SWY	As 6-monthly plus: Ca, Mg, K, Na, SO4, NO3, NO2, TON, Cd, Cu, Fe, Pb, Mn, Ni and Zn.

3.1.1 Surface Water Quality

River Desach – In total 4 samples, SWY, SWW, SW C and SWE are taken along the course of the river over a distance of approximately 800m, sampling upstream, adjacent to and downstream of the site. A further sample is taken at location SW B, a tributary of the river. Similar results are seen at each location along the length of the river and also in the tributary. Ammoniacal nitrogen levels continue remain below detection limits (<0.06mg/l). Chloride levels continue to remain low with a small range of between 7.03 and 9.4mg/l.

Lake – Located to the north of the site, surface water sample SWD2, shows a reduction from the 0.21mg/l level 2018 to 0.11mg/l in 2019. As noted in previous reports the elevated peaks in the ammoniacal nitrogen appear to be seasonal and may be associated with agricultural input, such as fertilisers.
Chloride concentrations continue to show a downward trend, falling to levels of between 13.3 – 18.8mg/l in 2019, since peaking in May 2017 (28.20mg/l).

Discharge Point (SWD) – The discharge point at SWD is monitored every two months. EP compliance limits for ammoniacal nitrogen, Dissolved Oxygen, BOD and Suspended Solids have been specified at this location. Ammoniacal nitrogen remained below detection limit (<0.06mg/l), and no breaches were noted during 2019 for Dissolved Oxygen, BOD and Suspended Solids.
During May, July and September there was no discharge noted at this location.

Infiltration Basin – Ammoniacal nitrogen levels remained below the detection limit (<0.06mg/l). Chloride levels remain low at 10.0mg/l, a slight elevation on the 2018 value of 5.0mg/l.

In summary, the data continued to shows no discernible impact from Area 3 on the River Desach or on the lake to the north of the site.

Table 8 - Selected Surface Water Quality Data for 2019

Sample Point	pH			Electrical Conductivity (µS/cm)			Ammoniacal Nitrogen (mg/l)			Chloride (mg/l)			Dissolved Oxygen (mg/l) & (%)			Suspended Solids (mg/l)			Biological Oxygen Demand (mg/l)		
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
B	7.0	-	7.5	62.4	-	78.5	<0.06	-	<0.06	7.33	-	9.4	8.7	-	8.8	n.m.			<1	-	<1
C	7.4	-	7.7	89.4	-	142	<0.06	-	<0.06	7.6	-	9.07	8.3	-	9.1	n.m.			<1	-	<1
D	7.8	8.0	8.1	-	-	-	<0.06	<0.06	<0.06	-	-	-	7.6 (92.4%)	9.7	13 (97.0%)	1	1.8	3	<1	<1	<1
D2	7.4	-	8.0	210	-	366	0.09	-	0.11	13.3	-	18.8	2.9	-	6.1	n.m.			1	-	2
E	7.6	-	7.9	95.7	-	183	<0.06	-	<0.06	8.13	-	8.5	8.6	-	9.6	n.m.			<1	-	<1
W	7.3	-	7.4	75.3	-	137	<0.06	-	<0.06	7.2	-	9.04	9.9	-	12	n.m.			<1	-	<1
Y	6.9	-	7.4	48.7	-	68.9	<0.06	-	<0.06	7.03	-	8.4	10	-	13.9	n.m.			<1	-	<1
Infiltration Basin*		8.2			302			<0.06			10			9.6		n.m.				-	
EP emission limits for SW D	*6.0*		*9.0*				*<0.3*						*>80%*			*<25*			*<4*		

*no sample was taken in May 2019 as the infiltration basin was dry.

NOTE :- Suspended solids measurement for sampling point D only , as per the requirements of the EP.

4. GAS MONITORING

(Table S3.5 Landfill gas in external borehole – limits and monitoring requirements)
(Table S3.7 Landfill gas – other monitoring requirements)

Frequency	Monitoring locations	Measurement/determinand
SIX-MONTHLY	Peripheral gas monitoring boreholes G1A, G2, G3, G4, G5 G6 and G7	Methane, Carbon Dioxide, Oxygen, Atmospheric pressure, Differential pressure, Temperature, Meteorological data.
SIX-MONTHLY	In-waste monitoring boreholes (at least two monitoring wells within each cell	Methane, Carbon Dioxide, Oxygen, Carbon monoxide, Atmospheric pressure, Differential pressure, Temperature, Meteorological data.

4.1 GAS MONITORING REVIEW

4.1.1 Perimeter Gas Monitoring

Landfill gas monitoring was carried in accordance toe the EP requirement on a six monthly basis in perimeter gas boreholes G1A, G2 – G7. The locations of the gas monitoring boreholes are shown in drawing 1.
The results of the monitoring undertaken in 2019 along with the compliance limits are shown in Table 9.

Methane was not detected in any of the external gas monitoring boreholes during 2019. With the exception of monitoring borehole G1A, where the control limits for carbon dioxide was breached, measurements taken in 2019 were below the compliance limits set at the individual boreholes.

Methane was not detected in gas monitoring borehole G6 or G7 and carbon dioxide levels remained very low during 2019. Both these boreholes are located between the engineered landfill in Area 3 and the unlined landfill in Area 2. Should any methane/carbon dioxide be detected within these boreholes it is most likely to be derived from Area 2.

Table 9 – Monitoring Results from Perimeter Gas Boreholes in 2019

Date	Atmospheric Pressure (differential Pressure) (mb)	G1A			G2			G3			G4		
		CH4 (%v/v)	C02 (%v/v)	O2 (%v/v)	CH4 (%v/v)	C02 (%v/v)	O2 (%v/v)	CH4 (%v/v)	C02 (%v/v)	O2 (%v/v)	CH4 (%v/v)	C02 (%v/v)	O2 (%v/v)
07/03/19	975 (-0.67 to 0.36)	0.0	1.3	1.0	0.0	0.1	21.6	0.0	2.8	18.4	0.0	0.1	21.4
05/09/19	1011-1012 (0.04 to 0.28)	0.0	5.2*	2.0	0.0	0.1	21.1	0.0	1.6	19.6	0.0	0.1	21.4
Control levels %v/v		*0.8*	*4.7*	-	*0.8*	*1.9*	-	*0.8*	*4.5*	-	*0.8*	*2.0*	-
Compliance levels %v/v		*1.0*	*5.9*	-	*1.0*	*2.3*	-	*1.0*	*5.7*	-	*1.0*	*2.5*	-

**Two further readings were done in September. CO2 levels reduced to below the control level.*
09/09/19 CO2 = 4.7%
30/09/19 CO2= 4.0%

Date	Atmospheric Pressure (differential Pressure) (mb)	G5			G6			G7		
		CH4 (%v/v)	C02 (%v/v)	O2 (%v/v)	CH4 (%v/v)	C02 (%v/v)	O2 (%v/v)	CH4 (%v/v)	C02 (%v/v)	O2 (%v/v)
07/03/19	975 (-0.76 to 0.36)	0.0	0.1	21.9	0.0	0.1	21.7	0.0	0.1	21.7
05/09/19	1011 – 1012 (0.04 to 0.28)	0.0	0.0	20.9	0.0	0.1	20.9	0.0	0.1	20.8
Control levels %v/v		*2.1*	*5.0*	-	*a*	*a*	-	*a*	*a*	-
Compliance levels %v/v		*2.6*	*6.2*	-	*a*	*a*	-	*a*	*a*	-

Compliance limits and control levels for G6 and G7 have not been set as monitoring data suggests that they are being affected by landfill gas derived from the closed unlined landfill in Area 2

4.1.2 In Waste Gas Monitoring (Area 3)

In waste gas monitoring locations include combined leachate and gas monitoring wells and gas extraction wells shown in figure 1. The data is summarised in Appendix 4 and data shows that the waste is continuing to produce landfill gas.
On the 27th of April 2018 a timer was fitted to the flare. Currently the flare is run for 10 hours in a 24hr cycle. The EP require readings at the flare to be carried out on a 6 monthly basis, however, additional data has been collected following the installation of the timer. The readings taken at the flare during 2019 are summarised in Table 10.

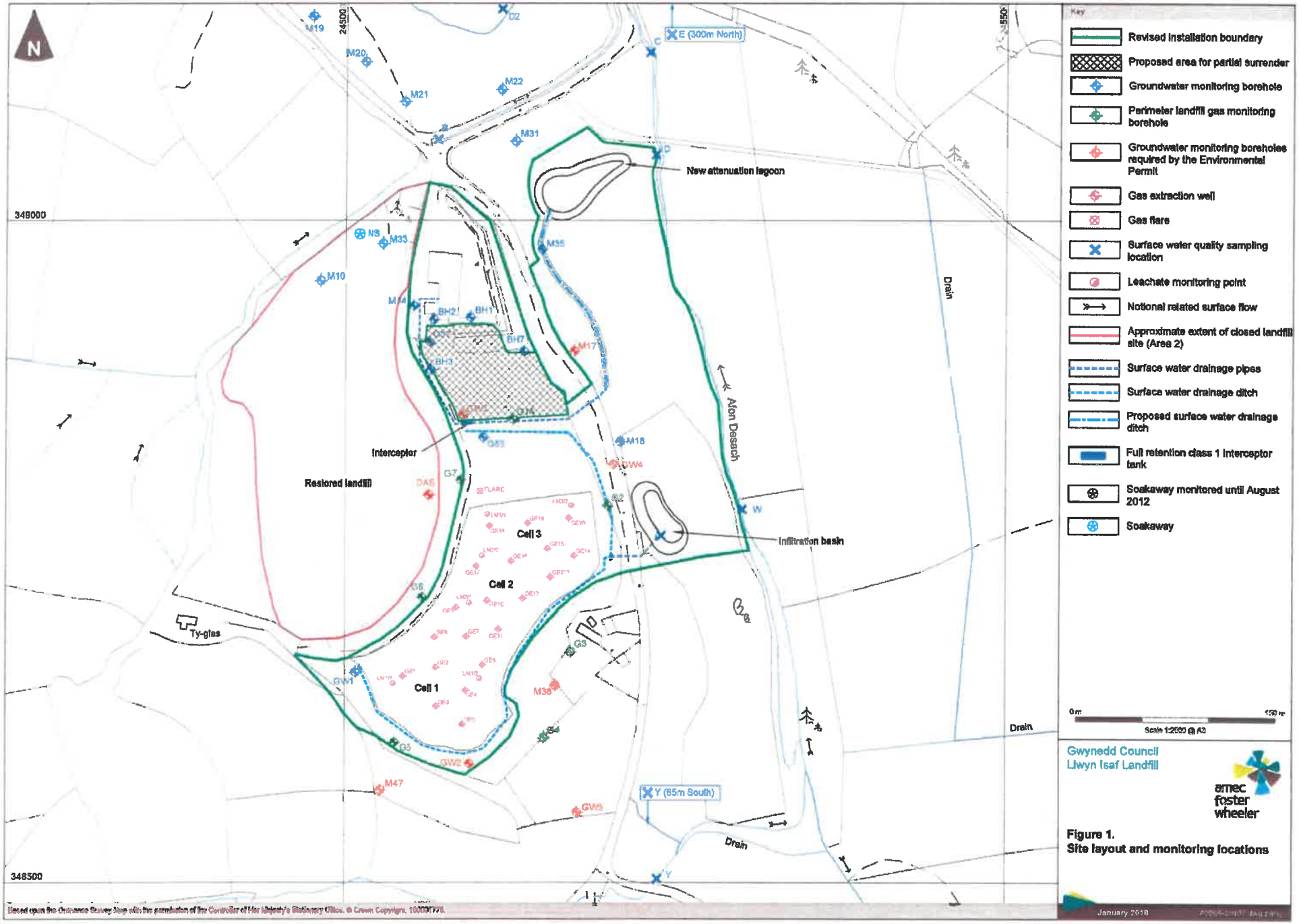
Table 10 - Readings at the flare during 2019

Date	CH4 %v/v	Balance gas	Flow (m3/hr)	Suction (mb)
18/01/19	56.6	14.1	20	-3.93
25/02/19	63.3	12.4	24	-4.01
11/03/19	58.9	14.5	25	-4.28
12/04/19	58.3	16.9	25	-4.10
17/05/19	58.8	15.5	28	-2.44
21/06/19	59.9	13.9	-	-3.78
12/07/19	60.4	11.9	27	-3.45
09/08/19	63.6	8.0	28	-1.74
13/09/19	59.4	13.2	28	-5.19
11/10/19	62.5	7.6	28	-3.59
15/11/19	64.6	6.1	24	-5.05
13/12/19	64.2	8.6	25	-4.45

Meteorological data (details of the rainfall, temperature and wind direction) for the reporting period are presented in Appendix 5.

4.1.3 Surface Emissions (Area 3)
To comply with EP condition *S3.6 Landfill gas from capped surfaces – limits and monitoring requirements.* A surface fugitive emission survey of Area 3 was carried out on the 4th of December 2019. The maximum result for methane emissions during the survey of the cap was 12ppm. No further actions were taken – as no action is required below 100ppm.

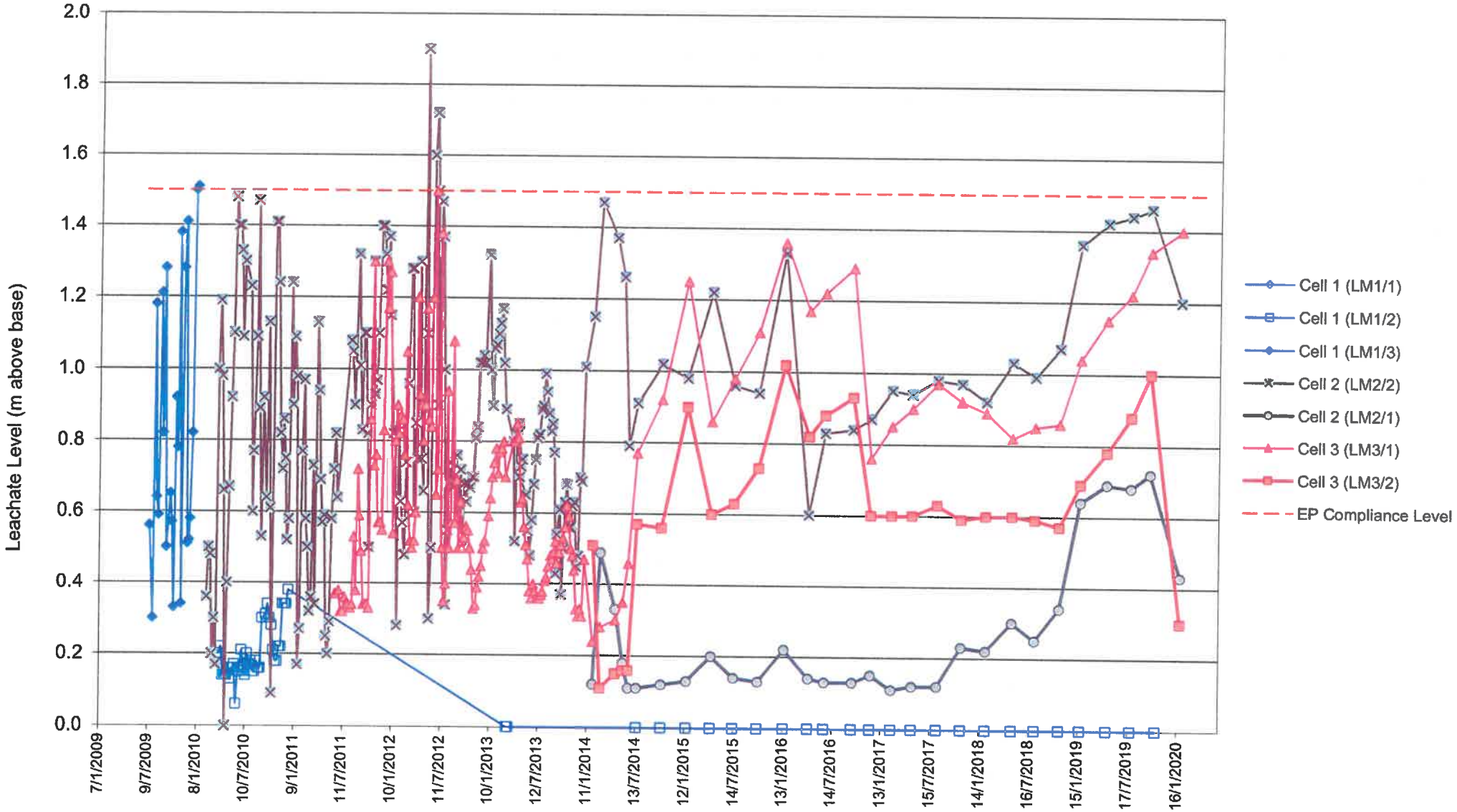
4.1.4 Flare Emissions and Bulk Gases
An Average flow of 26m3/hr was recorded at the flare during 2019 (27m3/hr in 2018). In total a volume of 101,403m3 of landfill gas was combusted at the site in 2019.
Flare emissions and bulk gas carried out at the site on the 17th of September 2019 are shown in Appendix 6. All results were compliant with table *S3.2 Point source emissions to air – emission limits and monitoring requirements* of the EP.


N
M19
M20
M21
M22
M31
D2
E (300m North)
New attenuation lagoon
349000
348500
M10
M33
M34
M35
M17
M18
BH1
BH2
BH3
BH7
Interceptor
Restored landfill
Cell 1
Cell 2
Cell 3
Afon Dessach
Drain
Drain
Drain
Ty-glas
Infiltration basin
M36
M47
GW1
GW2
GW4
GW5
Y (65m South)
Key
Revised installation boundary
Proposed area for partial surrender
Groundwater monitoring borehole
Perimeter landfill gas monitoring borehole
Groundwater monitoring boreholes required by the Environmental Permit
Gas extraction well
Gas flare
Surface water quality sampling location
Leachate monitoring point
Notional related surface flow
Approximate extent of closed landfill site (Area 2)
Surface water drainage pipes
Surface water drainage ditch
Proposed surface water drainage ditch
Full retention class 1 interceptor tank
Soakaway monitored until August 2012
Soakaway
Scale 1:2500 @ A3
Gwynedd Council
Llwyn Isaf Landfill
amec foster wheeler
Figure 1.
Site layout and monitoring locations
January 2018

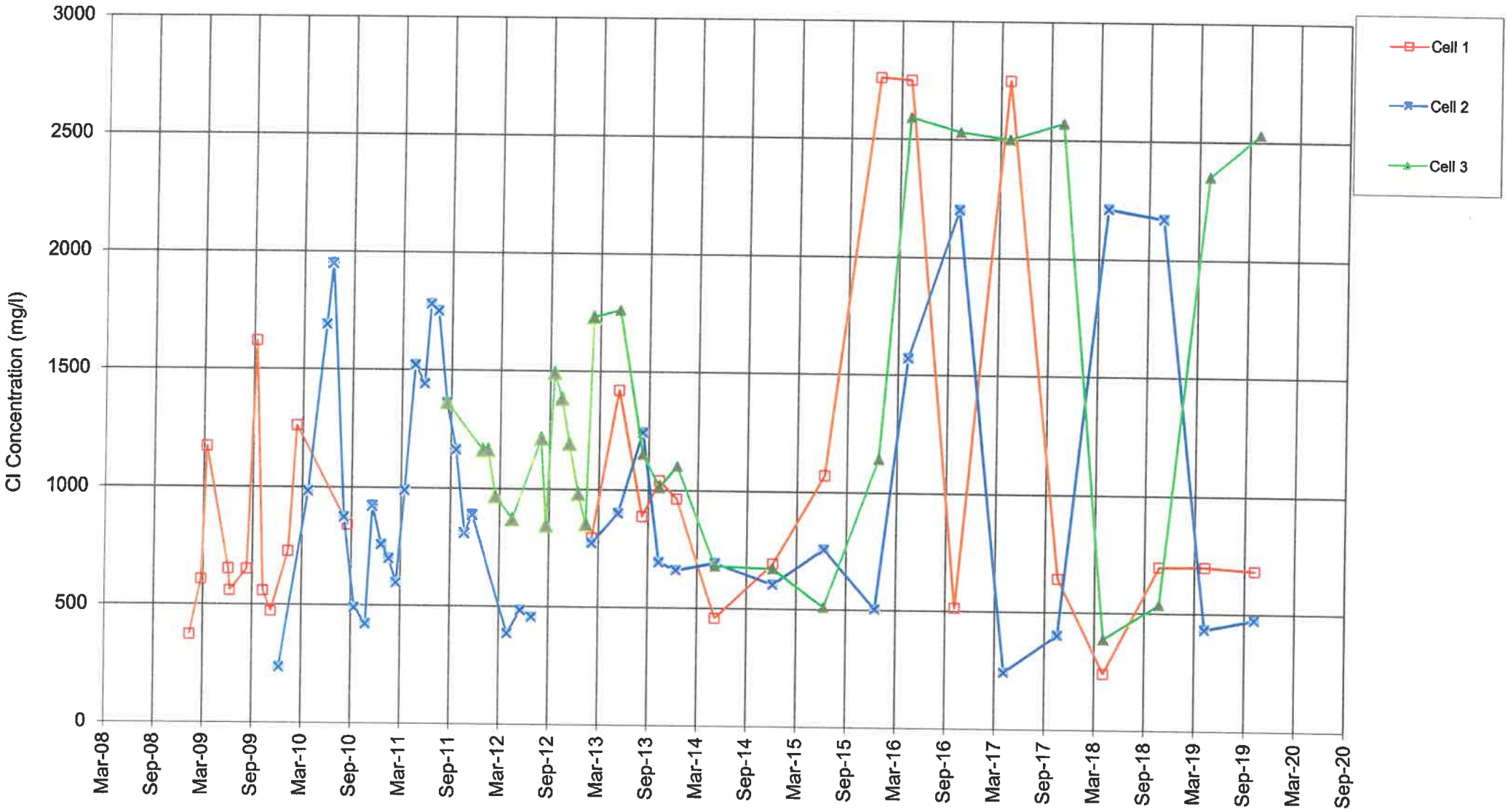
APPENDIX 1 –

Leachate Quality Data Plots

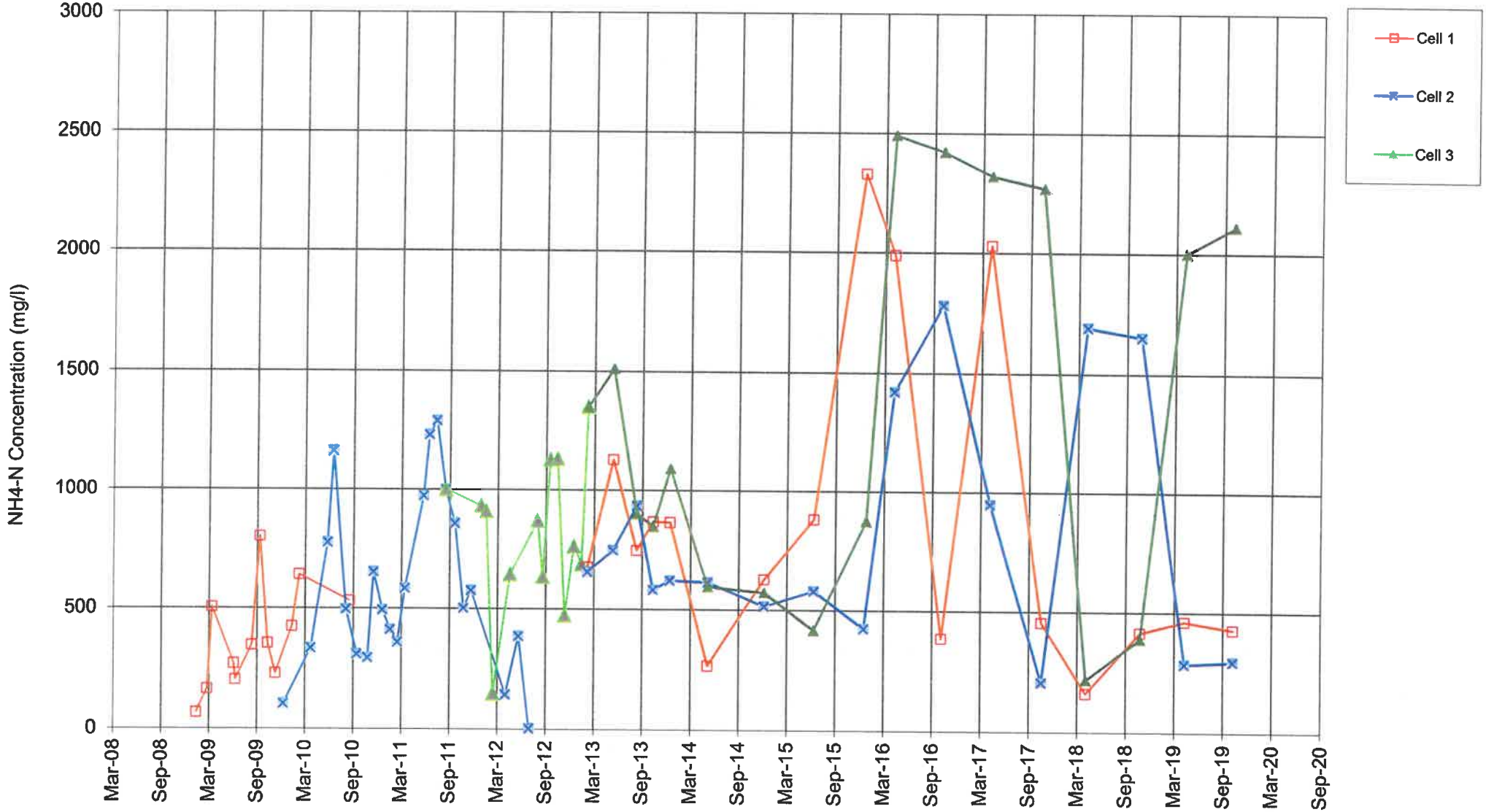
Llwyn Isaf Landfill: Leachate Levels



Llwyn Isaf Landfill: Chloride Concentrations in Landfill Leachate



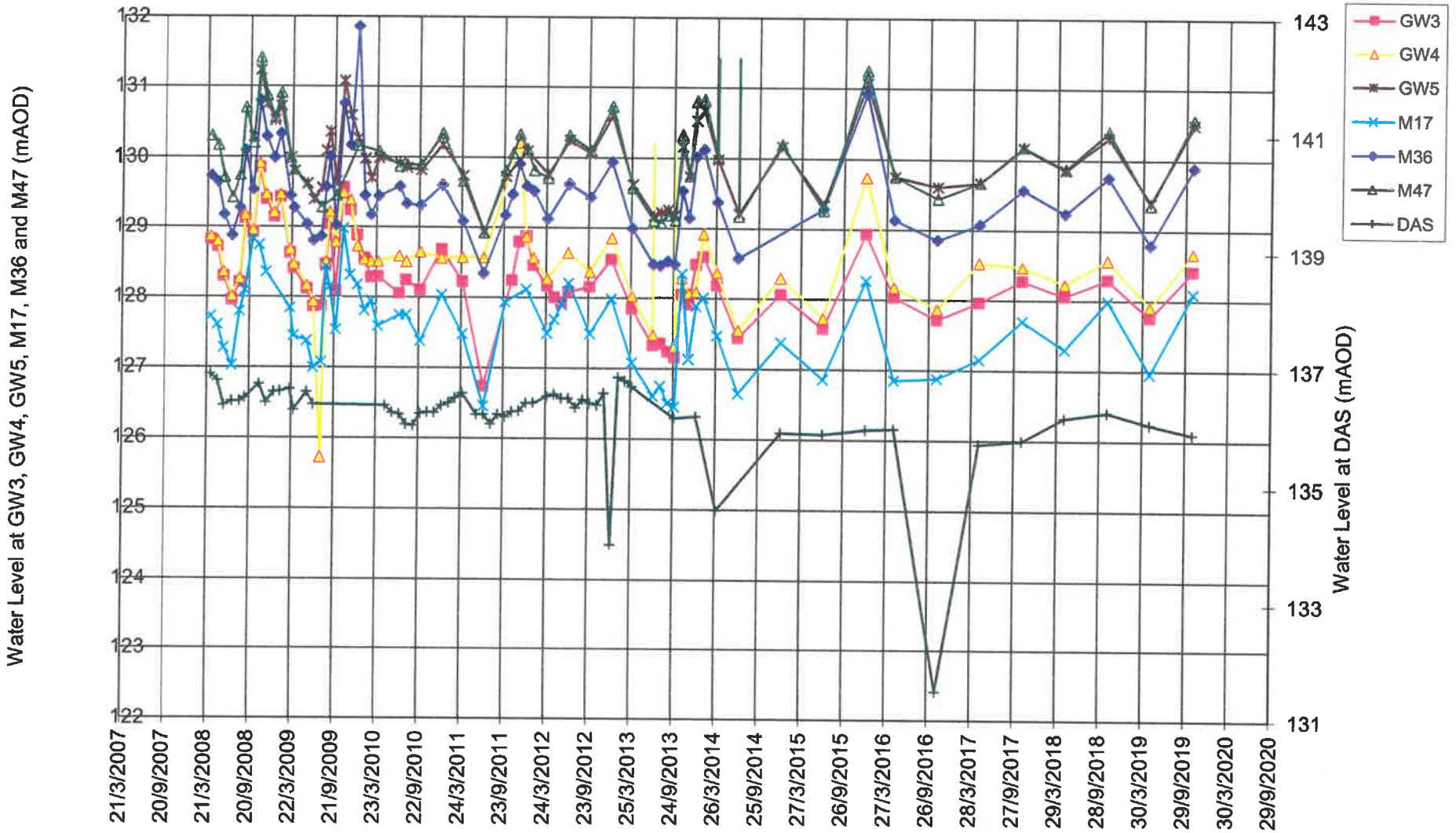
Llwyn Isaf Landfill: Ammoniacal-Nitrogen Concentrations in Landfill Leachate



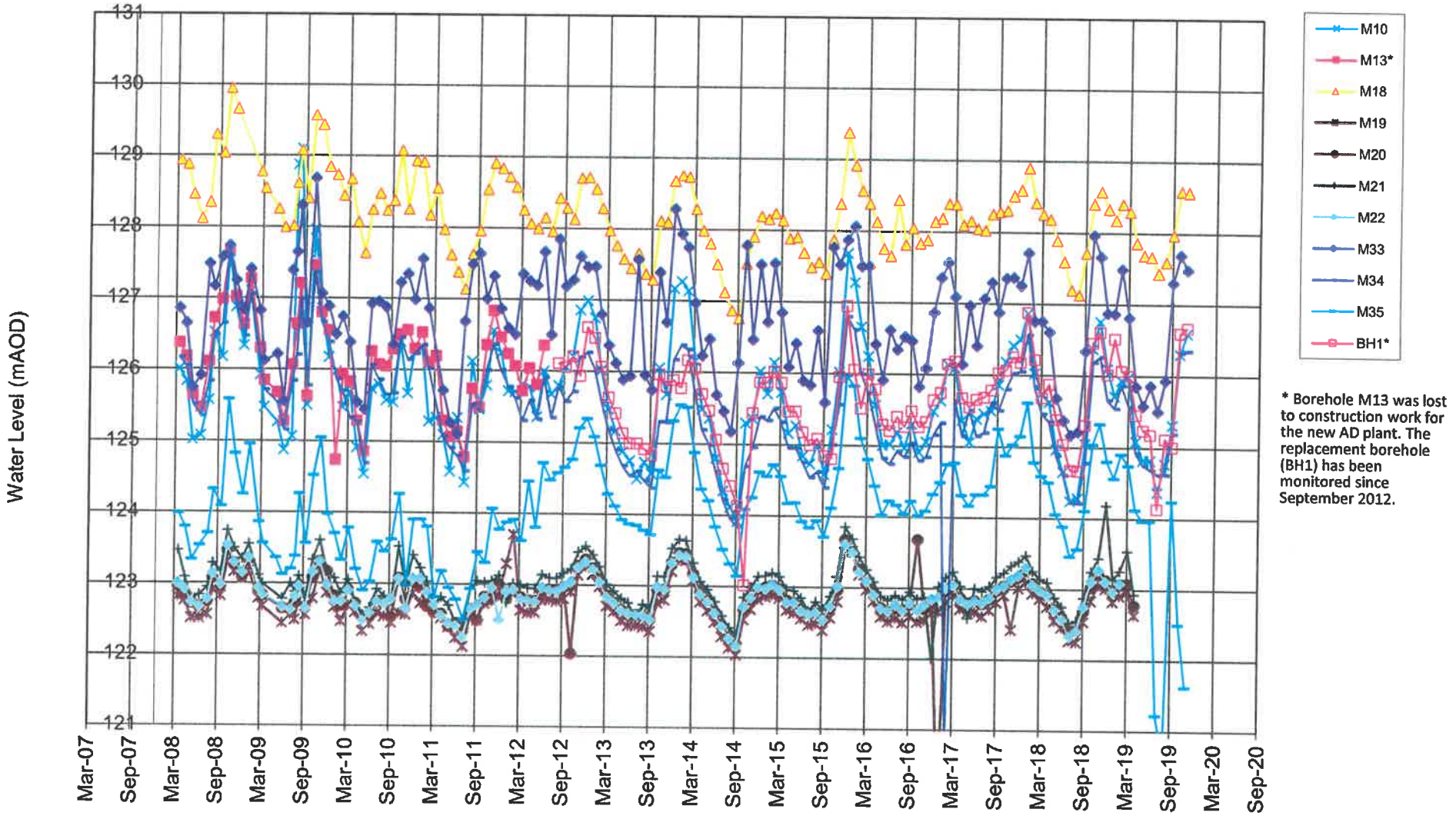
APPENDIX 2 –

Groundwater Quality Data Plots

Llwyn Isaf Landfill: Groundwater Levels (Area 3)

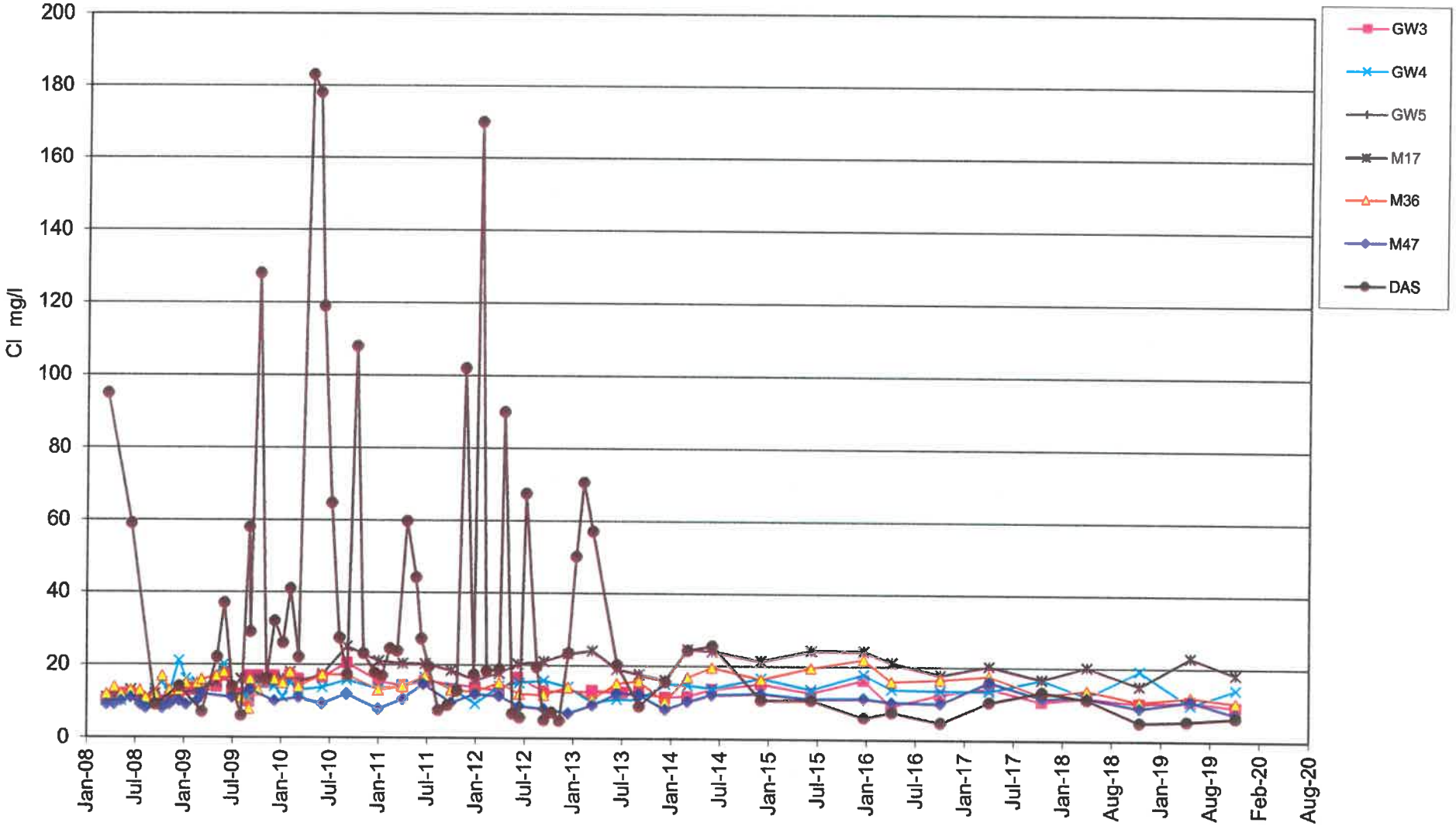


Llwyn Isaf Landfill: Groundwater Levels (Area 2)

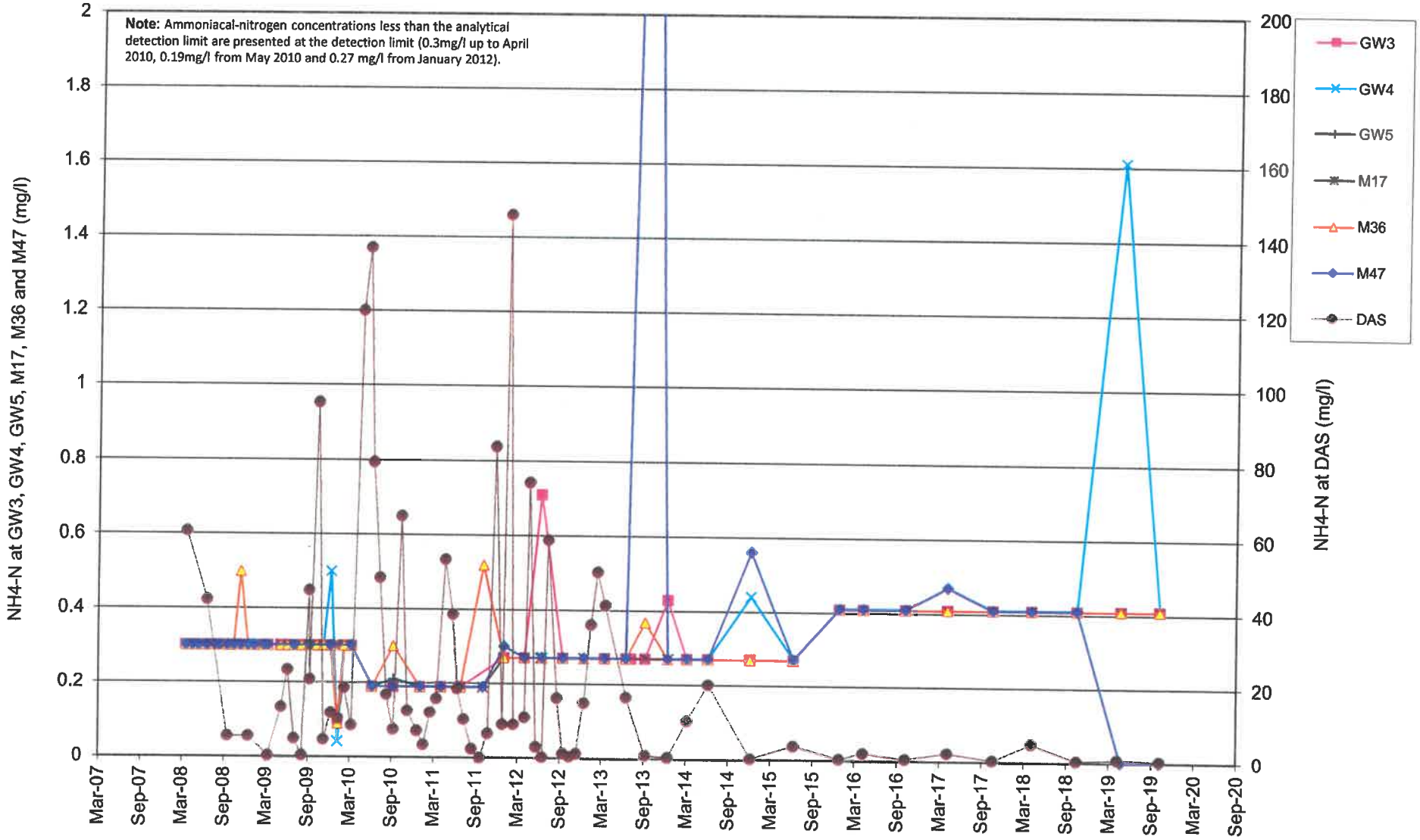


* Borehole M13 was lost to construction work for the new AD plant. The replacement borehole (BH1) has been monitored since September 2012.

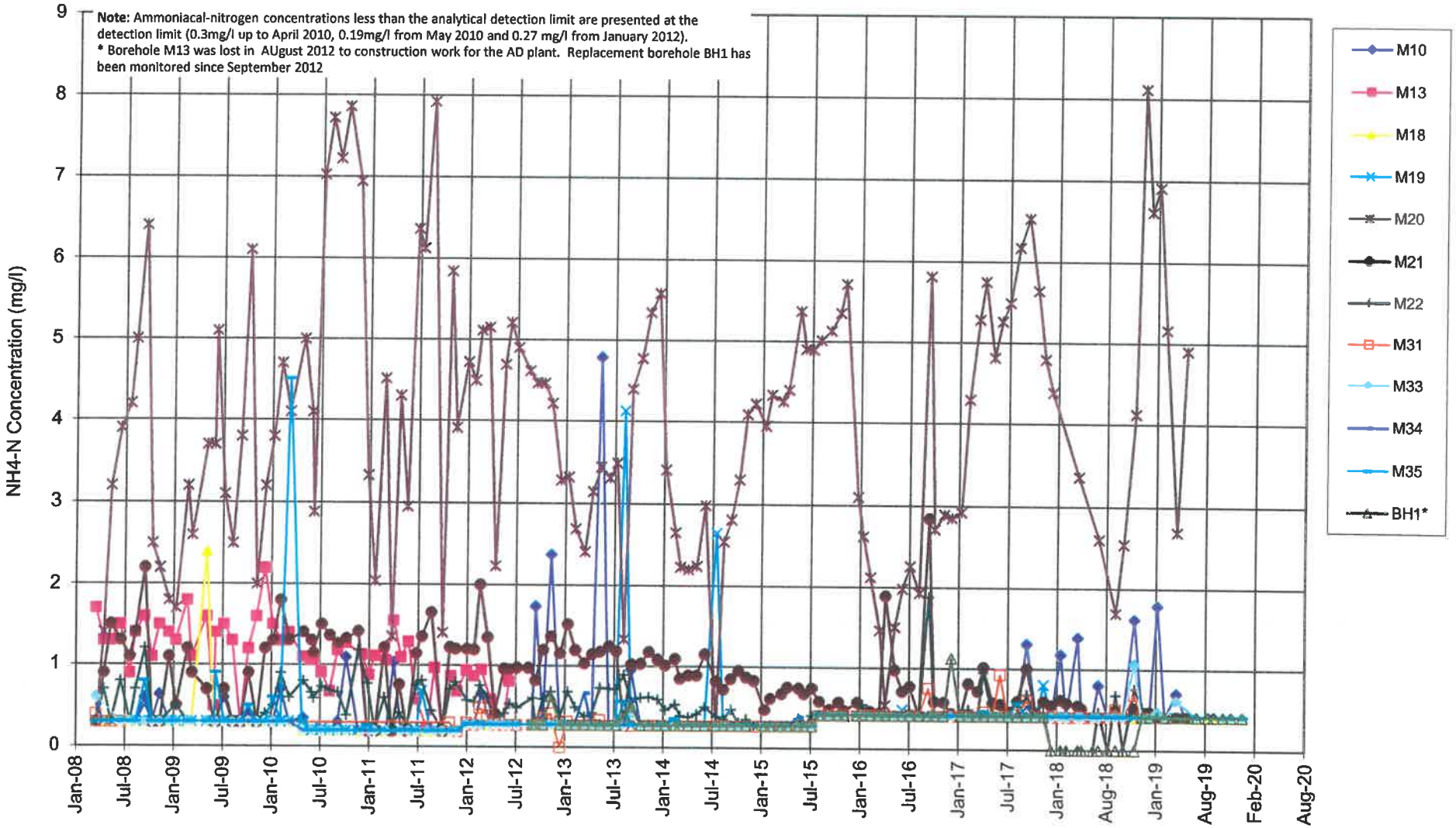
Llwyn Isaf Landfill - Chloride Groundwater Concentrations (Boreholes under EP for Area 3)



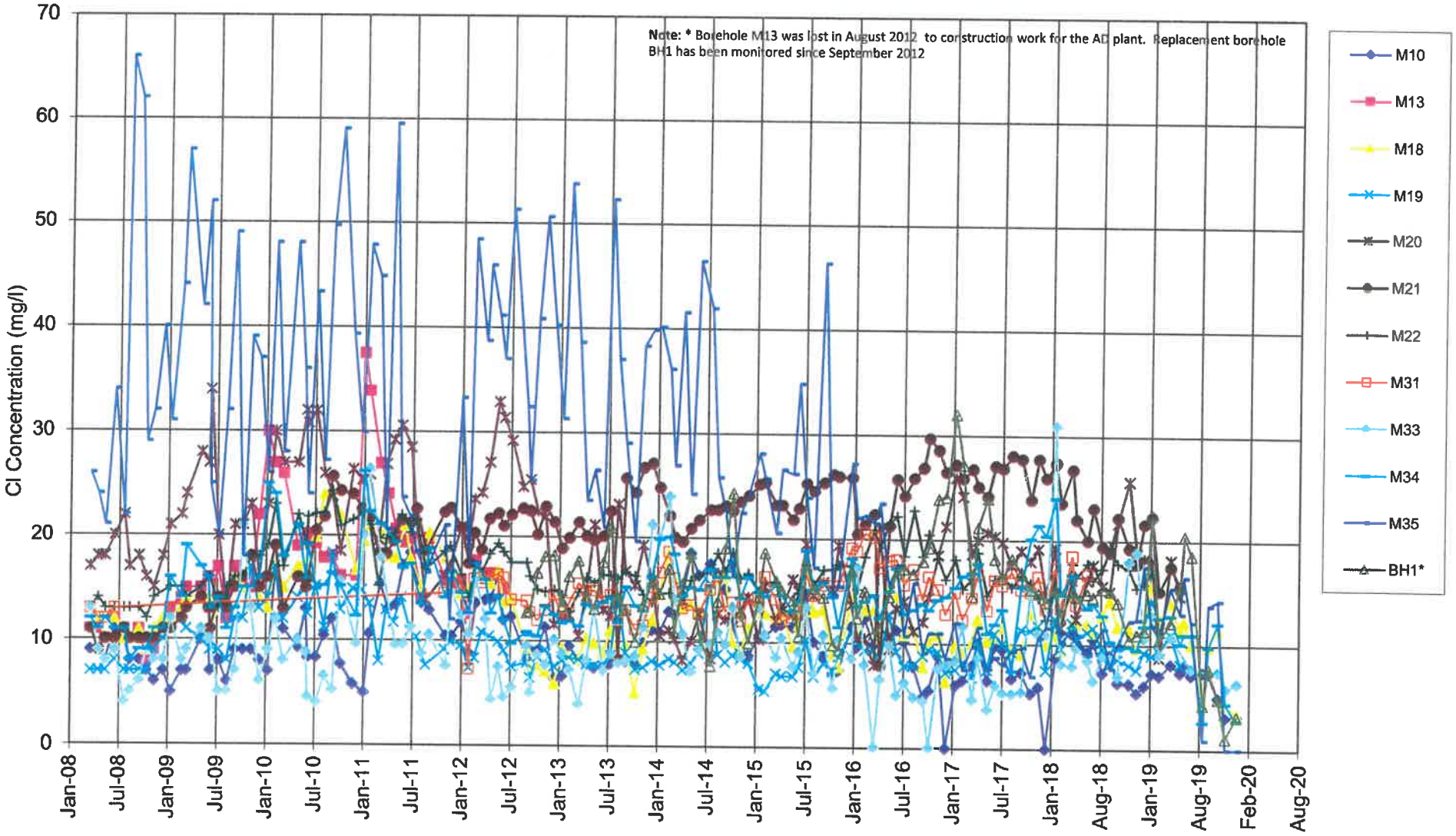
Llwyn Isaf Landfill - Ammoniacal-Nitrogen Groundwater Concentrations (Boreholes under EP for Area 3)

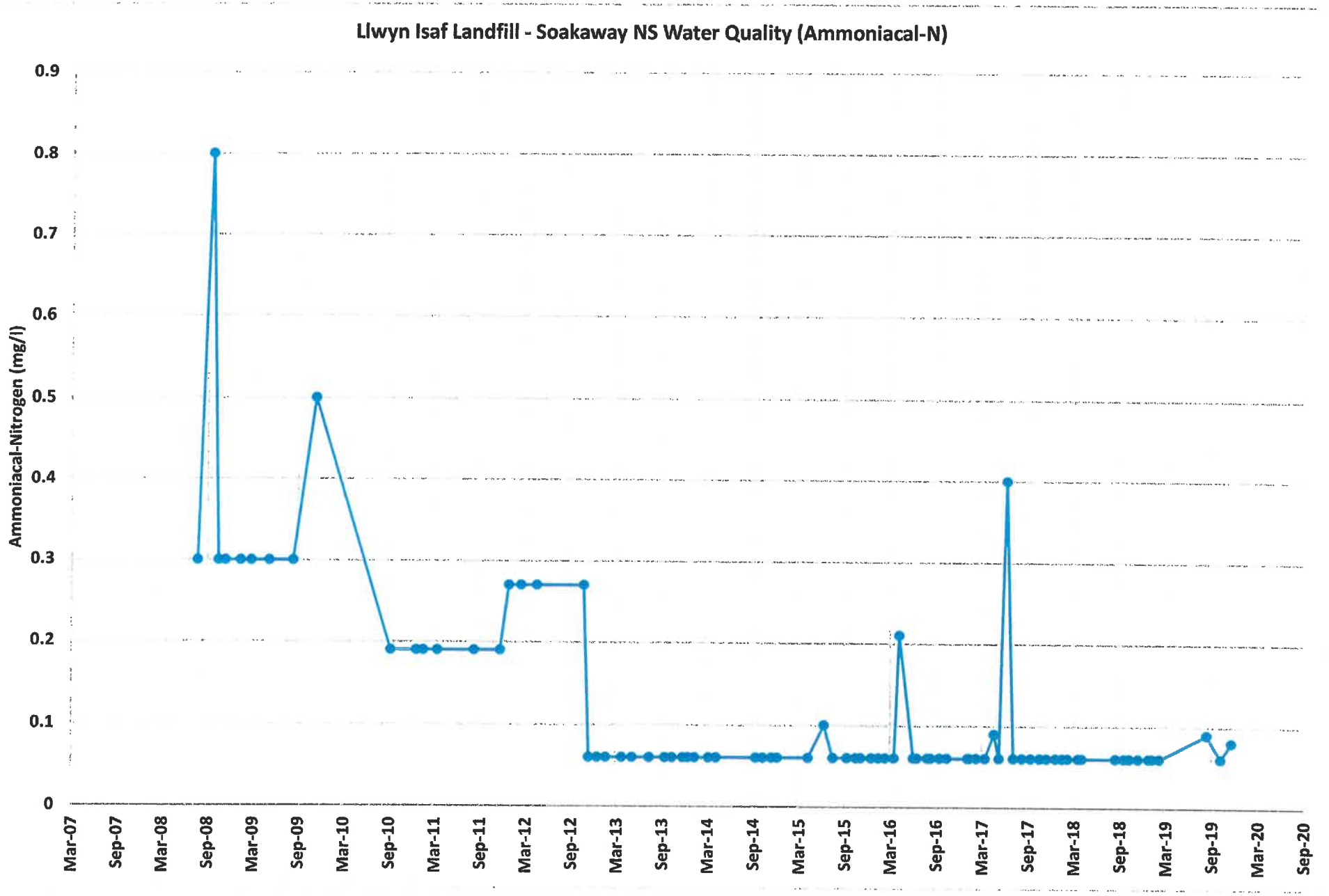


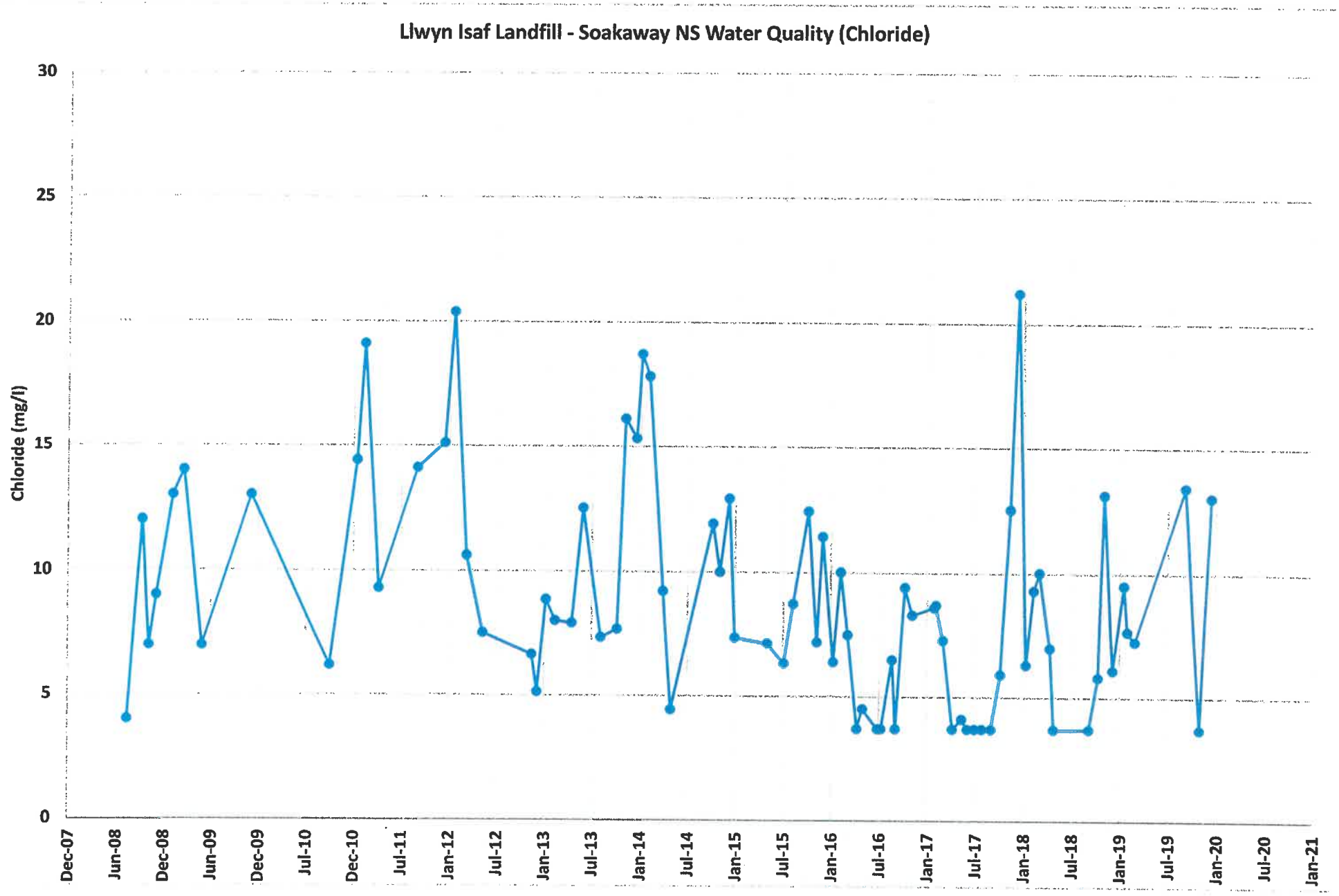
Llwyn Isaf Landfill - Ammoniacal-Nitrogen Groundwater Concentrations (Boreholes under former WML for Area 2)



Llwyn Isaf Landfill - Chloride Groundwater Concentration (Boreholes under former WML for Area 2)



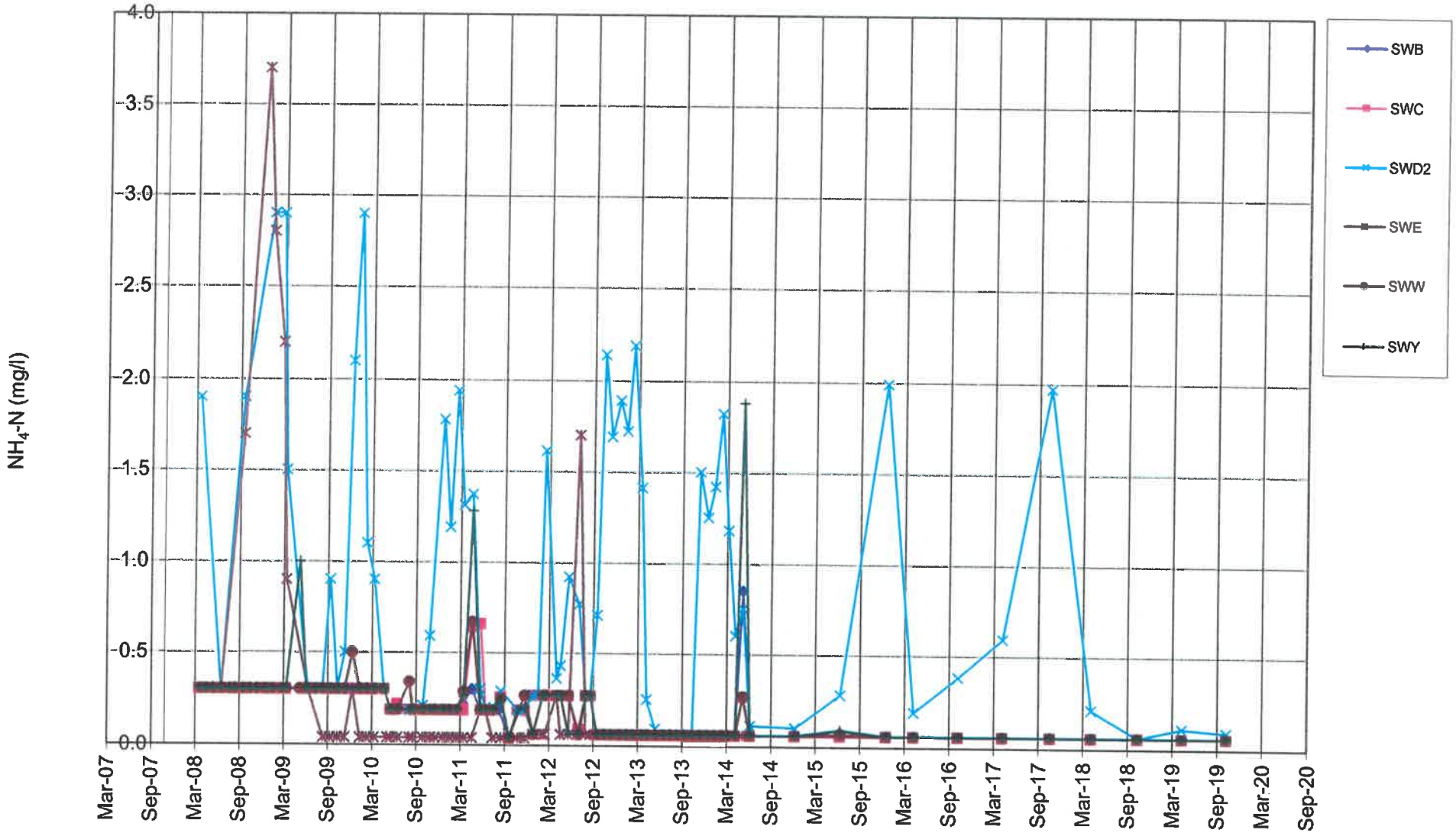

Llwyn Isaf Landfill - Soakaway NS Water Quality (Ammoniacal-N)
Ammoniacal-Nitrogen (mg/l)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10
Sep-10
Mar-11
Sep-11
Mar-12
Sep-12
Mar-13
Sep-13
Mar-14
Sep-14
Mar-15
Sep-15
Mar-16
Sep-16
Mar-17
Sep-17
Mar-18
Sep-18
Mar-19
Sep-19
Mar-20
Sep-20


Llwyn Isaf Landfill - Soakaway NS Water Quality (Chloride)
Chloride (mg/l)
30
25
20
15
10
5
0
Dec-07
Jun-08
Dec-08
Jun-09
Dec-09
Jul-10
Dec-10
Jul-11
Jan-12
Jul-12
Jan-13
Jul-13
Jan-14
Jul-14
Jan-15
Jul-15
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21

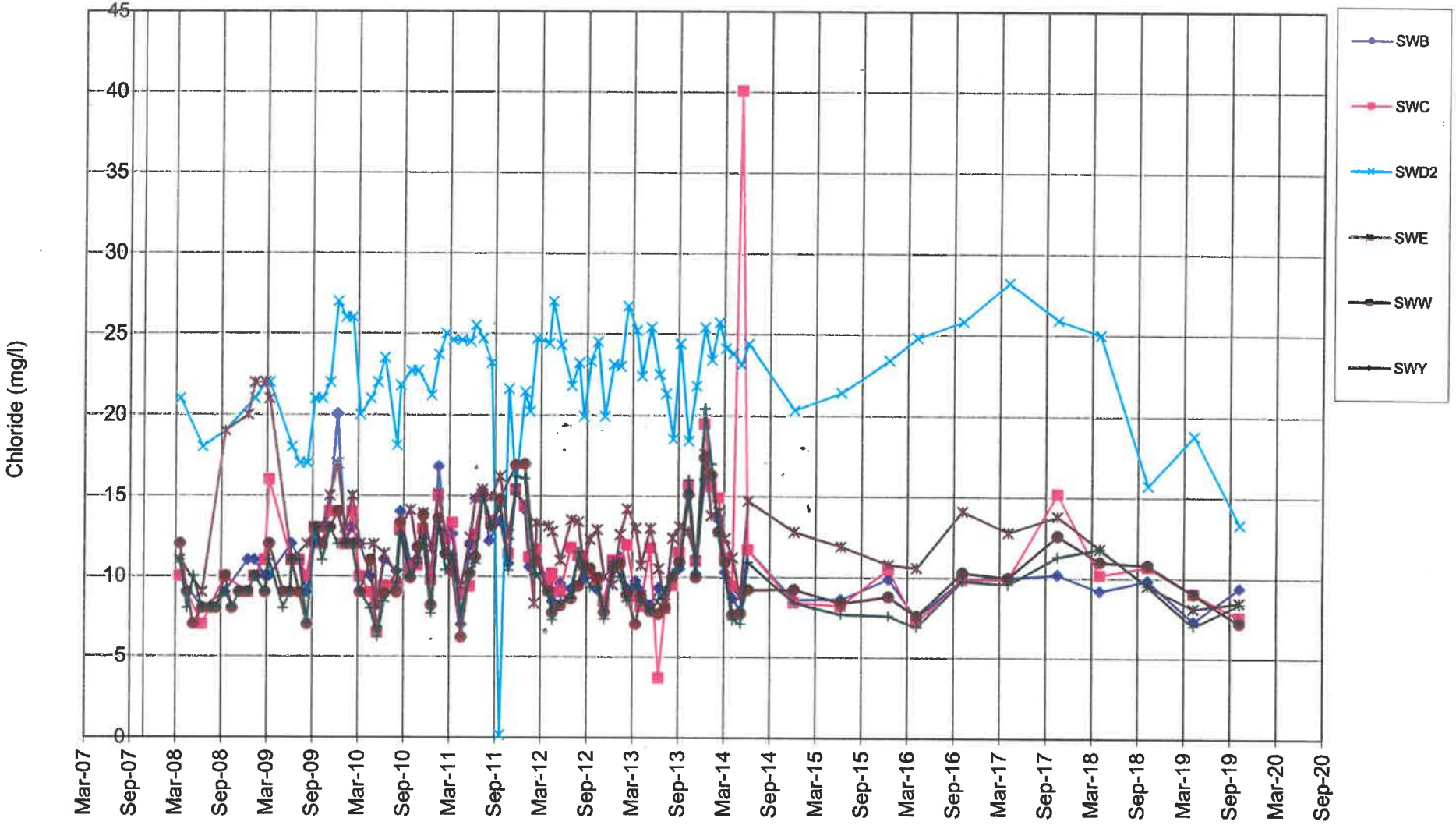
APPENDIX 3 –

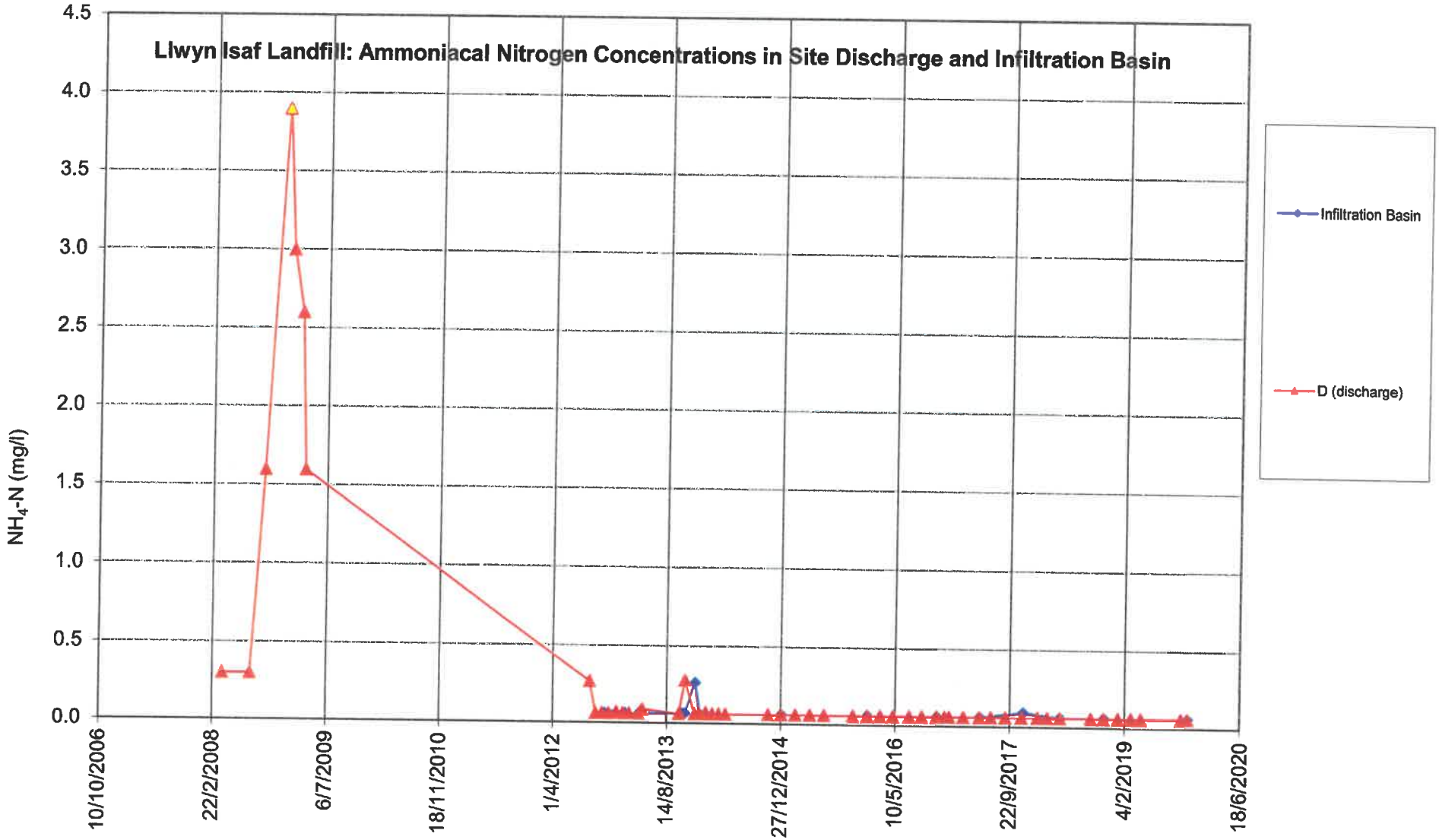
Surfacewater Quality Data Plots

Llwyn Isaf Landfill: Ammoniacal Nitrogen Concentrations in Afon Desach and Lake to the North of Site

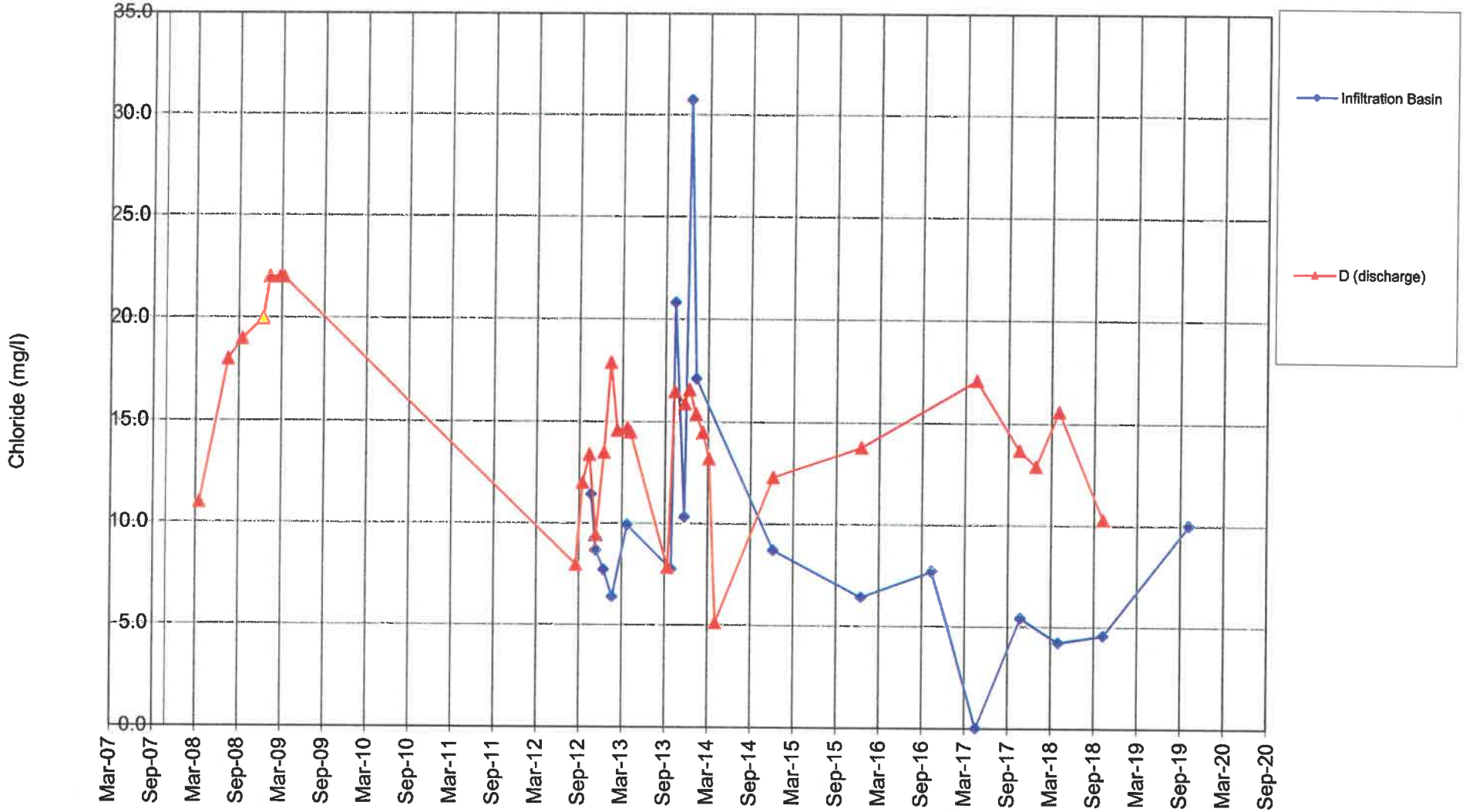


Llwyn Isaf Landfill: Chloride Concentrations in Afon Desach and Lake to the North of Site

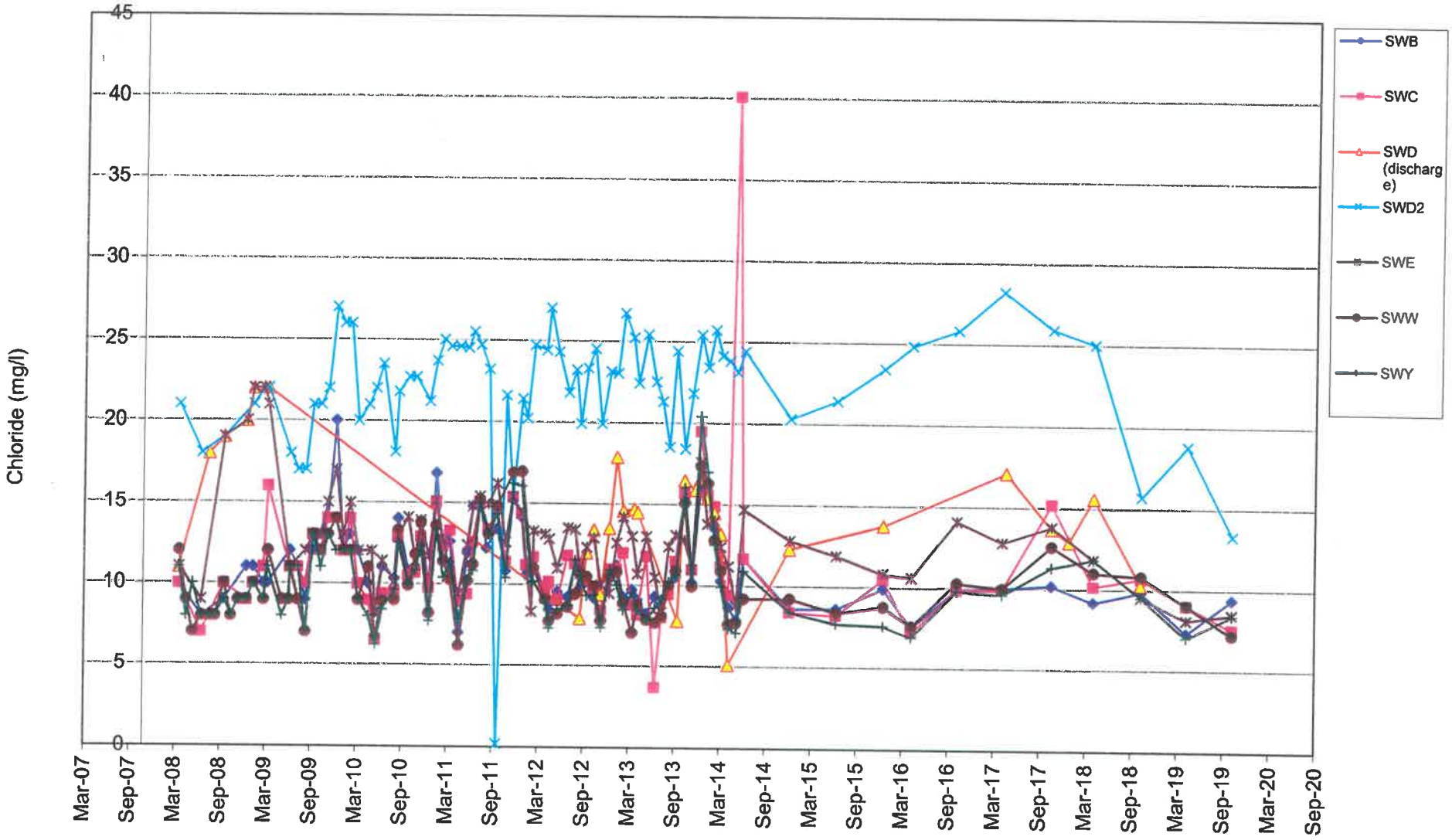



Llwyn Isaf Landfill: Ammoniacal Nitrogen Concentrations in Site Discharge and Infiltration Basin
NH_4-N (mg/l)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10/10/2006
22/2/2008
6/7/2009
18/11/2010
1/4/2012
14/8/2013
27/12/2014
10/5/2016
22/9/2017
4/2/2019
18/6/2020
Infiltration Basin
D (discharge)

Llwyn Isaf Landfill: Chloride Concentrations in Site Discharge and Infiltration Basin



Llwyn Isaf Landfill: Chloride Concentrations in Surface Water



APPENDIX 4 –

Gas Data

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Snow & Sleet
Date:	18/1/2019	**Flare Hrs**	52132
Name:	Steve Hindle	**Temperature ^{O}C**	02 to 04
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	25m^3hr
Last Calibration Date :	15/11/2018	**Flow after balance m^3h**	20m^3hr
Calibration Due Date :	15/5/2019	**Flow Leaving m^3hr**	20m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS-PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI_FLARE	18/1/2019 09:49	69.7	32	0.2	0	0	2	994	-4.39			100
LI_GE018	18/1/2019 09:49	69.7	32.6	0.1	0	0	1	993	0.51			100
LI_GE016	18/1/2019 09:51	62.7	28.7	0.1	8.5	8.12	1	993	-3.67			50
LI_GE019	18/1/2019 09:53	57.5	28.5	0.1	13.9	13.52	7	993	-1.07			5
LI_GE020	18/1/2019 09:55	54.9	24.9	0.3	19.9	18.77	2	993	-0.23			5
LI_GE014	18/1/2019 09:57	66.3	27.1	0	6.6	6.6	2	992	0.66			2
LI_GE014	18/1/2019 09:57	65.1	27	0	7.9	7.9	2	992	0.5			2
LI_GE015	18/1/2019 10:01	54.9	24.9	0.1	20.1	19.72	2	992	-1.38			10
LI_GE013	18/1/2019 10:02	54.9	33.2	0.2	11.7	10.94	3	992	-3.51			10
LI_GE013	18/1/2019 10:08	54.9	33.1	1	11	7.22	3	992	-3.47			10
LI_GE012	18/1/2019 10:10	67	38.7	0.1	0	0	3	992	-3.58			100
LI_GE011	18/1/2019 10:13	69.9	38.1	0	0	0	4	992	-3.6			10
LI_GE010	18/1/2019 10:14	67.1	32	0	0.9	0.9	4	992	-3.57			50
LI_LM1/3	18/1/2019 10:16	66.1	28	0.7	5.2	2.55	4	992	0.99			0
LI_GE007	18/1/2019 10:17	69.5	28.4	0	2.1	2.1	3	992	-3.5			0
LI_GE006	18/1/2019 10:18	66	30.1	0	3.9	3.9	4	992	-3.53			0
LI_GE004	18/1/2019 10:21	54.8	28.7	0.1	16.4	16.02	4	992	-3.57			50
LI_GE005	18/1/2019 10:23	58	32.1	0	9.9	9.9	4	992	-2.92			50
LI_GE003	18/1/2019 10:24	63.9	30.3	0	5.8	5.8	4	992	-3.51			0
LI_GE002	18/1/2019 10:26	68.1	29.8	0	2.1	2.1	4	992	-4.97			50
LI_GE001	18/1/2019 10:29	59	32.8	0	8.2	8.2	4	992	-3.67			50
LI_GE008	18/1/2019 10:32	53.8	29	0.1	17.1	16.72	4	991	-3.68			50
LI_GE009	18/1/2019 10:34	55.2	28.5	0.1	16.2	15.82	5	992	-1.12			10
LI_LM2/1	18/1/2019 10:35	13.9	19	4.2	62.9	47.02	10	992	0.46			0
LI_GE017	18/1/2019 10:38	58.9	28	0	13.1	13.1	4	992	0.27			10
LI_LM2/2	18/1/2019 10:39	40.7	28.5	0.8	30	26.98	5	992	0.47			0
A2LIGW30	18/1/2019 10:43	3.6	3.4	15.1	77.9	20.82	2	992	0.56			0
A2LIGW31	18/1/2019 10:46	53.6	25.5	0.7	20.2	17.55	3	992	0.65			25
A2LIGW18	18/1/2019 10:48	55.8	7.4	0.7	36.1	33.45	4	992	0.69			0
A2LIGW15	18/1/2019 10:49	1.3	1.6	18.1	79	10.58	2	992	1.11			0
A2LIGW14	18/1/2019 10:51	92.5	5.2	0.7	1.6	0	4	992	0.15			100
A2LIGW20	18/1/2019 10:53	14.5	4.2	5.3	76	55.97	2	992	0.58			0
A2LIGW10	18/1/2019 10:54	12.1	3.2	10.9	73.8	32.6	2	992	0.55			0
A2LIGW21	18/1/2019 10:55	35.7	11.8	3.4	49.1	36.25	2	992	0.68			0
A2LIGW19	18/1/2019 10:58	68.6	18.7	0.2	12.5	11.74	2	992	0.73			25
A2LIGW22	18/1/2019 10:59	54.4	23.8	0.2	21.6	20.84	2	991	0.75			25
A2LIGW25	18/1/2019 11:02	59.4	20.8	2.3	17.5	8.81	2	991	0.81			0
A2LIGW25	18/1/2019 11:04	74.8	23.4	0	1.8	1.8	2	991	0.68			40
A2LIGW26	18/1/2019 11:06	20.1	18.9	0.4	60.6	59.09	1	991	-0.02			0
A2LIGW27	18/1/2019 11:09	63.2	26.2	1.4	9.2	3.91	2	991	0.76			0
A2LIGW28	18/1/2019 11:10	76.7	23.5	0.1	0	0	2	991	0.76			25
LI_FLARE	18/1/2019 11:22	56.6	29.3	0	14.1	14.1	3	992	-3.93			100
LIA2SPUR	18/1/2019 11:24	63.8	27.3	0	8.9	8.9	4	992	0.86			0

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Sunshine
Date:	25/2/2019	**Flare Hrs**	52558
Name:	Steve Hindle	**Temperature °C**	16 to 18
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	26m^3hr
Last Calibration Date :	15/11/2018	**Flow after balance m^3h**	24m^3hr
Calibration Due Date :	15/5/2019	**Flow Leaving m^3hr**	24m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI FLARE	25/2/2019 10:27	50.8	28.4	0.4	20.4	18.89	2	1	1018	-4.52		100
LI GE018	25/2/2019 10:33	68.8	31.9	0.1	0	0	3	15	1018	-4.01		100
LI GE016	25/2/2019 10:34	65.4	28.9	0.2	5.5	4.74	3	4	1017	-3.63		25
LI GE019	25/2/2019 10:38	42.5	23.7	3	30.8	19.46	16	0	1017	-1.83		0
LI GE020	25/2/2019 10:40	40	24	0.1	35.9	35.52	4	0	1017	-2.61		5
LI GE014	25/2/2019 10:41	30.4	27	0.3	42.3	41.17	4	2	1017	-3.79		0
LI GE015	25/2/2019 10:43	56.6	25.8	0.1	17.5	17.12	4	2	1017	-2.59		50
LI GE013	25/2/2019 10:45	52.2	34.3	0.1	13.4	13.02	5	4	1017	-4.27		10
LI GE012	25/2/2019 10:46	70.6	39.6	0.7	>>>>	0	6	43	1017	-4.46		100
LI GE011	25/2/2019 10:51	57	31.4	4	7.6	0	6	0	1017	-4.5		10
LI GE010	25/2/2019 10:53	56.8	31.1	0.1	12	11.62	7	20	1017	-4.51		50
LI LM1/3	25/2/2019 10:56	9.7	6.9	13.2	70.2	20.3	15	0	1017	-0.76		0
LI GE007	25/2/2019 10:57	67.9	28.8	0.2	3.1	2.34	6	7	1017	-4.46		10
LI GE006	25/2/2019 10:58	65.1	29.8	0.2	4.9	4.14	7	1	1017	-4.5		10
LI GE004	25/2/2019 11:00	53.8	27.3	0.1	18.8	18.42	7	2	1017	-4.54		0
LI GE005	25/2/2019 11:04	55.5	30.4	0	14.1	14.1	7	5	1017	-4.56		50
LI GE003	25/2/2019 11:07	62.1	27.5	0	10.4	10.4	7	3	1017	-4.57		25
LI GE002	25/2/2019 11:08	65.9	26.4	0.1	7.6	7.22	7	4	1017	-4.49		0
LI GE001	25/2/2019 11:10	52.5	28.8	0	18.7	18.7	7	9	1017	-4.6		50
LI GE008	25/2/2019 11:13	43.9	26.4	0	29.7	29.7	8	9	1017	-4.67		25
LI GE009	25/2/2019 11:15	46.2	25.3	0.1	28.4	28.02	9	11	1017	-2.39		10
LI LM2/1	25/2/2019 11:17	5	5.2	15.5	74.3	15.71	6	0	1017	-0.18		0
LI GE017	25/2/2019 11:21	51.5	24	0.1	24.4	24.02	7	7	1017	-1.43		10
LI LM2/2	25/2/2019 11:22	18.3	12.1	11.3	58.3	15.59	8	0	1017	-1.03		0
A2LIGW30	25/2/2019 11:27	23.6	9.2	10.1	57.1	18.92	5	0	1017	1.19		0
A2LIGW31	25/2/2019 11:30	49	23.8	0.2	27	26.24	6	3	1017	-0.23		25
A2LIGW18	25/2/2019 11:33	42.6	6.2	0.7	50.5	47.85	6	0	1017	-0.08		0
A2LIGW15	25/2/2019 11:34	4	4.7	11	80.3	38.72	4	0	1017	0.23		0
A2LIGW14	25/2/2019 11:36	79.5	4.8	1	14.7	10.92	7	0	1018	-0.12		10
A2LIGW20	25/2/2019 11:37	28	4.2	4.3	63.5	47.25	8	0	1017	0.17		0
A2LIGW10	25/2/2019 11:40	21.4	3	9.6	66	29.71	4	0	1017	0.3		0
A2LIGW21	25/2/2019 11:41	43.2	8.6	2.4	45.8	36.73	4	0	1017	-0.1		0
A2LIGW19	25/2/2019 11:43	62.9	25.1	0.1	11.9	11.52	4	7	1017	-0.21		25
A2LIGW22	25/2/2019 11:45	66.1	22.9	0	11	11	5	4	1017	-0.19		5
A2LIGW25	25/2/2019 11:48	61.4	20.4	2.1	16.1	8.16	4	0	1017	-0.02		10
A2LIGW26	25/2/2019 11:50	68.9	24.7	0.1	6.3	5.92	3	1	1017	-0.19		25
A2LIGW27	25/2/2019 11:53	20.2	8.4	0.3	71.1	69.97	3	0	1017	-0.42		0
A2LIGW28	25/2/2019 11:55	62.1	24.6	0.9	12.4	9	3	0	1017	0		5
A2LIGW29	25/2/2019 11:56	74.1	20.8	0.1	5	4.62	3	3	1017	-0.21		25
LIA2SPUR	25/2/2019 13:13	65.7	23.5	0.1	10.7	10.32	4	2	1018	-0.42		10
LI FLARE	25/2/2019 13:15	63.3	24.2	0.1	12.4	12.02	4	2	1018	-4.01		26

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Sunny spells
Date:	11/3/2019	**Flare Hrs**	52718
Name:	Steve Hindle	**Temperature °C**	12 to 14
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	26m^3hr
Last Calibration Date :	15/11/2018	**Flow after balance m^3h**	25m^3hr
Calibration Due Date :	15/5/2019	**Flow Leaving m^3hr**	25m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI_FLARE	11/3/2019 10:37	57.7	25.1	0.3	16.9	15.77	1	1009	-3.72			100
LI_GE018	11/3/2019 10:40	69.1	28.8	0.2	1.9	1.14	2	1009	-3.67			100
LI_GE016	11/3/2019 10:41	64.5	26.3	0.2	9	8.24	3	1009	-3.59			0
LI_GE019	11/3/2019 10:43	63.1	25.4	0.4	11.1	9.59	9	1009	-1.8			5
LI_GE020	11/3/2019 10:46	62.3	20.4	0.3	17	15.87	5	1009	-1.98			10
LI_GE014	11/3/2019 10:48	42.2	23.3	0.2	34.3	33.54	4	1009	-0.8			0
LI_GE015	11/3/2019 10:49	54.5	23.5	0.1	21.9	21.52	5	1009	-3.15			5
LI_GE013	11/3/2019 10:51	58.3	31.8	0.2	9.7	8.94	6	1009	-3.59			0
LI_GE012	11/3/2019 10:52	66.6	35.7	0.4	0	0	7	1009	-3.59			100
LI_GE011	11/3/2019 10:57	50.7	28	4.3	17	0.75	7	1009	-3.61			0
LI_GE010	11/3/2019 10:58	65.2	28.9	0.1	5.8	5.42	7	1009	-3.57			50
LI_LM1/3	11/3/2019 11:00	0.1	0.1	21	78.8	0	4	1009	-0.55			0
LI_GE007	11/3/2019 11:01	64.4	26.6	0.3	8.7	7.57	5	1009	-3.53			10
LI_GE006	11/3/2019 11:01	63.5	28	0.1	8.4	8.02	6	1009	-3.57			10
LI_GE004	11/3/2019 11:04	56.4	26.5	0	17.1	17.1	6	1009	-3.53			50
LI_GE005	11/3/2019 11:05	63	29.9	0.1	7	6.62	6	1009	-3.48			50
LI_GE003	11/3/2019 11:08	64.3	27.3	0.1	8.3	7.92	6	1008	-3.46			0
LI_GE002	11/3/2019 11:09	65.3	26.2	0.1	8.4	8.02	6	1008	-3.43			0
LI_GE001	11/3/2019 11:11	63	29.7	0	7.3	7.3	6	1008	-3.4			50
LI_GE008	11/3/2019 11:15	57	28.7	0	14.3	14.3	7	1008	-3.38			5
LI_GE009	11/3/2019 11:16	55.5	26.3	0.1	18.1	17.72	7	1008	-2.46			25
LI_LM2/1	11/3/2019 11:19	0.2	0.3	21.3	78.2	0	4	1008	-0.21			0
LI_GE017	11/3/2019 11:21	54	24.1	0.3	21.6	20.47	5	1009	-1.94			10
LI_LM2/2	11/3/2019 11:23	7.4	6.5	16.2	69.9	8.66	6	1008	-1.73			0
A2LIGW30	11/3/2019 11:27	1.9	2.4	17.2	78.5	13.48	3	1009	0.36			0
A2LIGW31	11/3/2019 11:29	50.2	24.6	0.3	24.9	23.77	3	1008	-0.91			25
A2LIGW18	11/3/2019 11:31	19.5	5.5	0.3	74.7	73.57	3	1008	-0.02			0
A2LIGW15	11/3/2019 11:33	16.1	5	8.7	70.2	37.31	3	1008	-0.1			0
A2LIGW14	11/3/2019 11:35	68.9	4.6	3	23.5	12.16	6	1008	0.04			10
A2LIGW20	11/3/2019 11:37	25.2	3.5	8.1	63.2	32.58	3	1008	0.23			0
A2LIGW10	11/3/2019 11:38	19	2.9	11.8	66.3	21.7	3	1008	-0.06			0
A2LIGW21	11/3/2019 11:40	30.8	4.9	9.4	54.9	19.37	3	1008	-0.05			0
A2LIGW19	11/3/2019 11:42	62.7	28.1	0.1	9.1	8.72	2	1008	-0.76			5
A2LIGW22	11/3/2019 11:44	60.5	23.8	0.1	15.6	15.22	3	1008	-0.44			25
A2LIGW25	11/3/2019 11:46	29.2	9.9	11.2	49.7	7.36	2	1008	0.05			0
A2LIGW26	11/3/2019 11:48	60.5	25.4	0.2	13.9	13.14	2	1008	-0.7			25
A2LIGW27	11/3/2019 11:50	19.7	6.7	0.4	73.2	71.69	1	1008	0.24			0
A2LIGW28	11/3/2019 11:53	40.5	25	0	34.5	34.5	2	1008	0.13			10
A2LIGW29	11/3/2019 11:54	69.7	22.9	0.1	7.3	6.92	2	1008	-1.39			25
LIA2SPUR	11/3/2019 11:58	57.7	24	0.1	18.2	17.82	2	1008	-4.07			15
LI_FLARE	11/3/2019 12:00	58.9	26.2	0.4	14.5	12.99	3	1009	-4.28			100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Patchy Clould
Date:	12/4/2019	**Flare Hrs**	53101
Name:	Steve Hindle	**Temperature °C**	10 to 12
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	24m^3hr
Last Calibration Date :	15/11/2018	**Flow after balance m^3h**	25m^3hr
Calibration Due Date :	15/5/2019	**Flow Leaving m^3hr**	25m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI FLARE	12/4/2019 09:05	58.5	26.9	0.4	14.2	12.69	1	1010	-4.46			100
LI GE018	12/4/2019 09:44	67.7	30.2	0.2	1.9	1.14	3	1010	-4.93			100
LI GE016	12/4/2019 09:49	60	26.6	0	13.4	13.4	4	1009	-4.14			50
LI GE019	12/4/2019 09:54	40.9	21.9	3.3	33.9	21.43	15	1009	-1.79		Turned off High O2	0
LI GE020	12/4/2019 09:57	60.9	22.8	0.1	16.2	15.82	5	1009	-0.29			10
LI GE014	12/4/2019 10:01	45.9	23.7	0.1	30.3	29.92	5	1009	-2.15			5
LI GE015	12/4/2019 10:03	51.8	22.7	0	25.5	25.5	5	1009	-2.74			10
LI GE013	12/4/2019 10:06	47.7	31	0	21.3	21.3	6	1009	-4.34			10
LI GE012	12/4/2019 10:08	66.8	36.1	0.2	0	0	7	1009	-4.5			100
LI GE011	12/4/2019 10:14	57	30	2.9	10.1	0	8	1009	-4.52		Turned off High O2	0
LI GE010	12/4/2019 10:15	63.3	28.9	0.1	7.7	7.32	8	1009	-4.52			50
LI LM1/3	12/4/2019 10:19	2.6	3	17	77.4	13.14	16	1009	-0.74			0
LI GE007	12/4/2019 10:20	62.6	26.2	0.1	11.1	10.72	7	1009	-4.42			10
LI GE006	12/4/2019 10:21	64.4	27.4	0.1	8.1	7.72	8	1009	-4.43			10
LI GE004	12/4/2019 10:24	55.6	26.3	0.1	18	17.62	8	1009	-4.44			50
LI GE005	12/4/2019 10:25	57.6	30.3	0	12.1	12.1	9	1009	-4.43			50
LI GE003	12/4/2019 10:28	63.1	27.4	0	9.5	9.5	8	1009	-5.93			25
LI GE002	12/4/2019 10:29	66.9	26.2	0.1	6.8	6.42	8	1009	-4.43			50
LI GE001	12/4/2019 10:31	55.6	29	0	15.4	15.4	8	1009	-4.54			50
LI GE008	12/4/2019 10:34	46.3	27.2	0	26.5	26.5	9	1009	-4.49			25
LI GE009	12/4/2019 10:36	49	25.6	0	25.4	25.4	10	1009	-2.6			25
LI LM2/1	12/4/2019 10:38	0.5	2.1	18.3	79.1	9.93	7	1009	-0.34			0
LI GE017	12/4/2019 10:40	50.2	22.9	0.1	26.8	26.42	8	1009	-1.36			10
LI LM2/2	12/4/2019 10:42	23.2	18.8	6	52	29.32	9	1009	-1			0
A2LIGW30	12/4/2019 10:47	25.1	11.6	9.7	53.6	16.93	6	1009	-0.62			0
A2LIGW31	12/4/2019 10:49	47	23.8	0.1	29.1	28.72	7	1009	-0.19			25
A2LIGW18	12/4/2019 10:52	34.2	7.2	0.9	57.7	54.3	9	1009	-0.08			0
A2LIGW15	12/4/2019 10:54	22.1	4.7	7.7	65.5	36.39	7	1009	-1.05			0
A2LIGW14	12/4/2019 10:56	50.3	3.8	6.1	39.8	16.74	10	1009	-2.62			10
A2LIGW20	12/4/2019 10:58	11.7	3.6	7.2	77.5	50.28	4	1009	-0.4			0
A2LIGW10	12/4/2019 11:01	25.3	3.4	9.6	61.7	25.41	7	1009	0			0
A2LIGW21	12/4/2019 11:03	28.3	6.1	6.4	59.2	35.01	5	1009	-0.15			0
A2LIGW19	12/4/2019 11:05	60	26.6	0.1	13.3	12.92	3	1009	-0.25			25
A2LIGW22	12/4/2019 11:07	62.3	23.4	0	14.3	14.3	4	1008	-0.13			25
A2LIGW25	12/4/2019 11:10	57.2	19.9	0.9	22	18.6	3	1008	-0.02			10
A2LIGW26	12/4/2019 11:12	61.4	25.3	0	13.3	13.3	2	1008	-0.19			25
A2LIGW27	12/4/2019 11:14	10.8	9.2	0.4	79.6	78.09	2	1008	0.01			0
A2LIGW28	12/4/2019 11:16	55.2	24.7	0.2	19.9	19.14	2	1008	0			25
A2LIGW29	12/4/2019 11:17	73.2	22	0	4.8	4.8	2	1009	-0.22			25
LIA2SPUR	12/4/2019 11:21	61.4	24	0	14.6	14.6	2	1009	-0.44			15
LI FLARE	12/4/2019 11:30	58.3	24.5	0.3	16.9	15.77	5	1010	-4.1			100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	showers
Date:	17/5/2019	**Flare Hrs**	53522
Name:	Steve Hindle	**Temperature °C**	12 to 14
Equipment Used :	GA5000	**Compressor Hrs**	
Serial No :	G500196	**Flow Arrival m^3hr**	28m^3hr
Last Calibration Date :	2/4/2019	**Flow after balance m^3h**	28m^3hr
Calibration Due Date :	2/10/2019	**Flow Leaving m^3hr**	28m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI_LM1/3	17/5/2019 11:18	57.8	23.7	0.3	18.2	17.07	9	995	-2.91			0
LI_GE009	17/5/2019 11:35	47.4	25.3	0	27.3	27.3	6	995	-0.76			0
LI_LM2/1	17/5/2019 11:37	42.9	20.7	1.9	34.5	27.32	19	995	-0.6			0
LI_LM2/2	17/5/2019 11:41	58.8	29.7	0.7	10.8	8.15	11	995	-0.48			0
A2LIGW30	17/5/2019 11:45	14.8	7.9	14.1	63.2	9.9	3	995	-0.15			0
A2LIGW18	17/5/2019 11:49	6.9	7.9	0.2	85	84.24	2	995	-0.43			0
A2LIGW15	17/5/2019 11:50	16	4.1	9.9	70	32.58	4	987	-0.65			0
A2LIGW14	17/5/2019 11:53	23.4	1.7	14.4	60.5	6.07	6	995	-3.7			0
A2LIGW20	17/5/2019 11:55	15.3	6.4	0.8	77.5	74.48	2	995	-0.48			0
A2LIGW10	17/5/2019 11:57	7.8	3.6	11.9	76.7	31.72	1	995	-0.43			0
A2LIGW21	17/5/2019 11:59	29.3	8.8	3.6	58.3	44.69	2	995	-0.38			0
A2LIGW27	17/5/2019 12:09	0.6	12.2	1.1	86.1	81.94	1	995	-0.79			0
LI_GE019	17/5/2019 11:00	67.5	25.2	0.1	7.2	6.82	7	994	-0.4			2
LI_GE011	17/5/2019 11:15	66.2	32.4	1	0.4	0	6	995	2.46			5
LI_GE020	17/5/2019 11:03	64	20.1	0.2	15.7	14.94	5	994	-0.34			10
LI_GE014	17/5/2019 11:05	63.9	22.2	0	13.9	13.9	4	994	-0.38			10
LI_GE015	17/5/2019 11:07	57.2	21.8	0	21	21	5	995	-1.34			10
LI_GE013	17/5/2019 11:09	52.2	30.3	0	17.5	17.5	5	995	-2.75			10
LI_GE007	17/5/2019 11:19	67	26.6	0	6.4	6.4	8	995	-2.85			10
LI_GE006	17/5/2019 11:20	66	27.5	0.2	6.3	5.54	8	995	-2.99			10
A2LIGW25	17/5/2019 12:05	56.7	25.1	0	18.2	18.2	2	994	-0.22			10
LIA2SPUR	17/5/2019 12:17	56.7	25	0	18.3	18.3	1	994	-2.46			15
LI_GE008	17/5/2019 11:33	54.9	27.3	0	17.8	17.8	6	995	-3.03			25
LI_GE017	17/5/2019 11:39	62.7	25.3	0	12	12	6	995	-0.43			25
A2LIGW31	17/5/2019 11:47	46.3	24	0.1	29.6	29.22	3	995	-0.45			25
A2LIGW19	17/5/2019 12:01	57.1	28	0	14.9	14.9	2	995	-0.4			25
A2LIGW22	17/5/2019 12:02	58.7	24.7	0	16.6	16.6	2	995	-0.43			25
A2LIGW26	17/5/2019 12:07	60.9	25.8	0.1	13.2	12.82	2	994	-0.41			25
A2LIGW28	17/5/2019 12:11	46.7	24.7	0	28.6	28.6	2	995	-0.38			25
A2LIGW29	17/5/2019 12:12	70	22.8	0	7.2	7.2	1	995	-0.57			25
LI_GE016	17/5/2019 10:58	64.5	25.5	0.1	9.9	9.52	4	995	-3.34			50
LI_GE010	17/5/2019 11:17	65.1	26.3	0.6	8	5.73	6	995	-0.34			50
LI_GE004	17/5/2019 11:23	60	26.2	0	13.8	13.8	7	995	-2.92			50
LI_GE005	17/5/2019 11:25	61.5	29.4	0.1	9	8.62	6	994	-2.87			50
LI_GE003	17/5/2019 11:28	66.3	26.5	0	7.2	7.2	5	995	-2.87			50
LI_GE002	17/5/2019 11:29	69.9	25.7	0	4.4	4.4	5	995	-2.85			50
LI_GE001	17/5/2019 11:31	61	28.7	0	10.3	10.3	5	995	-2.91			50
LI_FLARE	17/5/2019 10:54	58.2	25.4	0.7	15.7	13.05	2	994	-3.68			100
LI_GE018	17/5/2019 10:55	68.3	28.6	0.2	2.9	2.14	4	995	-3.63			100
LI_GE012	17/5/2019 11:10	67.2	35	0.1	0	0	6	995	-3.01			100
LI_FLARE	17/5/2019 12:19	58.8	25.7	0	15.5	15.5	3	996	-2.44			100

Model	GA2000	Serial No	GA11066
Date down	21/6/2019 11:39	Software V	1.6.0.13
Computer	STEVEHINDLE-HP	steve hindle	
Date of las	1/1/2000		
Date of las	21/5/2019		
Next servic	21/11/2019		
Date of las	21/5/2019		

De-selecte	PEAKCH4	FLOW POI	TEMPERA	CO POD	H2S POD	H2S POD
SO2 POD	SO2 POD	NO2 POD	CL2 POD	H2 POD	HCN POD	
FLOW POI	H2S POD	H2S POD				

Security cc [79AC3811]

ID	DATE	CH4 %	CO2 %	O2 %	BALANCE %	Res Nitrog %	CO ppm	BARO mb	REL.PRESSURE mb	ANSWER 1
LI_FLARE	21/6/2019 10:00	59.2	27.3	0.4	13.1	11.59	2	1002	-3.26	100
LI_GE018	21/6/2019 10:02	69.4	30.6	0.3	0	0	3	1002	-3.16	100
LI_GE016	21/6/2019 10:05	64.2	26	0.2	9.6	8.84	4	1002	-3.05	25
LI_GE019	21/6/2019 10:09	41.3	21.9	5.9	30.9	8.6	22	1002	-1.24	0
LI_GE020	21/6/2019 10:11	56.3	21.3	0.1	22.3	21.92	6	1002	-1.97	10
LI_GE014	21/6/2019 10:13	46.7	27.2	0.2	25.9	25.14	6	1001	-3.07	10
LI_GE015	21/6/2019 10:15	60.1	23.1	0	16.8	16.8	6	1002	-2.5	10
LI_GE013	21/6/2019 10:16	61.8	34.1	0.1	4	3.62	7	1002	-3.23	10
LI_GE012	21/6/2019 10:18	65.5	36	0.3	0	0	8	1002	-3.29	100
LI_GE011	21/6/2019 10:24	47.4	28.4	4.6	19.6	2.21	8	1002	-3.27	10
LI_GE010	21/6/2019 10:25	70.4	30.3	0.1	0	0	9	1002	-3.27	20
LI_LM1/3	21/6/2019 10:27	48.9	20.9	2.7	27.5	17.29	10	1002	-1.06	0
LI_GE007	21/6/2019 10:28	68	27.8	0	4.2	4.2	10	1002	-3.22	10
LI_GE006	21/6/2019 10:29	68.2	28.9	0.1	2.8	2.42	11	1002	-3.25	0
LI_GE004	21/6/2019 10:34	62	26.3	0.8	10.9	7.88	9	1002	-3.26	50
LI_GE005	21/6/2019 10:35	64.1	30.6	0.2	5.1	4.34	9	1002	-3.29	50
LI_GE003	21/6/2019 10:39	70.3	27.7	0	2	2	9	1002	-3.3	0
LI_GE002	21/6/2019 10:40	70.9	26	0	3.1	3.1	8	1002	-3.32	0
LI_GE001	21/6/2019 10:42	65.6	29.6	0.1	4.7	4.32	9	1002	-3.31	50
LI_GE008	21/6/2019 10:45	60.6	28	0	11.4	11.4	10	1001	-3.33	25
LI_GE009	21/6/2019 10:47	68.2	25	0.7	6.1	3.45	10	1002	-1.13	5
LI_LM2/1	21/6/2019 10:50	4.1	3.7	17.1	75.1	10.46	6	1002	-0.52	0
LI_GE017	21/6/2019 10:51	51.4	25.8	0.2	22.6	21.84	9	1002	-2.36	0
LI_LM2/2	21/6/2019 10:53	41.2	24.2	5.6	29	7.83	9	1002	-1.47	
A2LIGW3(	21/6/2019 11:00	12.1	4.6	16.3	67	5.39	5	1002	0.6	0
A2LIGW31	21/6/2019 11:02	46.2	23.5	0.2	30.1	29.34	5	1002	-0.69	25
A2LIGW1E	21/6/2019 11:04	13.4	9.7	1.1	75.8	71.64	4	1002	-0.32	0
A2LIGW1E	21/6/2019 11:06	5.1	3.8	10.3	80.8	41.87	3	1002	1.19	0
A2LIGW14	21/6/2019 11:08	51	2.6	7.4	39	11.03	9	1002	-0.09	0
A2LIGW2(	21/6/2019 11:10	10	1	17.1	71.9	7.26	13	1002	-0.16	0
A2LIGW1(	21/6/2019 11:11	12.3	1.6	15.2	70.9	13.44	11	1002	-0.15	0
A2LIGW21	21/6/2019 11:13	29.6	11.6	1.8	57	50.2	5	1002	-0.37	0
A2LIGW1S	21/6/2019 11:16	56.7	26	0	17.3	17.3	4	1002	-0.6	5
A2LIGW22	21/6/2019 11:17	59	23.6	0	17.4	17.4	4	1002	-0.5	5
A2LIGW25	21/6/2019 11:20	61.8	23.4	0.6	14.2	11.93	4	1001	-0.59	25
A2LIGW2E	21/6/2019 11:22	60.6	25.8	0	13.6	13.6	3	1001	-0.46	25
A2LIGW27	21/6/2019 11:24	21.2	11	0.8	67	63.98	3	1001	-0.28	0
A2LIGW2E	21/6/2019 11:26	49.7	25.4	0	24.9	24.9	3	1002	-0.31	40
A2LIGW2S	21/6/2019 11:28	62.3	22.9	0	14.8	14.8	3	1002	-0.7	25
LIA2SPUR	21/6/2019 11:32	56.8	24.2	0	19	19	3	1002	-1.14	20
LI_FLARE	21/6/2019 11:35	59.9	26.1	0.1	13.9	13.52	5	1003	-3.78	100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Sunny
Date:	12/7/2019	**Flare Hrs**	54077
Name:	Steve Hindle	**Temperature °C**	20 to 22
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	26m^3hr
Last Calibration Date :	21/5/2019	**Flow after balance m^3h**	27m^3hr
Calibration Due Date :	21/11/2019	**Flow Leaving m^3hr**	27m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI FLARE	12/7/2019 10:33	60	27.3	0.3	12.4	11.27	2	1000	-3.21			100
LI GE018	12/7/2019 10:35	70	30.7	0.3	0	0	4	1000	-3.1			100
LI GE016	12/7/2019 10:37	66.1	26.1	0.1	7.7	7.32	4	1000	-3			50
LI GE019	12/7/2019 10:38	69.1	28.2	0.2	2.5	1.74	8	1000	-0.91			5
LI GE020	12/7/2019 10:41	59.8	21.3	0	18.9	18.9	7	1000	-1.7			10
LI GE014	12/7/2019 10:43	47.7	27.7	0.2	24.4	23.64	6	1000	-2.91			10
LI GE015	12/7/2019 10:44	62.4	23	0	14.6	14.6	6	1000	-2.33			25
LI GE013	12/7/2019 10:49	61.4	34.3	0	4.3	4.3	7	1000	-3.02			10
LI GE012	12/7/2019 10:50	65.4	36	0.2	0	0	8	1000	-3.07			100
LI GE011	12/7/2019 10:58	51.8	31.2	3.4	13.6	0.75	8	1000	1.3		High O2	0
LI GE010	12/7/2019 11:00	71.7	31.7	0.2	0	0	9	1000	-3.06			50
LI LM1/3	12/7/2019 11:03	46.6	21.5	2.8	29.1	18.52	7	1000	-1.22			0
LI GE007	12/7/2019 11:04	65.7	28.6	0	5.7	5.7	8	1000	-3.11			10
LI GE006	12/7/2019 11:06	66.6	29.3	0.1	4	3.62	9	1000	-3.13			10
LI GE004	12/7/2019 11:08	66.7	28.2	0	5.1	5.1	9	1000	-3.13			50
LI GE005	12/7/2019 11:10	64.5	31.1	0	4.4	4.4	8	1000	-3.05			50
LI GE003	12/7/2019 11:13	69.6	27.9	0	2.5	2.5	8	1000	-3.06			50
LI GE002	12/7/2019 11:14	72.7	26.5	0	0.8	0.8	7	1000	-3.1			50
LI GE001	12/7/2019 11:17	66.4	30.7	0	2.9	2.9	8	1000	-3.09			50
LI GE008	12/7/2019 11:21	60.9	28.4	0.1	10.6	10.22	8	1000	-3.07			25
LI GE009	12/7/2019 11:23	63.8	26.4	0	9.8	9.8	9	1000	-1.94			10
LI LM2/1	12/7/2019 11:25	12.7	8.4	13.7	65.2	13.41	7	1000	-0.4			0
LI GE017	12/7/2019 11:27	52.2	27.6	0.1	20.1	19.72	8	1000	-2.11			25
LI LM2/2	12/7/2019 11:30	26.3	18.5	8.6	46.6	14.09	6	1000	-1.22			0
A2LIGW30	12/7/2019 11:35	34.2	12.3	7.2	46.3	19.08	5	1000	-0.13			0
A2LIGW31	12/7/2019 11:38	44.6	24.1	0.1	31.2	30.82	4	1000	-0.44			25
A2LIGW18	12/7/2019 11:40	9	11	5.5	74.5	53.71	3	1000	-0.08			0
A2LIGW15	12/7/2019 11:41	3.9	6.8	6.2	83.1	59.66	3	1000	0.08			0
A2LIGW14	12/7/2019 11:43	12.1	0.9	16.6	70.4	7.65	12	1000	0.08			0
A2LIGW20	12/7/2019 11:44	17.4	8.3	2.2	72.1	63.78	4	1000	-0.05			0
A2LIGW10	12/7/2019 11:46	16.9	5.4	8.2	69.5	38.5	4	1000	0.03			0
A2LIGW21	12/7/2019 11:47	28.7	12.6	2	56.7	49.14	4	1000	-0.07			0
A2LIGW19	12/7/2019 11:51	54.1	29.2	0.3	16.4	15.27	3	1000	-0.24			25
A2LIGW22	12/7/2019 11:52	60.8	25.5	0	13.7	13.7	4	1000	-0.34			25
A2LIGW25	12/7/2019 11:55	19	19.3	8.5	53.2	21.07	5	1000	-0.37			0
A2LIGW26	12/7/2019 11:58	62.1	27	0.1	10.8	10.42	3	999	-0.15			25
A2LIGW27	12/7/2019 12:00	25.6	21.5	1.2	51.7	47.16	4	1000	-0.31			0
A2LIGW28	12/7/2019 12:03	53.9	26.8	0.1	19.2	18.82	3	1000	-0.19			25
A2LIGW29	12/7/2019 12:04	58.3	23.8	0.1	17.8	17.42	3	1000	-0.4			25
LIA2SPUR	12/7/2019 12:09	58.2	25.9	0	15.9	15.9	3	1000	-0.84			15
LI FLARE	12/7/2019 12:13	60.4	27.7	0	11.9	11.9	4	1001	-3.45			100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	showers
Date:	9/8/2019	**Flare Hrs**	54077
Name:	Steve Hindle	**Temperature °C**	18 to 20
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	28m^3hr
Last Calibration Date :	21/5/2019	**Flow after balance m^3hr**	28m^3hr
Calibration Due Date :	21/11/2019	**Flow Leaving m^3hr**	28m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI FLARE	9/8/2019 09:48	61.5	28.3	1.2	9	4.46	3	978	-2.32			100
LI GE018	9/8/2019 09:50	70	31.7	0.2	0	0	6	978	-2.2			100
LI GE016	9/8/2019 09:52	67	27.3	0.1	5.6	5.22	6	977	-1.8			50
LI GE019	9/8/2019 09:53	72.9	28.6	0	0	0	9	977	-0.87			25
LI GE020	9/8/2019 09:55	65.9	20.9	0.1	13.1	12.72	8	977	0.46			25
LI GE014	9/8/2019 09:57	54.2	28.9	0.1	16.8	16.42	7	977	-1.75			10
LI GE015	9/8/2019 09:59	64.5	23.4	0.2	11.9	11.14	8	977	-0.31			25
LI GE013	9/8/2019 10:01	64	35.5	0.1	0.4	0.02	9	977	-1.9			10
LI GE012	9/8/2019 10:02	63.3	36.4	0.4	0	0	9	977	-2.01			100
LI GE011	9/8/2019 10:05	63.5	36.1	0.4	0	0	10	977	-0.37			5
LI GE010	9/8/2019 10:06	68.7	33.3	0.1	0	0	10	977	-2.6			50
LI LM1/3	9/8/2019 10:09	47.8	23.2	1.2	27.8	23.26	8	977	1.51			0
LI GE007	9/8/2019 10:10	69	30.3	0.1	0.6	0.22	9	977	-2.01			10
LI GE006	9/8/2019 10:11	68.6	30.4	0.2	0.8	0.04	10	978	-2.06			10
LI GE004	9/8/2019 10:13	66	28.8	0.4	4.8	3.29	10	977	-1.21			50
LI GE005	9/8/2019 10:15	67.4	32.4	0	0.2	0.2	10	977	-2.12			50
LI GE003	9/8/2019 10:18	70.5	28.6	0	0.9	0.9	8	977	-2.13			50
LI GE002	9/8/2019 10:21	72.1	27.1	0.1	0.7	0.32	8	977	-2.23			50
LI GE001	9/8/2019 10:24	66	32.2	0.1	1.7	1.32	9	977	-2.4			50
LI GE008	9/8/2019 10:29	62.6	27.6	0	9.8	9.8	9	977	-1.99			25
LI GE009	9/8/2019 10:31	67.3	26.5	0	6.2	6.2	10	977	0.64			25
LI LM2/1	9/8/2019 10:33	55	24.6	1.6	18.8	12.75	37	977	0.12			0
LI GE017	9/8/2019 10:36	58	30.3	0.2	11.5	10.74	14	977	-0.67			25
LI LM2/2	9/8/2019 10:37	45.4	28.9	0.7	25	22.35	14	977	0.11			0
A2LIGW30	9/8/2019 11:41	46.8	12.3	7.1	33.8	6.96	2	976	0.17			0
A2LIGW31	9/8/2019 11:44	47.1	24.9	0.1	27.9	27.52	3	977	-0.21			25
A2LIGW18	9/8/2019 11:46	17.4	12.7	0.3	69.6	68.47	2	977	-0.04			0
A2LIGW15	9/8/2019 11:51	0.3	2.1	18.2	79.4	10.6	3	977	4.17			0
A2LIGW14	9/8/2019 11:54	65.7	2.9	4.2	27.2	11.32	3	977	0.15			5
A2LIGW20	9/8/2019 11:55	16.2	8.4	1.4	74	68.71	2	977	-0.48			0
A2LIGW10	9/8/2019 11:56	0.2	0.1	20	79.7	4.1	0	977	-0.21			0
A2LIGW21	9/8/2019 11:58	29.3	14.1	1.6	55	48.95	2	977	-0.13			0
A2LIGW19	9/8/2019 12:01	58.1	24.7	0	17.2	17.2	5	976	-0.34			5
A2LIGW22	9/8/2019 12:03	59.6	26.4	0	14	14	3	976	-0.04			25
A2LIGW25	9/8/2019 12:08	48.3	25.4	1.1	25.2	21.04	3	976	-0.08			0
A2LIGW26	9/8/2019 12:10	62.6	27.7	0	9.7	9.7	2	976	0			25
A2LIGW27	9/8/2019 12:12	10	14.3	4.4	71.3	54.67	1	976	-0.15			0
A2LIGW29	9/8/2019 12:14	57	27.7	0	15.3	15.3	2	976	-0.4			25
A2LIGW28	9/8/2019 12:16	69.9	24.3	0	5.8	5.8	2	976	-0.1			25
LIA2SPUR	9/8/2019 12:24	58.9	26.4	0	14.7	14.7	2	976	-2.84			15
LI FLARE	9/8/2019 12:26	63.6	28.4	0	8	8	6	977	-1.74			100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Sunny spells
Date:	13/9/2019	**Flare Hrs**	54682
Name:	Steve Hindle	**Temperature °C**	13 to 15
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	28m^3hr
Last Calibration Date :	21/5/2019	**Flow after balance m^3h**	28m^3hr
Calibration Due Date :	21/11/2019	**Flow Leaving m^3hr**	28m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI_FLARE	13/9/2019 11:39	58.1	28.8	0.6	12.5	10.23	4	1020	-4.47			100
LI_GE018	13/9/2019 11:41	69.2	32.3	0.2	0	0	8	1020	-4.37			100
LI_GE016	13/9/2019 11:43	65.7	27.6	0.2	6.5	5.74	4	1019	-4.17			50
LI_GE019	13/9/2019 11:46	44.8	24.2	3.5	27.5	14.27	21	1019	-3.74		high O2	0
LI_GE020	13/9/2019 11:48	49.6	25	0.1	25.3	24.92	7	1019	-4.28			25
LI_GE014	13/9/2019 11:50	43.2	29.4	0	27.4	27.4	6	1019	-4.26			10
LI_GE015	13/9/2019 11:52	63.1	24.9	0	12	12	6	1019	-3.54			25
LI_GE013	13/9/2019 11:55	58.2	34.8	0.2	6.8	6.04	7	1019	-4.54			10
LI_GE012	13/9/2019 12:00	64.7	35.8	0.5	0	0	8	1019	-4.59			100
LI_GE011	13/9/2019 12:03	50.3	30.5	3.7	15.5	1.51	9	1019	-4.57		high O2	0
LI_GE010	13/9/2019 12:04	69.2	32.6	0	0	0	10	1019	-4.59			50
LI_LM1/3	13/9/2019 12:08	20.7	13.4	8	57.9	27.66	6	1019	-2.6			0
LI_GE007	13/9/2019 12:09	68.9	30.2	0	0.9	0.9	8	1019	-4.5			10
LI_GE006	13/9/2019 12:11	68	30.8	0.2	1	0.24	10	1019	-4.52			10
LI_GE004	13/9/2019 12:13	63.8	28.4	0.6	7.2	4.93	9	1019	-4.47			50
LI_GE005	13/9/2019 12:14	65.9	31.6	0.1	2.4	2.02	10	1019	-4.47			50
LI_GE003	13/9/2019 12:18	69.7	29	0	1.3	1.3	8	1019	-4.53			50
LI_GE002	13/9/2019 12:20	64.9	25.7	1.1	8.3	4.14	10	1019	-4.88			50
LI_GE001	13/9/2019 12:22	65.1	31.9	0	3	3	9	1019	-4.61			50
LI_GE008	13/9/2019 12:24	56.2	28.2	0	15.6	15.6	10	1019	-4.63			25
LI_GE009	13/9/2019 12:26	51.4	25.8	0	22.8	22.8	11	1019	-4.57			25
LI_LM2/1	13/9/2019 12:29	0.1	0.1	20.2	79.6	3.24	6	1019	-1.88			0
LI_GE017	13/9/2019 12:31	49.5	28.3	0.3	21.9	20.77	9	1019	-3.15			10
LI_LM2/2	13/9/2019 12:33	8.8	7.5	14.3	69.4	15.35	7	1019	-2.22			0
A2LIGW31	13/9/2019 14:11	50.6	24.2	0.4	24.8	23.29	4	1019	-0.42			25
A2LIGW18	13/9/2019 14:13	18.4	10.2	0.4	71	69.49	3	1019	-0.37			0
A2LIGW15	13/9/2019 14:14	0.1	0.1	20.1	79.7	3.72	2	1020	-0.26		sample valve missing	0
A2LIGW14	13/9/2019 14:16	7.7	0.4	18.6	73.3	2.99	9	1020	-0.26			0
A2LIGW20	13/9/2019 14:17	6	0.3	19.1	74.6	2.4	10	1020	-0.28			0
A2LIGW10	13/9/2019 14:19	0.1	0	20.6	79.3	1.43	2	1020	-0.29		sample valve missing	0
A2LIGW21	13/9/2019 14:20	10.1	2.8	15.9	71.2	11.1	9	1020	-0.29			0
A2LIGW19	13/9/2019 14:24	59.7	24.4	0.3	15.6	14.47	6	1019	-0.27			25
A2LIGW22	13/9/2019 14:25	61.1	24.9	0.2	13.8	13.04	4	1019	-0.29			25
A2LIGW25	13/9/2019 14:30	42.8	18.8	5.6	32.8	11.63	5	1019	-0.28			0
A2LIGW26	13/9/2019 14:32	64.4	27	0.2	8.4	7.64	4	1019	-0.33			25
A2LIGW27	13/9/2019 14:34	18.4	15.3	0.4	65.9	64.39	3	1019	-0.27			0
A2LIGW28	13/9/2019 14:36	59.9	27.1	0	13	13	4	1019	-0.31			25
A2LIGW29	13/9/2019 14:38	68.1	23.8	0	8.1	8.1	4	1020	-0.41			25
A2LIGW30	13/9/2019 14:39	0.2	0.1	19.8	79.9	5.06	3	1020	-0.23			0
LIA2SPUR	13/9/2019 14:43	61.2	25.8	0.2	12.8	12.04	4	1020	-0.59			15
LI_FLARE	13/9/2019 14:44	59.4	27.1	0.3	13.2	12.07	5	1021	-5.19			100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Showers
Date:	11/10/2019	**Flare Hrs**	546960
Name:	Steve Hindle	**Temperature °C**	11 to 13
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	28m^3hr
Last Calibration Date :	21/5/2019	**Flow after balance m^3h**	28m^3hr
Calibration Due Date :	21/11/2019	**Flow Leaving m^3hr**	28m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	ATMOS - PHERIC PRESSURE mb	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI FLARE	11/10/2019 10:12	64.6	30.8	0.3	4.3	3.17	2	2	984	-2.87		100
LI GE018	11/10/2019 10:14	69.7	33.3	0.1	0	0	4	13	984	-2.81		100
LI GE016	11/10/2019 10:16	64.8	29	0.1	6.1	5.72	4	4	984	-2.55		50
LI GE019	11/10/2019 10:17	67	31.4	0.2	1.4	0.64	8	0	983	1.03		5
LI GE020	11/10/2019 10:19	55.2	25.8	0.1	18.9	18.52	7	0	983	-2.71		25
LI GE014	11/10/2019 10:21	47.4	29.9	0	22.7	22.7	6	0	983	0		0
LI GE015	11/10/2019 10:22	63	25.2	0	11.8	11.8	6	0	984	-2.38		25
LI GE013	11/10/2019 10:25	61.5	36.5	0.1	1.9	1.52	7	3	983	-2.78		10
LI GE012	11/10/2019 10:26	66	38.5	0.1	0	0	8	46	983	-2.9		100
LI GE011	11/10/2019 10:29	65.8	38.8	0.1	0	0	8	1	983	-1.65		10
LI GE010	11/10/2019 10:30	69.3	34.9	0.2	0	0	7	28	983	-2.97		50
LI LM1/3	11/10/2019 10:33	42.8	24	0.7	32.5	29.85	5	0	983	-0.05		0
LI GE007	11/10/2019 10:34	71.5	31.8	0	0	0	6	7	983	-2.81		10
LI GE006	11/10/2019 10:35	69.1	31.4	0.2	0	0	7	7	983	-2.81		10
LI GE004	11/10/2019 10:37	67.5	31.1	0	1.4	1.4	7	1	983	-2.76		50
LI GE005	11/10/2019 10:39	68	34	0	0	0	7	4	983	-2.72		50
LI GE003	11/10/2019 10:45	72.1	31.9	0	0	0	5	3	983	-25.06		50
LI GE002	11/10/2019 10:46	69.1	28.6	0.8	1.5	0	6	0	983	-2.92		50
LI GE001	11/10/2019 10:48	66.1	34.4	0	0	0	6	8	983	-2.88		50
LI GE008	11/10/2019 10:50	64.9	29.7	0	5.4	5.4	7	9	983	-2.94		25
LI GE009	11/10/2019 10:52	59.3	27.8	0	12.9	12.9	8	7	983	-2.89		25
LI LM2/1	11/10/2019 10:54	43.6	23.2	4	29.2	14.08	19	5	983	0.13		0
LI GE017	11/10/2019 10:56	52.8	31	0	16.2	16.2	8	5	983	-1.11		10
LI LM2/2	11/10/2019 10:57	37.8	26.3	2	33.9	26.34	9	6	983	-0.15		0
A2LIGW30	11/10/2019 11:04	0.8	1.3	19.2	78.7	6.12	4	0	983	0.29		0
A2LIGW31	11/10/2019 11:06	57	28.5	0.3	14.2	13.07	5	0	983	0.3		25
A2LIGW18	11/10/2019 11:09	25	11.3	0.4	63.3	61.79	4	0	983	0.32		0
A2LIGW15	11/10/2019 11:10	0.1	0.1	21.1	78.7	0	3	0	983	0.23	sample valve missing	0
A2LIGW14	11/10/2019 11:11	22.3	1.7	15.1	60.9	3.82	10	0	983	0.25		0
A2LIGW20	11/10/2019 11:13	3.3	0.4	20.2	76.1	0	13	0	983	-0.02		0
A2LIGW10	11/10/2019 11:14	0.1	0.1	21.1	78.7	0	4	0	983	0.24	sample valve missing	0
A2LIGW21	11/10/2019 11:15	27.2	11.7	6.2	54.9	31.46	5	0	983	0.1		0
A2LIGW19	11/10/2019 11:20	51.6	24.6	3.4	20.4	7.55	4	2	983	0.06	high O2	0
A2LIGW22	11/10/2019 11:21	61.5	29	0.1	9.4	9.02	5	0	983	0.08		25
A2LIGW25	11/10/2019 11:25	60.5	27.8	0.3	11.4	10.27	4	0	983	0.2		25
A2LIGW26	11/10/2019 11:27	65.5	29.2	0	5.3	5.3	4	2	982	0.12		25
A2LIGW27	11/10/2019 11:29	24.2	13.1	0.3	62.4	61.27	3	0	983	0.06		0
A2LIGW28	11/10/2019 11:31	61.7	29.8	0.1	8.4	8.02	3	1	983	0.2		25
A2LIGW29	11/10/2019 11:33	70.3	26.3	0	3.4	3.4	4	1	983	0.06		25
LIA2SPUR	11/10/2019 11:41	61.3	29	0.1	9.6	9.22	4	0	983	-0.09		15
LI FLARE	11/10/2019 11:44	62.5	29.8	0.1	7.6	7.22	5	2	984	-3.59		100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Showers
Date:	15/11/2019	**Flare Hrs**	55292
Name:	Steve Hindle	**Temperature °C**	07 to 09
Equipment Used :	GA2000	**Compressor Hrs**	
Serial No :	GA11066	**Flow Arrival m^3hr**	24m^3hr
Last Calibration Date :	21/5/2019	**Flow after balance m^3h**	24m^3hr
Calibration Due Date :	21/11/2019	**Flow Leaving m^3hr**	24m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	H2S ppm	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI FLARE	15/11/2019 10:45	63.5	29.9	0.8	5.8	2.78	2	0	-4.99			100
LI GE018	15/11/2019 10:50	69.7	32.7	0.1	0	0	4	11	-4.94			100
LI GE016	15/11/2019 10:55	71.7	31.9	0.2	0	0	4	2	-4.94			50
LI GE019	15/11/2019 10:58	11.2	7.9	15.5	65.4	6.81	17	0	-2.19			0
LI GE020	15/11/2019 11:00	55.6	26.2	0.4	17.8	16.29	5	0	-4.79			25
LI GE014	15/11/2019 11:02	61.7	27.1	0.8	10.4	7.38	5	0	-2.39			10
LI GE015	15/11/2019 11:04	65.8	26.4	0.1	7.7	7.32	5	0	-4.62			25
LI GE013	15/11/2019 11:05	64.1	36.4	0.1	0	0	6	1	-4.91			10
LI GE012	15/11/2019 11:07	66.4	37.8	0.2	0	0	7	42	-5.02			100
LI GE011	15/11/2019 11:09	65.8	37.5	0.4	0	0	7	1	-5.01			10
LI GE010	15/11/2019 11:10	67.9	33.7	0	0	0	8	28	-4.99			50
LI LM1/3	15/11/2019 11:13	25.8	14.9	7.7	51.6	22.49	5	0	-3.11			0
LI GE007	15/11/2019 11:14	72.9	30.1	0.2	0	0	6	3	-5.03			10
LI GE006	15/11/2019 11:15	71.1	30.6	0.1	0	0	7	4	-5			10
LI GE004	15/11/2019 11:17	71	30.1	0.1	0	0	7	0	-5.01			50
LI GE005	15/11/2019 11:19	68.3	32.1	0	0	0	6	1	-4.99			50
LI GE003	15/11/2019 11:21	71.6	30.7	0.3	0	0	6	0	-5.05			50
LI GE002	15/11/2019 11:22	65.2	27.1	1.5	6.2	0.53	7	0	-5.01			50
LI GE001	15/11/2019 11:24	69.2	33.8	0.1	0	0	6	2	-5			50
LI GE008	15/11/2019 11:26	68.6	31.5	0	0	0	6	7	-5.01			25
LI GE009	15/11/2019 11:27	54.4	28.3	0	17.3	17.3	8	0	-4.94			25
LI LM2/1	15/11/2019 11:30	0.4	0.5	21.2	77.9	0	3	0	-0.28			0
LI GE017	15/11/2019 11:32	56.6	29.2	0.2	14	13.24	5	9	-3.54			25
LI LM2/2	15/11/2019 11:34	11.6	11.8	12.2	64.4	18.28	5	0	-2.57			0
A2LIGW30	15/11/2019 11:40	0.3	2.9	17.3	79.5	14.11	2	0	-0.08			0
A2LIGW29	15/11/2019 11:42	64.3	21.4	2.2	12.1	3.78	5	3	3.1			25
A2LIGW28	15/11/2019 11:43	65.6	29	0.2	5.2	4.44	3	4	0.18			25
A2LIGW27	15/11/2019 11:45	21	10.9	0.3	67.8	66.67	2	0	0.27			0
A2LIGW26	15/11/2019 11:47	68	29.5	0.2	2.3	1.54	2	3	0.1			25
A2LIGW25	15/11/2019 11:50	49.9	23.9	3.8	22.4	8.04	2	0	0.08			0
A2LIGW22	15/11/2019 11:52	65.6	27.4	0	7	7	2	2	0.1			25
A2LIGW19	15/11/2019 11:54	26.8	7.3	1	64.9	61.12	2	0	0.19			0
A2LIGW21	15/11/2019 11:57	33	12.5	3.8	50.7	36.34	3	0	0.09			
A2LIGW10	15/11/2019 11:59	9.5	3.5	17.5	69.5	3.35	3	0	0.19		sample valve missing	0
A2LIGW20	15/11/2019 12:01	28.5	8.2	8.1	55.2	24.58	3	0	3.55			0
A2LIGW14	15/11/2019 12:02	15.8	1.7	16.1	66.4	5.54	1	0	-0.03			0
A2LIGW15	15/11/2019 12:04	0.3	0.3	21.4	78	0	0	0	0.21		sample valve missing	0
A2LIGW18	15/11/2019 12:06	12.7	7.1	9	71.2	37.18	5	0	0.41			0
A2LIGW31	15/11/2019 12:08	57.3	27.2	0.5	15	13.11	1	0	0.08			25
LIA2SPUR	15/11/2019 12:17	64.9	27.7	0.1	7.3	6.92	1	3	-0.98			15
LI FLARE	15/11/2019 12:18	64.6	29.2	0.1	6.1	5.72	2	2	-5.05			100

GAS FIELD MONITORING SHEET

CH4 Consultants

Site:	**Llwyn Isaf**	**Weather Conditions**	Showers
Date:	13/12/2019	**Flare Hrs**	55571
Name:	Steve Hindle	**Temperature °C**	06 to 09
Equipment Used :	GA5000	**Compressor Hrs**	
Serial No :	G500196	**Flow Arrival m^3hr**	25m^3hr
Last Calibration Date :	22/10/2019	**Flow after balance m^3h**	25m^3hr
Calibration Due Date :	22/4/2020	**Flow Leaving m^3hr**	25m^3hr

1	2	3	4	5	6	7	8	9	10	11	12	13
ID	Date/Time	CH4 %	CO2 %	O2 %	BALANCE %	RESIDUAL NITROGEN %	CO ppm	H2S ppm	SUCTION PRESSURE mb	FLOW m3/hr	COMMENTS	VALVE POSITION %
LI FLARE	13/12/2019 09:26	64.1	27.5	0.3	8.1	6.97	2	5	-6.91			100
LI GE018	13/12/2019 09:29	70.1	30.4	0.2	0	0	4	27	-5.35			100
LI GE016	13/12/2019 09:30	65	26.6	0.3	8.1	6.97	4	12	-5.19			50
LI GE019	13/12/2019 09:32	55.7	23.2	0.1	21	20.62	9	0	-2.89			5
LI GE020	13/12/2019 09:35	54.9	24	0.1	21	20.62	7	14	-5.09			25
LI GE014	13/12/2019 09:38	57.4	23.2	1.8	17.6	10.8	6	0	-3.11			10
LI GE015	13/12/2019 09:39	61.9	24.6	0.1	13.4	13.02	6	4	-5.14			25
LI GE013	13/12/2019 09:42	63	33.9	0.2	2.9	2.14	6	11	-5.25			10
LI GE012	13/12/2019 09:43	66	36.5	0.2	0	0	7	55	-5.23			100
LI GE011	13/12/2019 09:49	65.7	35.8	0.4	0	0	7	5	-5.42			10
LI GE010	13/12/2019 09:50	68.5	31.9	0	0	0	7	37	-5.35			50
LI LM1/3	13/12/2019 09:53	28.8	17.4	4	49.8	34.68	4	0	-3.3			0
LI GE007	13/12/2019 09:54	72.9	28.1	0.2	0	0	5	9	-5.37			10
LI GE006	13/12/2019 09:56	71.8	28.5	0.1	0	0	6	10	-5.23			10
LI GE004	13/12/2019 09:57	70.3	28.5	0.1	1.1	0.72	6	1	-5.35			50
LI GE005	13/12/2019 09:59	69	30.7	0.1	0.2	0	5	3	-5.09			50
LI GE003	13/12/2019 10:03	72.8	29.1	0.2	0	0	4	1	-5.11			50
LI GE002	13/12/2019 10:04	66.7	25.5	1.7	6.1	0	5	0	-5.23			50
LI GE001	13/12/2019 10:06	69.3	32.2	0	0	0	5	5	-5.18			50
LI GE008	13/12/2019 10:08	65.9	29.4	0.2	4.5	3.74	5	11	-5.14			50
LI GE009	13/12/2019 10:10	64.4	27.3	0.1	8.2	7.82	6	5	-5			25
LI LM2/1	13/12/2019 10:13	10.3	6	16	67.7	7.22	4	0	0.14			0
LI GE017	13/12/2019 10:15	50.9	27.3	0.1	21.7	21.32	6	13	-3.73			25
LI LM2/2	13/12/2019 10:18	23.7	15.2	8.9	52.2	18.56	6	2	-2.89			0
A2LIGW30	13/12/2019 10:23	0.8	6.5	12.2	80.5	34.38	2	0	0			0
A2LIGW29	13/12/2019 10:25	72	24	0.3	3.7	2.57	3	0	-0.15			25
A2LIGW28	13/12/2019 10:26	64.3	27.9	0.2	7.6	6.84	3	0	-0.1			25
A2LIGW27	13/12/2019 10:29	16.9	11.5	0.5	71.1	69.21	2	0	-0.1			0
A2LIGW26	13/12/2019 10:31	67.9	28	0	4.1	4.1	3	0	-0.1			25
A2LIGW25	13/12/2019 10:33	54.5	25.1	1.7	18.7	12.27	2	0	0.09			0
A2LIGW22	13/12/2019 10:37	63.3	26.8	0.2	9.7	8.94	2	0	-0.19			40
A2LIGW19	13/12/2019 10:40	32.9	11.2	0.8	55.1	52.08	2	0	-0.03			0
A2LIGW21	13/12/2019 10:42	4	1	16.3	78.7	17.09	12	0	-0.09			0
A2LIGW10	13/12/2019 10:44	1.1	1.4	17.6	79.9	13.37	1	0	0.07		sample valve missing	0
A2LIGW20	13/12/2019 10:46	39.3	8.1	1	51.6	47.82	1	0	-1.15			0
A2LIGW14	13/12/2019 10:47	30.1	3.1	11.9	54.9	9.92	1	0	0			0
A2LIGW15	13/12/2019 10:49	0	1.2	20.6	78.2	0.33	0	0	0.02		sample valve missing	0
A2LIGW18	13/12/2019 10:51	13.9	7.2	1.4	77.5	72.21	0	0	-0.02			0
A2LIGW31	13/12/2019 10:54	61.3	26.9	0.1	11.7	11.32	1	0	-0.07			25
LIA2SPUR	13/12/2019 11:02	64	27.1	0	8.9	8.9	3	0	-3.28			15
LI FLARE	13/12/2019 11:04	64.2	27.2	0	8.6	8.6	3	0	-4.45			100

APPENDIX 5 –

Meteorological Data

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - LLWYN ISAF LANDFILL SITE,

JANUARY 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.		MM.		MM.		M.P.H.		
2	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry / Cold
3	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry / Cold
4	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry / Cold
5	A.M. / P.M.		MM.		MM.		M.P.H.		
6	A.M. / P.M.		MM.		MM.		M.P.H.		
7	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Cloudy	Sleet + Rain
8	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Dry	Cold
9	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry / Frosty
10	A.M. / P.M.	—	MM.	—	MM.	10	M.P.H.	Clear	Sleet + Rain
11	A.M. / P.M.	10	MM.	10	MM.	5	M.P.H.	U Cloud	Slight Rain
12	A.M. / P.M.		MM.		MM.		M.P.H.		
13	A.M. / P.M.		MM.		MM.		M.P.H.		
14	A.M. / P.M.	—	MM.	10	MM.	5	M.P.H.	Cloudy	Showers
15	A.M. / P.M.	—	MM.	10	MM.	—	M.P.H.	Clear	Dry / Cold
16	A.M. / P.M.	5	MM.	15	MM.	—	M.P.H.	Clear	Dry / Cold
17	A.M. / P.M.	15	MM.	30	MM.	—	M.P.H.	Clear	Dry / Cold
18	A.M. / P.M.	15	MM.	45	MM.	10	M.P.H.	Cloudy	Rain
19	A.M. / P.M.		MM.		MM.		M.P.H.		
20	A.M. / P.M.		MM.		MM.		M.P.H.		
21	A.M. / P.M.	5	MM.	50	MM.	—	M.P.H.	Clear	Dry / Frosty
22	A.M. / P.M.	12	MM.	62	MM.	—	M.P.H.	Clear	Dry / Cold
23	A.M. / P.M.	—	MM.	62	MM.	—	M.P.H.	Clear	Dry / Cold
24	A.M. / P.M.	—	MM.	62	MM.	—	M.P.H.	Clear	Dry / Cold
25	A.M. / P.M.	5	MM.	73	MM.	—	M.P.H.	Clear	Dry / Cold
26	A.M. / P.M.		MM.		MM.		M.P.H.		
27	A.M. / P.M.		MM.		MM.		M.P.H.		
28	A.M. / P.M.		MM.		MM.		M.P.H.		
29	A.M. / P.M.		MM.		MM.		M.P.H.		
30	A.M. / P.M.		MM.		MM.		M.P.H.		
31	A.M. / P.M.		MM.		MM.		M.P.H.		

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

FEBRUARY 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.		MM.		MM.		M.P.H.		
2	A.M. / P.M.		MM.		MM.		M.P.H.		
3	A.M. / P.M.		MM.		MM.		M.P.H.		
4	A.M. / P.M.		MM.		MM.		M.P.H.		
5	A.M. / P.M.	64	MM.	64	MM.	—	M.P.H.	Clear	Dry/Cold
6	A.M. / P.M.	24	MM.	88	MM.	5	M.P.H.	Clear	Dry
7	A.M. / P.M.	18	MM.	106	MM.	30	M.P.H.	Many Mid Clouds	Rain
8	A.M. / P.M.	64	MM.	170	MM.	35	M.P.H.	Cloudy	Heavy Rain
9	A.M. / P.M.		MM.		MM.		M.P.H.		
10	A.M. / P.M.		MM.		MM.		M.P.H.		
11	A.M. / P.M.	15	MM.	185	MM.	—	M.P.H.	Clear	Dry
12	A.M. / P.M.	—	MM.	185	MM.	5	M.P.H.	Cloudy	Dry
13	A.M. / P.M.	—	MM.	185	MM.	10	M.P.H.	Cloudy	Wet
14	A.M. / P.M.	—	MM.	185	MM.	—	M.P.H.	Clear	Dry
15	A.M. / P.M.	—	MM.	185	MM.	—	M.P.H.	Clear	Dry/Clear
16	A.M. / P.M.		MM.		MM.		M.P.H.		
17	A.M. / P.M.		MM.		MM.		M.P.H.		
18	A.M. / P.M.	8	MM.	193	MM.	10	M.P.H.	Cloudy	Dry
19	A.M. / P.M.	—	MM.	193	MM.	—	M.P.H.	Clear	Dry
20	A.M. / P.M.	28	MM.	221	MM.	10	M.P.H.	Cloudy	Heavy Rain
21	A.M. / P.M.	70	MM.	291	MM.	10	M.P.H.	Cloudy	Rain
22	A.M. / P.M.	—	MM.	291	MM.	—	M.P.H.	Clear	Dry/Sunny
23	A.M. / P.M.		MM.		MM.		M.P.H.		
24	A.M. / P.M.		MM.		MM.		M.P.H.		
25	A.M. / P.M.	—	MM.	291	MM.	10	M.P.H.	Clear	Dry
26	A.M. / P.M.	—	MM.	291	MM.	—	M.P.H.	Clear	Dry/Sunny
27	A.M. / P.M.	—	MM.	291	MM.	—	M.P.H.	Clear	Dry
28	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Foggy	Rain
29	A.M. / P.M.		MM.		MM.	—	M.P.H.		
30	A.M. / P.M.		MM.		MM.		M.P.H.		
31	A.M. / P.M.		MM.		MM.		M.P.H.		

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

MARCH 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.	10	MM.	10	MM.	—	M.P.H.	V Clowdy	Dry
2	A.M. / P.M.		MM.		MM.		M.P.H.		
3	A.M. / P.M.		MM.		MM.		M.P.H.		
4	A.M. / P.M.	48	MM.	58	MM.	5	M.P.H.	Clear.	Slight Rain.
5	A.M. / P.M.	10	MM.	68	MM.	10	M.P.H.	Clear	Dry
6	A.M. / P.M.	45	MM.	113	MM.	—	M.P.H.	V Clowdy	Rain
7	A.M. / P.M.	15	MM.	128	MM.	20	M.P.H.	V Clowdy	Heavy Rain.
8	A.M. / P.M.	20	MM.	148	MM.	—	M.P.H.	Clear	Dry
9	A.M. / P.M.		MM.		MM.		M.P.H.		
10	A.M. / P.M.		MM.		MM.		M.P.H.		
11	A.M. / P.M.	33	MM.	181	MM.	10	M.P.H.	Clear	Dry / Cold.
12	A.M. / P.M.	62	MM.	243	MM.	10	M.P.H.	V Clowdy	Heavy Rain
13	A.M. / P.M.	20	MM.	263	MM.	20	M.P.H.	Clear	Dry
14	A.M. / P.M.	8	MM.	271	MM.	10	M.P.H.	Clear	Dry
15	A.M. / P.M.	10	MM.	281	MM.	5	M.P.H.	Clear	Cold / Dry
16	A.M. / P.M.		MM.		MM.		M.P.H.		
17	A.M. / P.M.		MM.		MM.		M.P.H.		
18	A.M. / P.M.	35	MM.	306	MM.	10	M.P.H.	V Clowdy	Rain
19	A.M. / P.M.	5	MM.	311	MM.	10	M.P.H.	Clowdy	Rain.
20	A.M. / P.M.	10	MM.	321	MM.	5	M.P.H.	Some Clowd.	Dry
21	A.M. / P.M.	—	MM.	321	MM.	—	M.P.H.	Clowdy	Slight Rain
22	A.M. / P.M.	5	MM.	326	MM.	—	M.P.H.	Clowdy	Rain
23	A.M. / P.M.		MM.		MM.		M.P.H.		
24	A.M. / P.M.		MM.		MM.		M.P.H.		
25	A.M. / P.M.		MM.		MM.		M.P.H.		
26	A.M. / P.M.		MM.		MM.		M.P.H.		
27	A.M. / P.M.		MM.		MM.		M.P.H.		
28	A.M. / P.M.		MM.		MM.		M.P.H.		
29	A.M. / P.M.		MM.		MM.		M.P.H.		
30	A.M. / P.M.		MM.		MM.		M.P.H.		
31	A.M. / P.M.		MM.		MM.		M.P.H.		

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

APRIL 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.		MM.		MM.		M.P.H.		
2	A.M. / P.M.		MM.		MM.		M.P.H.		
3	A.M. / P.M.		MM.		MM.		M.P.H.		
4	A.M. / P.M.		MM.		MM.		M.P.H.		
5	A.M. / P.M.		MM.		MM.		M.P.H.		
6	A.M. / P.M.		MM.		MM.		M.P.H.		
7	A.M. / P.M.		MM.		MM.		M.P.H.		
8	A.M. / P.M.	45	MM.	45	MM.	—	M.P.H.	Clear	Dry
9	A.M. / P.M.	—	MM.	45	MM.	—	M.P.H.	Clear	Dry / Cool
10	A.M. / P.M.	—	MM.	45	MM.	—	M.P.H.	Clear	Dry / Sunny
11	A.M. / P.M.	5	MM.	50	MM.	—	M.P.H.	Clear	Dry Cool
12	A.M. / P.M.	—	MM.	50	MM.	—	M.P.H.	Clear	Dry / Cool
13	A.M. / P.M.		MM.		MM.		M.P.H.		
14	A.M. / P.M.		MM.		MM.		M.P.H.		
15	A.M. / P.M.	—	MM.	50	MM.	10	M.P.H.	Clear	Dry
16	A.M. / P.M.	4	MM.	54	MM.	8	M.P.H.	Cloudy	Rain
17	A.M. / P.M.	—	MM.	54	MM.	—	M.P.H.	Clear	Dry / Sunny
18	A.M. / P.M.	—	MM.	54	MM.	10	M.P.H.	Clear	Dry
19	A.M. / P.M.		MM.		MM.		M.P.H.		
20	A.M. / P.M.		MM.		MM.		M.P.H.		
21	A.M. / P.M.		MM.		MM.		M.P.H.		
22	A.M. / P.M.		MM.		MM.		M.P.H.		
23	A.M. / P.M.	—	MM.	54	MM.	—	M.P.H.	Clear	Dry / Sunny
24	A.M. / P.M.	—	MM.	54	MM.	—	M.P.H.	Clear	Dry / Cool
25	A.M. / P.M.	14	MM.	68	MM.	—	M.P.H.	Cloudy	Rain
26	A.M. / P.M.	19	MM.	87	MM.	20	M.P.H.	V Cloudy	Rain
27	A.M. / P.M.	25	MM.	112	MM.	—	M.P.H.	Clear	Dry
28	A.M. / P.M.		MM.		MM.		M.P.H.		
29	A.M. / P.M.		MM.		MM.		M.P.H.		
30	A.M. / P.M.		MM.		MM.		M.P.H.		
31	A.M. / P.M.		MM.		MM.		M.P.H.		

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

MAY 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.	6	MM.	6	MM.	—	M.P.H.	Clear.	Some Rain / Dry
2	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Cloudy	Slight Rain
3	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Cloudy	Dry
4	A.M. / P.M.		MM.		MM.		M.P.H.		
5	A.M. / P.M.		MM.		MM.		M.P.H.		
6	A.M. / P.M.		MM.		MM.		M.P.H.		
7	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Dry / Sunny
8	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Dry
9	A.M. / P.M.	—	MM.	6	MM.	10	M.P.H.	Cloudy	Slight Rain
10	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Dry
11	A.M. / P.M.		MM.		MM.		M.P.H.		
12	A.M. / P.M.		MM.		MM.		M.P.H.		
13	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Sunny / Dry
14	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Sunny
15	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Sunny
16	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear.	Sunny
17	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Cloudy	Slight Rain
18	A.M. / P.M.		MM.		MM.	—	M.P.H.		
19	A.M. / P.M.		MM.		MM.	—	M.P.H.		
20	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Dry / Sunny
21	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Sunny Day
22	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Sunny Day
23	A.M. / P.M.		MM.		MM.		M.P.H.		
24	A.M. / P.M.	—	MM.	6	MM.	—	M.P.H.	Clear	Dry
25	A.M. / P.M.		MM.		MM.		M.P.H.		
26	A.M. / P.M.		MM.		MM.		M.P.H.		
27	A.M. / P.M.	15	MM.	21	MM.	10	M.P.H.	Some Clear	Cloudy
28	A.M. / P.M.	14	MM.	35	MM.	10	M.P.H.	Cloudy	Rain
29	A.M. / P.M.	14	MM.	49	MM.	10	M.P.H.	Cloudy	Rain
30	A.M. / P.M.	—	MM.	49	MM.	15	M.P.H.	Cloudy	Dry
31	A.M. / P.M.	—	MM.	49	MM.	10	M.P.H.	Cloudy	Dry

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

JUNE 2019		RAINFALL					
DATE	HOUR	DAILY	MONTH TODATE	WIND	CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.	MM.	MM.	M.P.H.		
2	A.M. / P.M.	MM.	MM.	M.P.H.		
3	A.M. / P.M.	10 MM.	10 MM.	5 M.P.H.	Clear	Dry
4	A.M. / P.M.	16 MM.	26 MM.	10 M.P.H.	V Cloudy	Rain
5	A.M. / P.M.	13 MM.	39 MM.	— M.P.H.	Cloudy	Rain
6	A.M. / P.M.	— MM.	39 MM.	5 M.P.H.	Cloudy	Some Rain
7	A.M. / P.M.	5 MM.	44 MM.	10 M.P.H.	V Cloudy	Rain
8	A.M. / P.M.	MM.	MM.	M.P.H.		
9	A.M. / P.M.	MM.	MM.	M.P.H.		
10	A.M. / P.M.	17 MM.	61 MM.	— M.P.H.	Clear	Dry
11	A.M. / P.M.	— MM.	61 MM.	10 M.P.H.	Cloudy	Dry
12	A.M. / P.M.	10 MM.	71 MM.	10 M.P.H.	Cloudy	Slight Rain
13	A.M. / P.M.	8 MM.	79 MM.	— M.P.H.	Cloudy	Slight Rain
14	A.M. / P.M.	MM.	MM.	M.P.H.		
15	A.M. / P.M.	MM.	MM.	M.P.H.		
16	A.M. / P.M.	MM.	MM.	M.P.H.		
17	A.M. / P.M.	MM.	MM.	M.P.H.		
18	A.M. / P.M.	MM.	MM.	M.P.H.		
19	A.M. / P.M.	MM.	MM.	M.P.H.		
20	A.M. / P.M.	MM.	MM.	M.P.H.		
21	A.M. / P.M.	MM.	MM.	M.P.H.		
22	A.M. / P.M.	MM.	MM.	M.P.H.		
23	A.M. / P.M.	MM.	MM.	M.P.H.		
24	A.M. / P.M.	38 MM.	116 MM.	— M.P.H.	Clear	Dry
25	A.M. / P.M.	— MM.	116 MM.	— M.P.H.	Clear	Dry
26	A.M. / P.M.	8 MM.	124 MM.	— M.P.H.	Clear	Dry
27	A.M. / P.M.	— MM.	124 MM.	— M.P.H.	Clear	Sunny
28	A.M. / P.M.	— MM.	— MM.	— M.P.H.	Clear	Sunny
29	A.M. / P.M.	MM.	MM.	M.P.H.		
30	A.M. / P.M.	MM.	MM.	M.P.H.		
31	A.M. / P.M.	MM.	MM.	M.P.H.		

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

JULY 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
2	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
3	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
4	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry/Sunny
5	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry/Sunny
6	A.M. / P.M.		MM.		MM.		M.P.H.		
7	A.M. / P.M.		MM.		MM.		M.P.H.		
8	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry Sunny
9	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
10	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
11	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Some Cloud	Slight Rain
12	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
13	A.M. / P.M.		MM.		MM.		M.P.H.		
14	A.M. / P.M.		MM.		MM.		M.P.H.		
15	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
16	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
17	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
18	A.M. / P.M.	1.4	MM.	1.4	MM.	—	M.P.H.	Clear	Dry
19	A.M. / P.M.	1.5	MM.	2.9	MM.	10	M.P.H.	Cloudy	Rain
20	A.M. / P.M.		MM.		MM.		M.P.H.		
21	A.M. / P.M.		MM.		MM.		M.P.H.		
22	A.M. / P.M.		MM.		MM.		M.P.H.		
23	A.M. / P.M.	.35	MM.	24	MM.	10	M.P.H.	Cloudy	Slight Rain
24	A.M. / P.M.	—	MM.	24	MM.	5	M.P.H.	Clear	Dry
25	A.M. / P.M.	—	MM.	24	MM.	—	M.P.H.	Clear	Dry/Sunny
26	A.M. / P.M.	—	MM.	24	MM.	—	M.P.H.	Clear	Dry
27	A.M. / P.M.		MM.		MM.		M.P.H.		
28	A.M. / P.M.		MM.		MM.		M.P.H.		
29	A.M. / P.M.	.—	MM.	24	MM.	—	M.P.H.	Clear	Dry/Sunny
30	A.M. / P.M.	—	MM.	24	MM.	—	M.P.H.	Clear	Dry/Sunny
31	A.M. / P.M.	2.3	MM.	9.3	MM.	—	M.P.H.	Cloudy	Rain

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

AUGUST 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
2	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry
3	A.M. / P.M.		MM.		MM.		M.P.H.		
4	A.M. / P.M.		MM.		MM.		M.P.H.		
5	A.M. / P.M.		MM.		MM.		M.P.H.		
6	A.M. / P.M.		MM.		MM.		M.P.H.		
7	A.M. / P.M.	18	MM.	18	MM.	10	M.P.H.	Cloudy	Dry
8	A.M. / P.M.	—	MM.	18	MM.	—	M.P.H.	Clear	Dry
9	A.M. / P.M.	15	MM.	33	MM.	—	M.P.H.	Clear	Some Clear.
10	A.M. / P.M.		MM.		MM.		M.P.H.		
11	A.M. / P.M.		MM.		MM.		M.P.H.		
12	A.M. / P.M.	38	MM.	71	MM.	—	M.P.H.	Clear	Dry
13	A.M. / P.M.	15	MM.	86	MM.	10	M.P.H.	Cloudy	Rain.
14	A.M. / P.M.	10	MM.	96	MM.	10	M.P.H.	Cloudy	Dry.
15	A.M. / P.M.	8	MM.	104	MM.	25	M.P.H.	V Cloudy	Rain
16	A.M. / P.M.		MM.		MM.		M.P.H.		
17	A.M. / P.M.		MM.		MM.		M.P.H.		
18	A.M. / P.M.		MM.		MM.		M.P.H.		
19	A.M. / P.M.	48	MM.	152	MM.	10	M.P.H.	Clear	Dry
20	A.M. / P.M.	—	MM.	152	MM.	—	M.P.H.	Clear	Dry
21	A.M. / P.M.	—	MM.	152	MM.	—	M.P.H.	Clear	Dry
22	A.M. / P.M.	18	MM.	170	MM.	20	M.P.H.	Cloudy	Dry
23	A.M. / P.M.	—	MM.	170	MM.	—	M.P.H.	Clear	Dry
24	A.M. / P.M.		MM.		MM.		M.P.H.		
25	A.M. / P.M.		MM.		MM.		M.P.H.		
26	A.M. / P.M.		MM.		MM.		M.P.H.		
27	A.M. / P.M.	—	MM.	170	MM.	—	M.P.H.	Clear	Dry
28	A.M. / P.M.	8	MM.	178	MM.	15	M.P.H.	Cloudy	Rain.
29	A.M. / P.M.	5	MM.	183	MM.	—	M.P.H.	Clear	Dry
30	A.M. / P.M.	~~183~~	MM.	183	MM.	25	M.P.H.	Cloudy	Dry.
31	A.M. / P.M.		MM.		MM.		M.P.H.		

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

SEPTEMBER 2019		RAINFALL				WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
DATE	HOUR	DAILY		MONTH TODATE					
1	A.M. / P.M.		MM.		MM.		M.P.H.		
2	A.M. / P.M.		MM.		MM.		M.P.H.		
3	A.M. / P.M.	11	MM.	11	MM.	—	M.P.H.	Cloudy	Light Rain
4	A.M. / P.M.	8	MM.	19	MM.	-	M.P.H.	Clear	Dry
5	A.M. / P.M.	—	MM.	19	MM.	—	M.P.H.	Clear	Dry
6	A.M. / P.M.	—	MM.	19	MM.	20	M.P.H.	Cloudy	Dry
7	A.M. / P.M.		MM.		MM.		M.P.H.		
8	A.M. / P.M.		MM.		MM.		M.P.H.		
9	A.M. / P.M.	21	MM.	40	MM.	10	M.P.H.	Cloudy	Rain
10	A.M. / P.M.	—	MM.	40	MM.	—	M.P.H.	Clear	Dry/Sunny
11	A.M. / P.M.	8	MM.	48	MM.	5	M.P.H.	Some Cloud	Dry
12	A.M. / P.M.	—	MM.	48	MM.	5	M.P.H.	Cloudy	Slight Rain
13	A.M. / P.M.	4	MM.	52	MM.	—	M.P.H.	Clear	Dry.
14	A.M. / P.M.		MM.		MM.		M.P.H.		
15	A.M. / P.M.		MM.		MM.		M.P.H.		
16	A.M. / P.M.	18	MM.	70	MM.	—	M.P.H.	Clear	Dry
17	A.M. / P.M.	—	MM.	70	MM.	-	M.P.H.	Clear	Dry
18	A.M. / P.M.	-	MM.	70	MM.	—	M.P.H.	Clear	Dry
19	A.M. / P.M.	—	MM.	70	MM.	-	M.P.H.	Clear	Dry
20	A.M. / P.M.	-	MM.	70	MM.	-	M.P.H.	Clear	Dry/Sunny
21	A.M. / P.M.		MM.		MM.		M.P.H.		
22	A.M. / P.M.		MM.		MM.		M.P.H.		
23	A.M. / P.M.		MM.		MM.		M.P.H.		
24	A.M. / P.M.		MM.		MM.		M.P.H.		
25	A.M. / P.M.		MM.		MM.		M.P.H.		
26	A.M. / P.M.		MM.		MM.		M.P.H.		
27	A.M. / P.M.		MM.		MM.		M.P.H.		
28	A.M. / P.M.		MM.		MM.		M.P.H.		
29	A.M. / P.M.		MM.		MM.		M.P.H.		
30	A.M. / P.M.	.20	MM.	150	MM.	—	M.P.H.	Clear	Dry
31	A.M. / P.M.		MM.		MM.		M.P.H.		

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

OCTOBER 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.	30	MM.	30	MM.	—	M.P.H.	Clear	Dry
2	A.M. / P.M.	—	MM.	30	MM.	—	M.P.H.	Clear	Dry
3	A.M. / P.M.	—	MM.	30	MM.	—	M.P.H.	Clear	Dry
4	A.M. / P.M.	10	MM.	40	MM.	20	M.P.H.	Cloudy	Rain
5	A.M. / P.M.		MM.		MM.		M.P.H.		
6	A.M. / P.M.		MM.		MM.		M.P.H.		
7	A.M. / P.M.	33	MM.	73	MM.	—	M.P.H.	Clear	Showers
8	A.M. / P.M.	—	MM.	73	MM.	—	M.P.H.	Clear	Dry
9	A.M. / P.M.	—	MM.	73	MM.	—	M.P.H.	Some Cloud	Dry
10	A.M. / P.M.	—	MM.	73	MM.	—	M.P.H.	Clear	Dry.
11	A.M. / P.M.	15	MM.	88	MM.	10	M.P.H.	Cloudy	Rain.
12	A.M. / P.M.		MM.		MM.		M.P.H.		
13	A.M. / P.M.		MM.		MM.		M.P.H.		
14	A.M. / P.M.	25	MM.	113	MM.	—	M.P.H.	Clear	Dry
15	A.M. / P.M.	—	MM.	113	MM.	5	M.P.H.	Some Cloud.	Dry
16	A.M. / P.M.	8	MM.	121	MM.	—	M.P.H.	Clear	Dry / Sunny
17	A.M. / P.M.	5	MM.	126	MM.	—	M.P.H.	Clear	Dry
18	A.M. / P.M.	25	MM.	151	MM.	20	M.P.H.	V Cloudy	Heavy Rain
19	A.M. / P.M.		MM.		MM.		M.P.H.		
20	A.M. / P.M.		MM.		MM.		M.P.H.		
21	A.M. / P.M.	.40	MM.	191	MM.	—	M.P.H.	Cloudy	Dry.
22	A.M. / P.M.	—	MM.	191	MM.	—	M.P.H.	Clear	Dry
23	A.M. / P.M.	—	MM.	191	MM.	—	M.P.H.	Clear	Dry
24	A.M. / P.M.	5	MM.	196	MM.	—	M.P.H.	Clear	Dry
25	A.M. / P.M.	5	MM.	201	MM.	20	M.P.H.	V Cloudy	Heavy Rain
26	A.M. / P.M.		MM.		MM.		M.P.H.		
27	A.M. / P.M.		MM.		MM.		M.P.H.		
28	A.M. / P.M.	34	MM.	235	MM.	—	M.P.H.	Clear	Frosty / Dry
29	A.M. / P.M.	—	MM.	235	MM.	—	M.P.H.	Clear	Dry / Frosty
30	A.M. / P.M.	—	MM.	235	MM.	—	M.P.H.	Clear	Dry / Cold
31	A.M. / P.M.	—	MM.	235	MM.	—	M.P.H.	Clear	Dry / Cold

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

NOVEMBER 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.	25	MM.	25	MM.	20	M.P.H.	Cloudy	Rain
2	A.M. / P.M.		MM.		MM.		M.P.H.		
3	A.M. / P.M.		MM.		MM.		M.P.H.		
4	A.M. / P.M.	65	MM.	90	MM.	5	M.P.H.	Clear	Wet
5	A.M. / P.M.	5	MM.	95	MM.	—	M.P.H.	Cloudy	Wet
6	A.M. / P.M.	8	MM.	103	MM.	10	M.P.H.	Cloudy	Dry / Wet
7	A.M. / P.M.	20	MM.	123	MM.	—	M.P.H.	Cloudy	Rain
8	A.M. / P.M.	5	MM.	128	MM.	—	M.P.H.	Clear	Dry
9	A.M. / P.M.		MM.		MM.		M.P.H.		
10	A.M. / P.M.		MM.		MM.		M.P.H.		
11	A.M. / P.M.	31	MM.	159	MM.	10	M.P.H.	Cloudy	Dry
12	A.M. / P.M.	—	MM.	159	MM.	30	M.P.H.	V Cloudy	Heavy Rain
13	A.M. / P.M.	5	MM.	164	MM.	—	M.P.H.	Clear	Dry
14	A.M. / P.M.	5	MM.	169	MM.	20	M.P.H.	Cloudy	Slight Rain
15	A.M. / P.M.	10	MM.	179	MM.	—	M.P.H.	Cloudy	Dry
16	A.M. / P.M.		MM.		MM.		M.P.H.		
17	A.M. / P.M.		MM.		MM.		M.P.H.		
18	A.M. / P.M.	10	MM.	189	MM.	—	M.P.H.	Cloudy	Dry
19	A.M. / P.M.	—	MM.	189	MM.	—	M.P.H.	Clear	Dry
20	A.M. / P.M.	8	MM.	197	MM.	10	M.P.H.	Cloudy	Rain
21	A.M. / P.M.	—	MM.	197	MM.	10	M.P.H.	Clear	Dry / Cold
22	A.M. / P.M.	—	MM.	197	MM.	—	M.P.H.	Clear	Dry
23	A.M. / P.M.		MM.		MM.		M.P.H.		
24	A.M. / P.M.		MM.		MM.		M.P.H.		
25	A.M. / P.M.	15	MM.	212	MM.	5	M.P.H.	Clear	Dry
26	A.M. / P.M.	15	MM.	227	MM.	—	M.P.H.	V Cloudy	Rain
27	A.M. / P.M.	13	MM.	240	MM.	—	M.P.H.	Cloudy	Some Rain
28	A.M. / P.M.	—	MM.	240	MM.	—	M.P.H.	Cloudy	Dry
29	A.M. / P.M.	—	MM.	240	MM.	5	M.P.H.	Clear	Frosty
30	A.M. / P.M.		MM.		MM.		M.P.H.		
31	A.M. / P.M.		MM.		MM.		M.P.H.		

CYNGOR GWYNEDD - GWASANAETH TRIN GWASTRAFF

RAINFALL / WEATHER RECORD - CILGWYN LANDFILL SITE

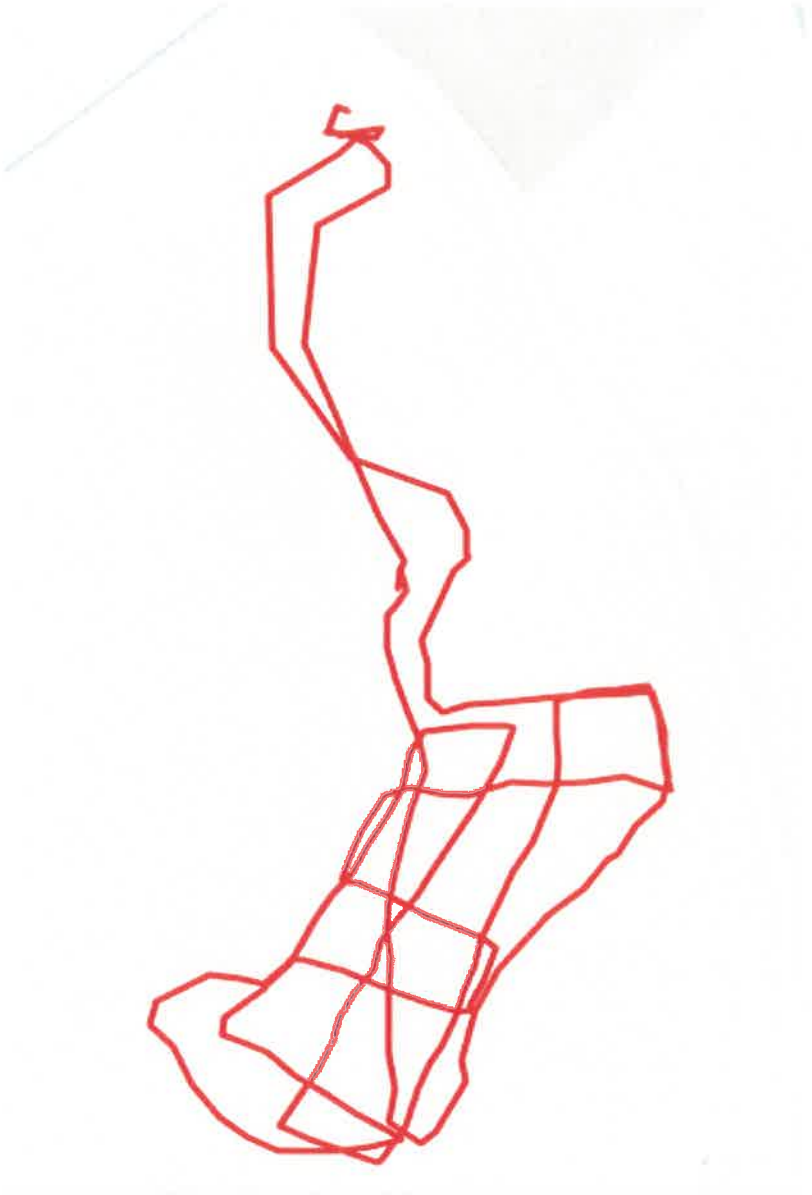
DECEMBER 2019		RAINFALL							
DATE	HOUR	DAILY		MONTH TODATE		WIND		CLOUD DESCRIPTION	WEATHER DESCRIPTION
1	A.M. / P.M.		MM.		MM.		M.P.H.		
2	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Frosty
3	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Frosty
4	A.M. / P.M.	—	MM.	—	MM.	—	M.P.H.	Clear	Dry / Cold.
5	A.M. / P.M.	10	MM.	10	MM.	—	M.P.H.	Cloudy	Dry
6	A.M. / P.M.	8	MM.	18	MM.	10	M.P.H.	Cloudy	Damp
7	A.M. / P.M.		MM.		MM.		M.P.H.		
8	A.M. / P.M.		MM.		MM.		M.P.H.		
9	A.M. / P.M.	31	MM.	49	MM.	5	M.P.H.	Clear	Dry
10	A.M. / P.M.	10	MM.	59	MM.	30	M.P.H.	V Cloudy	Heavy Rain
11	A.M. / P.M.		MM.		MM.		M.P.H.		
12	A.M. / P.M.	30	MM.	89	MM.	10	M.P.H.	Cloudy	Rain
13	A.M. / P.M.		MM.		MM.		M.P.H.		
14	A.M. / P.M.		MM.		MM.		M.P.H.		
15	A.M. / P.M.		MM.		MM.		M.P.H.		
16	A.M. / P.M.	45	MM.	134	MM.	—	M.P.H.	Clear	Dry
17	A.M. / P.M.	—	MM.	134	MM.	—	M.P.H.	Clear	Dry
18	A.M. / P.M.	8	MM.	142	MM.	10	M.P.H.	Cloudy	Dry / Cold.
19	A.M. / P.M.	15	MM.	157	MM.	10	M.P.H.	Cloudy	Rain
20	A.M. / P.M.	—	MM.	157	MM.	—	M.P.H.	Cloudy	Dry
21	A.M. / P.M.		MM.		MM.		M.P.H.		
22	A.M. / P.M.		MM.		MM.		M.P.H.		
23	A.M. / P.M.	9	MM.	186	MM.	+	M.P.H.	Cloudy	Dry / Wet.
24	A.M. / P.M.	.	MM.		MM.		M.P.H.		
25	A.M. / P.M.		MM.		MM.		M.P.H.		
26	A.M. / P.M.		MM.		MM.		M.P.H.		
27	A.M. / P.M.	8	MM.	174	MM.	—	M.P.H.	Clear	Dry
28	A.M. / P.M.		MM.		MM.		M.P.H.		
29	A.M. / P.M.		MM.		MM.		M.P.H.		
30	A.M. / P.M.	8	MM.	182	MM.	—	M.P.H.	Clear	Dry
31	A.M. / P.M.	—	MM.	182	MM.	—	M.P.H.	Clear	Dry

C:\Users\826714\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\XVJKSGD9\BLANK yearly weather record sheet

APPENDIX 6 –

Surface Emissions, Flare Emissions and Bulk Gases

Llwyn Isaf - Area 3
Walkover INICON survey carried out on the 04/12/19, dry overcast, light wind
Area 3 plot - max 12ppm



Element Materials Technology, Unit C6, Emery Court, The Embankment Business Park, Heaton Mersey, Stockport, SK4 3GL
Your Element Contact: James Eldridge (07826 916 684)
E: james.eldridge@element.com

Stack Emissions Testing Report Commissioned by
Gwynedd Council

Installation Name & Address
Gwynedd Council
Llwyn Isaf Landfill
Clynnog Fawr
Gwynedd
LL54 5DF

PPC Permit: YP3138UJ

Stack Reference
Landfill Gas Flare

Dates of the Monitoring Campaign
17th September 2019

Job Reference Number
EST-5169

Report Written by
Dagmara Kepczynska Team Leader MCERTS Level 2 MM 15 1358 TE1 TE2 TE3 TE4

Report Approved by
Michelle Edwards Team Leader MCERTS Level 2 MM 05 659 TE1 TE2 TE3 TE4

Report Date
15th October 219

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

Executive Summary

MONITORING OBJECTIVES

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare
17th September 2019

Overall Aim of the Monitoring Campaign

Element were commissioned by Gwynedd Council to carry out stack emissions testing on the Landfill Gas Flare at Llwyn Isaf Landfill.

The aim of the monitoring campaign was to demonstrate compliance with a set of emission limit values (ELVs) as specified in the Site's Permit.

Special Requirements

There were no special requirements.

Target Parameters

Total VOCs (as Carbon), Oxides of Nitrogen (as NO_2), Carbon Monoxide

Executive Summary

MONITORING RESULTS

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare
17th September 2019

where MU = Measurement Uncertainty associated with the Result

		Concentration		
Parameter	**Units**	**Result**	**MU +/-**	**Limit**
Total VOCs (as Carbon) [1]	mg/m³	5.6	0.73	10
Oxides of Nitrogen (as NO_2) [1]	mg/m³	137	6.9	150
Carbon Monoxide [1]	mg/m³	1.5	2.0	50
Oxygen	% v/v	Dry 9.5	0.37	
Water Vapour	% v/v	11.4	0.50	

[1] Reference Conditions (REF) are: 273K, 101.3kPa, dry gas, 3% oxygen.

Executive Summary

MONITORING DATE(S) & TIMES

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare
17th September 2019

Parameter		Units	Concentration	Sampling Date(s)	Sampling Times	Duration mins
Total VOCs (as Carbon)	R1	mg/m^3	5.6	17/09/2019	12:45 - 13:45	60
Oxides of Nitrogen (as NO_2)	R1	mg/m^3	137	17/09/2019	12:45 - 13:45	60
Carbon Monoxide	R1	mg/m^3	1.5	17/09/2019	12:45 - 13:45	60
Oxygen	R1	% v/v	9.5	17/09/2019	12:45 - 13:45	60
Water Vapour	R1	% v/v	11.4	17/09/2019	12:45 - 13:45	60

All results are expressed at the respective reference conditions.

PROCESS DETAILS

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare
17th September 2019

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	Full Capacity
Continuous or Batch Process	Continuous
Feedstock (if applicable)	N/A
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	Landfill Gas
Plume Appearance	None Visible

Executive Summary

MONITORING & ANALYTICAL METHODS

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare
17th September 2019

	Monitoring				Analysis					
Parameter	Standard	Technical Procedure	ISO 17025 Testing	Testing Lab	Analytical Procedure	Analytical Technique	ISO 17025 Analysis	Analysis Lab	MCERTS Testing	LOD (Average)
Water Vapour	EN 14790	CAT-TP-05	Yes	EET	CAT-TP-05	Gravimetric	Yes	EET	Yes	0.1 % v/v
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20	Yes	EET	Flame Ionisation Detection by Sick 3006 FID				Yes	0.32 mg/m³
Oxides of Nitrogen (as NO_2)	EN 14792	CAT-TP-21	Yes	EET	Chemiluminescence by Horiba PG-250				Yes	0.41 mg/m³
Carbon Monoxide	EN 15058	CAT-TP-21	Yes	EET	NDIR by Horiba PG-250				Yes	0.25 mg/m³
Oxygen	EN 14789	CAT-TP-21	Yes	EET	Dry Zirconia Cell by Horiba PG-250				Yes	0.1 %

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
All Parameters	All Runs	All sample gas was extracted from the stack via a 3m length of pre-installed unheated stainless steel 6mm tubing.

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	0.06
Width	m	-
Area	m^2	0.00
Port Depth	cm	0
Orientation of Duct	-	Vertical
Number of Ports	-	1
Sample Port Size	-	Valve

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	On Ground
Inside / Outside	Outside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	N/A
Platform has vertical base boards (approx. 0.25m high)	N/A
Platform has chains / self closing gates at top of ladders	N/A
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location does not meet all of the Flow Criteria requirements in the Environment Agency's Technical Guidance Note M1 and EN 15259 (see Validation Criteria Table below).

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Executive Summary

PLANT PHOTOS

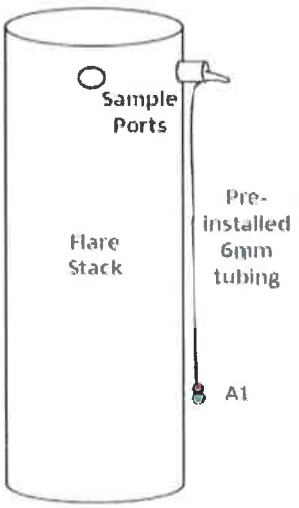
Photo 1

Photo 2

Photo 3

Photo 4

SAMPLE POINTS



where
- ○ = isokinetic point sampled at
- ● = isokinetic point not sampled at
- ● = combustion gases sample point
- ● = non-isokinetic sample point

APPENDIX CONTENTS

APPENDIX 1

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Dagmara Kepczynska	MCERTS Level 2	MM 15 1358	TE1 TE2 TE3 TE4
Trainee	Waqas Khan	MCERTS Trainee	MM 19 1932	None

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	-
Control Box DGM (2)	-
Box Thermocouples (1)	-
Box Thermocouples (2)	-
Umbilical (1)	-
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	-
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	-
S-Pitot (2)	-
L-Pitot	-
Site Balance	CAT 17.13
500g / 1Kg Check Weights	CAT 17.13
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	CAT 9.9
Horiba PG-250	-
Servomex 4900	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	CAT 4.0107
Gasmet DX4000	-
Gasmet Sampling System	-
Bernath 3006 FID	CAT 8.7
M&C PSS	-
Mass Flow Controller (1)	CAT 6.3
Mass Flow Controller (2)	CAT 6.4
Mass View (1)	CAT 25.16
Mass View (2)	CAT 25.35
Hioki 5043 (V)	CAT 11.64
Hioki 5031 (mA)	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	-
Digital Manometer (2)	-
Digital Temperature Meter	-
Stopwatch	CAT 14.53
Barometer	CAT 13.20
Stack Thermocouple (1)	-
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	
Tape Measure	CAT 16.14

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Water Vapour	EN 14790	CAT-TP-05
Total VOCs (as Carbon)	EN 12619:2013	CAT-TP-20
Oxides of Nitrogen (as NO_2)	EN 14792	CAT-TP-21
Carbon Monoxide	EN 15058	CAT-TP-21
Oxygen	EN 14789	CAT-TP-21

WATER VAPOUR: RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	% v/v	11.4	11.4
Uncertainty	±% v/v	0.50	0.50

General Sampling Information

Parameter	Value
Standard	EN 14790
Technical Procedure	CAT-TP-05

WATER VAPOUR: SAMPLING DETAILS

Sample Runs

Parameter	Units	Run 1
Sampling Times	-	12:45 - 13:45
Sampling Dates	-	17/09/2019
Sampling Device	-	MFC / MV
Duration	mins	60
Volume Sampled (STP, Dry)	m^3	0.1253
Volume Sampled (STP, Wet)	m^3	0.1413
Sample Flow Rate	l/min	2.06
Liquid Trap Start Mass	g	4445.7
Liquid Trap End Mass	g	4455.1
Silica Trap Start Mass	g	1474.1
Silica Trap End Mass	g	1477.6
Total Mass Of Water Vapour	g	12.9
Calculated Water Vapour	% v/v	11.37

Where: MFC stands for Mass Flow Controller, MV stands for Mass View Flowmeter

WATER VAPOUR: QUALITY ASSURANCE

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	2.1
Pre-Sampling Leak Rate	l/min	0.00
Post-Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.04
Leak Test Acceptable	-	Yes

Water Droplets	Units	Run 1
Are Water Droplets Present	-	No

Measurement Uncertainty	Units	Run 1
Measurement Uncertainty (MU)	%	4.4
Allowable MU	%	20.0
MU Acceptable	%	Yes

Silica Gel	Units	Run 1
Less than 50% Faded	%	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
All sample gas was extracted from the stack via a 3m length of pre-installed unheated stainless steel 6mm tubing.	x	

WATER VAPOUR: MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (STP)	V_m	0.1253	uV_m	m^3	0.0025
Repeatability of Weighing	R_w	12.90	uR_w	g	0.11
Reading of Balance	R_b	12.90	uR_b	g	0.06
Leak	L	0.00		%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (STP)	%	2.00	≤2%
Repeatability of Weighing	%	0.85	No Requirement
Reading of Balance	%	0.50	No Requirement
Leak	%	0.00	≤2%

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.1253	90.79
Repeatability of Weighing	R_w	g	12.90	0.88
Reading of Balance	R_b	g	12.90	0.88
Leak	L	% v/v	0.00	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	% v/v	0.227
Repeatability of Weighing	% v/v	0.097
Reading of Balance	% v/v	0.057
Leak	% v/v	0.000

Parameter	**Units**	**Run 1**
Combined uncertainty	% v/v	0.25
Expanded uncertainty (95% confidence)	% v/v	0.50
Expanded uncertainty (95% confidence), estimated with Method Deviations	% v/v	0.50
Uncertainty if Water Droplets are present	% v/v	N/A
Reported Uncertainty	% v/v	0.50
Expanded uncertainty (95% confidence)	%	4.4
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	4.4
Uncertainty if Water Droplets are present	%	N/A
Reported Uncertainty	%	4.4

APPENDIX 2

TOTAL VOCs (as CARBON): RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m³	5.6	5.6
Uncertainty	±mg/m³	0.73	0.73
Mass Emission	g/hr		
Uncertainty	±g/hr		

General Sampling Information

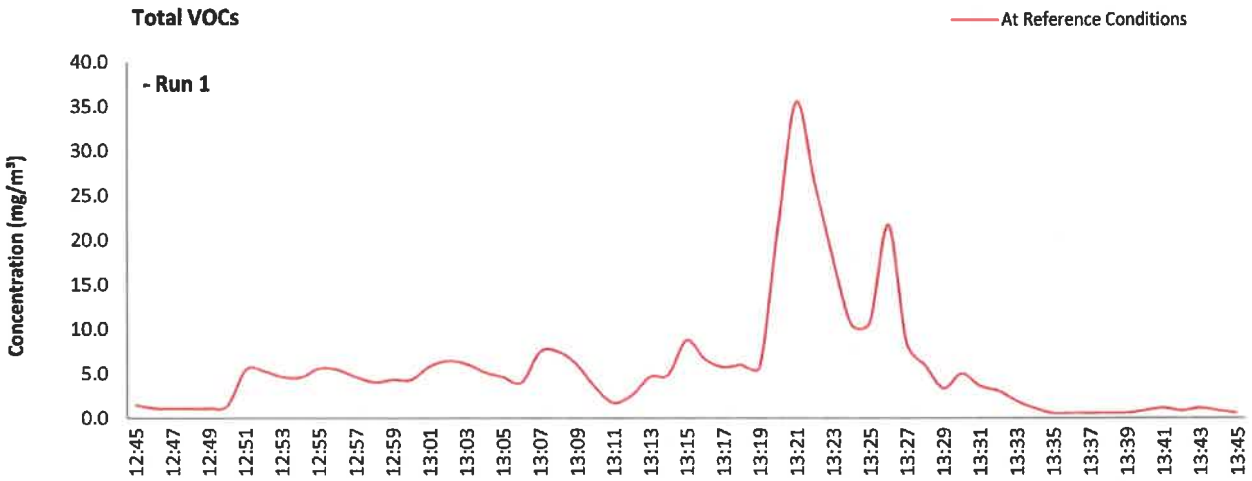
Parameter	Value	
Standard	EN 12619:2013	
Technical Procedure	CAT-TP-20	
Probe Material	Titanium	
Filtration Type / Size	2µm Stainless Steel and 0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Propane in 10% O_2 in N_2 (5 Grade)	
Span Gas Reference Number	CYL 12.0239 in N_2 | CYL 1.0362a in AIR	
Span Gas Expiry Date	09/08/2021 | 26/02/2024	
Span Gas Start Pressure (bar)	160 | 80	
Gas Cylinder Concentration (ppm)	82.9 | 80.32	
Span Gas Set Point (ppm)	81.67	This is the blended concentration of both propane cylinders
Span Gas Uncertainty (%)	2 | 2	
Zero Gas Type	10% O_2 in N_2 (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 3% oxygen.

TOTAL VOCs (as CARBON): DATA TREND

Graphical Trend of Data



TOTAL VOCs (as CARBON): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	12:45 - 13:45
Sampling Dates	-	17/09/2019
Instrument Range	ppm	100
Span Gas Value	ppm	81.7

Quality Assurance

	Zero Drift	Units	Run 1
CAL 1	Zero Down Sampling Line (Pre)	ppm	0.00
	Zero Down Sampling Line (Post)	ppm	0.00
	Zero Drift	ppm	0.00
	Allowable Zero Drift	± ppm	4.08
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span Down Sampling Line (Pre)	ppm	81.60
	Span Down Sampling Line (Post)	ppm	81.60
	Span Drift	ppm	0.00
	Allowable Span Drift	± ppm	4.08
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	14 - 15

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
All sample gas was extracted from the stack via a 3m length of pre-installed unheated stainless steel 6mm tubing.	x	

TOTAL VOCs (as CARBON): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	10.0		mg/m³ (REF)
TGN M2 Allowable MU	15.0		%
Measured concentration	3.59		mg/m³ (STP, dry)
Range Used	100.0		ppm
Range Used [A]	160.6		mg/m³
Cal gas conc.	81.7		ppm
Conversion	1.61		ppm to mg/m³
MCERTS Range [B]	15.0		mg/m³
Lower of [A] or [B]	15.0		mg/m³
Cal gas conc.	131.2		mg/m³

Performance characteristics	RUN 1		Units
Response time	45		seconds
Number of readings in measurement	60		-
Repeatability at zero	2.00		% full scale
Repeatability at span level	0.00		% full scale
Deviation from linearity	0.06		% of value
Zero drift	0.00		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	1.60		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	1.40		% full scale/10K
Combined interference	0.45		% range
Dependence on voltage	0.50		% full scale/10V
Losses in the line (leak)	0.12		% of value
Uncertainty of calibration gas	2.83		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.00		mg/m³
Lack of fit	0.01		mg/m³
Drift	0.00		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.01		mg/m³
Ambient temperature dependence	0.20		mg/m³
Combined interference (from MCERTS Certificate)	0.04		mg/m³
Dependence on voltage	0.06		mg/m³
Losses in the line (leak)	0.00		mg/m³
Uncertainty of calibration gas	0.06		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	3.59		mg/m³
Combined uncertainty			0.23		mg/m³
Expanded uncertainty	k =	1.96	0.44		mg/m³
Uncertainty corrected to std conds. (O_2)			0.69		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	12.32		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	4.42		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	15.0		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	12.90		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	7.93		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	15.5		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be <15% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 15% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components). Ref EA TGN M2.

APPENDIX 2

OXIDES OF NITROGEN (as NO_2): RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m³	137	137
Uncertainty	±mg/m³	6.9	6.9
Mass Emission	g/hr		
Uncertainty	±g/hr		

General Sampling Information

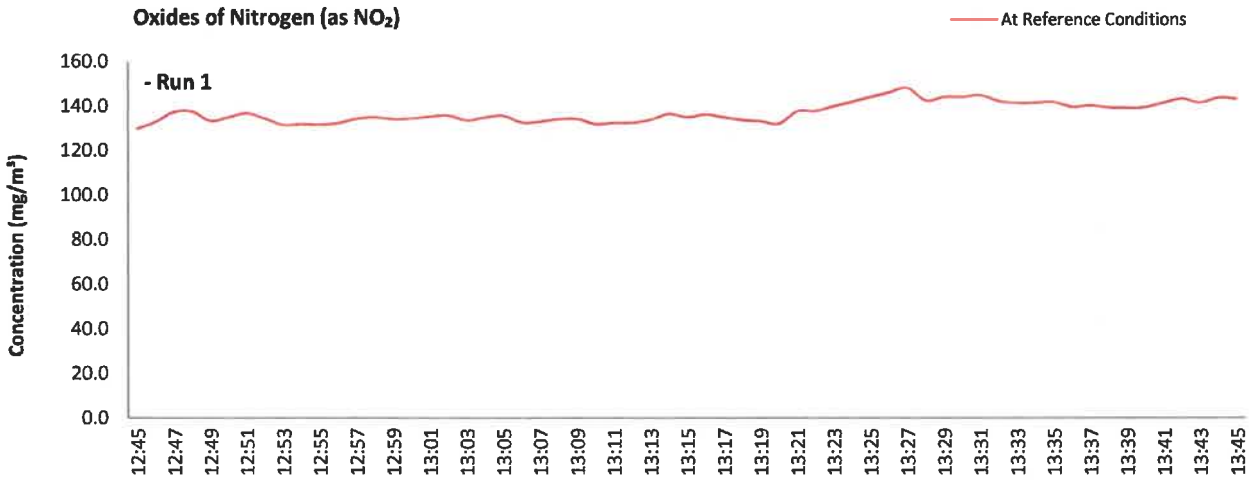
Parameter	Value	
Standard	EN 14792	
Technical Procedure	CAT-TP-21	
Probe Material	Titanium	
Filtration Type / Size	2µm Stainless Steel and 0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Date & Result of Last Converter Check	10/07/2019 - 96%	
Span Gas Type	Nitrogen Monoxide	
Span Gas Reference Number	CYL 12.0239	
Span Gas Expiry Date	09/08/2019	
Span Gas Start Pressure (bar)	160	
Gas Cylinder Concentration (ppm)	414.9	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 3% oxygen.

OXIDES OF NITROGEN (as NO_2): DATA TREND

Graphical Trend of Data



OXIDES OF NITROGEN (as NO_2): SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	12:45 - 13:45
Sampling Dates	-	17/09/2019
Instrument Range	ppm	250
Span Gas Value	ppm	73.1

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	3.0
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	ppm	0.00
	Zero at Analyser (Post)	ppm	-0.30
	Zero Drift	ppm	-0.30
	Allowable Zero Drift	± ppm	3.65
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	ppm	72.90
	Span at Analyser (Post)	ppm	75.00
	Span Drift	ppm	2.10
	Allowable Span Drift	± ppm	3.65
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	14 - 15

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
All sample gas was extracted from the stack via a 3m length of pre-installed unheated stainless steel 6mm tubing.	x	

OXIDES OF NITROGEN (as NO_2): MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	150.0		mg/m³ (REF)
TGN M2 Allowable MU	10.0		%
Measured concentration	87.45		mg/m³ (STP, dry)
Ratio NO / NO_2	5		%
Range Used	250.0		ppm
Range Used [A]	513.1		mg/m³
Cal gas conc.	73.1		ppm
Conversion	2.05		ppm to mg/m³
MCERTS Range [B]	125.0		mg/m³
Lower of [A] or [B]	125.0		mg/m³
Cal gas conc.	150.0		mg/m³

Performance characteristics	RUN 1		Units
Response time	60		seconds
Number of readings in measurement	60		-
Repeatability at zero	0.40		% full scale
Repeatability at span level	0.40		% full scale
Deviation from linearity	0.28		% of value
Zero drift	-0.41		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	0.40		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	0.18		% full scale/10K
Combined interference	0.60		% range
Dependence on voltage	0.40		% full scale/10V
Converter efficiency	96.0		%
Losses in the line (leak)	0.00		% of value
Uncertainty of calibration gas blending	1.40		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.05		mg/m³
Lack of fit	0.20		mg/m³
Drift	-0.36		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.11		mg/m³
Ambient temperature dependence	0.03		mg/m³
Combined interference (from MCERTS Certificate)	0.43		mg/m³
Dependence on voltage	0.05		mg/m³
Converter efficiency	0.10		mg/m³
Losses in the line (leak)	0.00		mg/m³
Uncertainty of calibration gas blending	0.71		mg/m³
Uncertainty of calibration gas	1.01		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	87.45		mg/m³
Combined uncertainty			1.45		mg/m³
Expanded uncertainty	k =	1.96	2.83		mg/m³
Uncertainty corrected to std conds. (O_2)			4.45		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	3.24		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	1.89		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	10.0		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	5.02		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	4.85		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	10.7		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be <10% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 10% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components). Ref EA TGN M2.

APPENDIX 2

CARBON MONOXIDE: RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare

Sample Runs

Parameter	Units	Run 1	Mean
Concentration	mg/m³	1.5	1.5
Uncertainty	±mg/m³	2.0	2.0
Mass Emission	g/hr		
Uncertainty	±g/hr		

General Sampling Information

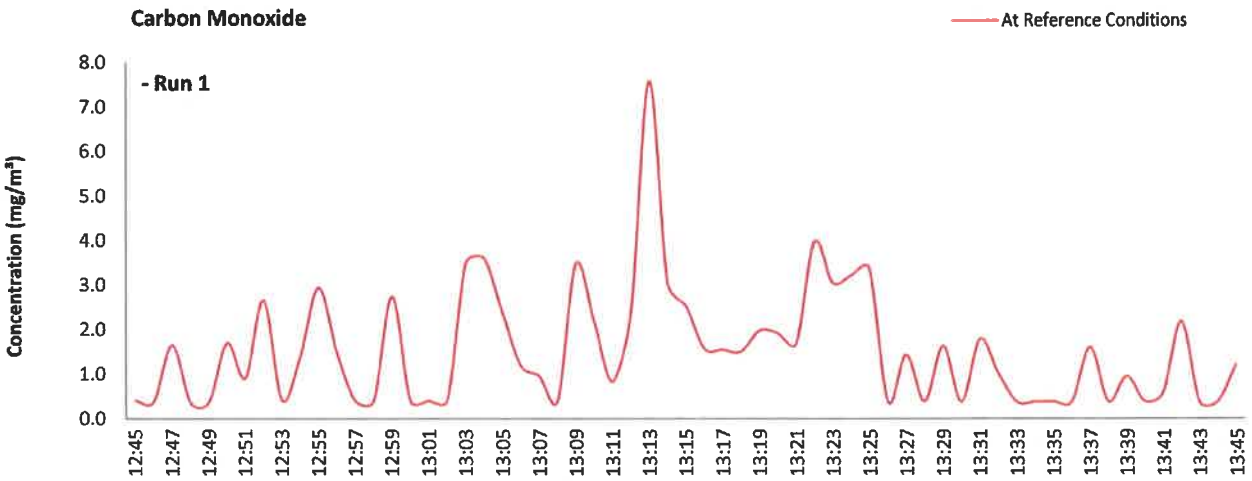
Parameter	Value	
Standard	EN 15058	
Technical Procedure	CAT-TP-21	
Probe Material	Titanium	
Filtration Type / Size	2µm Stainless Steel and 0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Carbon Monoxide	
Span Gas Reference Number	CYL 12.0239	
Span Gas Expiry Date	09/08/2019	
Span Gas Start Pressure (bar)	160	
Gas Cylinder Concentration (ppm)	411.2	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, dry gas, 3% oxygen.

CARBON MONOXIDE: DATA TREND

Graphical Trend of Data



CARBON MONOXIDE: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	12:45 - 13:45
Sampling Dates	-	17/09/2019
Instrument Range	ppm	100
Span Gas Value	ppm	40.0

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	3.0
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	ppm	0.00
	Zero at Analyser (Post)	ppm	0.40
	Zero Drift	ppm	0.40
	Allowable Zero Drift	± ppm	2.00
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	ppm	40.50
	Span at Analyser (Post)	ppm	41.90
	Span Drift	ppm	1.40
	Allowable Span Drift	± ppm	2.00
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	14 - 15

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
All sample gas was extracted from the stack via a 3m length of pre-installed unheated stainless steel 6mm tubing.	x	

CARBON MONOXIDE: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	50.0		mg/m³ (REF)
TGN M2 Allowable MU	6.0		%
Measured concentration	0.98		mg/m³ (STP, dry)
Range Used	100.0		ppm
Range Used [A]	124.9		mg/m³
Cal gas conc.	40.0		ppm
Conversion	1.25		ppm to mg/m³
MCERTS Range [B]	95.0		mg/m³
Lower of [A] or [B]	95.0		mg/m³
Cal gas conc.	50.0		mg/m³

Performance characteristics	RUN 1		Units
Response time	60		seconds
Number of readings in measurement	60		-
Repeatability at zero	0.40		% full scale
Repeatability at span level	0.40		% full scale
Deviation from linearity	0.12		% of value
Zero drift	0.99		% full scale
Span drift	0.00		% full scale
Volume or pressure flow dependence	0.40		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	0.05		% full scale/10K
Combined interference	0.73		% range
Dependence on voltage	0.40		% full scale/10V
Losses in the line (leak)	1.50		% of value
Uncertainty of calibration gas blending	1.40		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		mg/m³
Standard deviation of repeatability at span level	0.05		mg/m³
Lack of fit	0.07		mg/m³
Drift	0.29		mg/m³
Volume or pressure flow dependence	0.00		mg/m³
Atmospheric pressure dependence	0.08		mg/m³
Ambient temperature dependence	0.01		mg/m³
Combined interference (from MCERTS Certificate)	0.40		mg/m³
Dependence on voltage	0.05		mg/m³
Losses in the line (leak)	0.01		mg/m³
Uncertainty of calibration gas blending	0.01		mg/m³
Uncertainty of calibration gas	0.01		mg/m³

			RUN 1		Units
Measurement uncertainty		**Result**	0.98		mg/m³
Combined uncertainty			0.64		mg/m³
Expanded uncertainty	k =	1.96	1.26		mg/m³
Uncertainty corrected to std conds. (O_2)			1.98		mg/m³ (REF)

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	128.41		% of Value
Expanded uncertainty (no O_2) - at 95% Confidence	2.52		% at ELV
Overall Allowable uncertainty (no O_2) - at 95% Confidence	6.0		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**N/A**		-

	RUN 1		Units
Expanded uncertainty (with O_2) - at 95% Confidence	128.47		% of Value
Expanded uncertainty (with O_2) - at 95% Confidence	5.51		% at ELV
Overall Allowable uncertainty (with O_2) - at 95% Confidence	7.1		% at ELV
Result of Compliance with Uncertainty Requirement in M2	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be <6% of the value at the ELV, on a dry gas basis, or if O_2 correction is applied less than 6% + the uncertainty associated with the O_2 correction (using sqrt of sum squares to add uncertainty components). Ref EA TGN M2.

OXYGEN: RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill
Landfill Gas Flare

Sample Runs

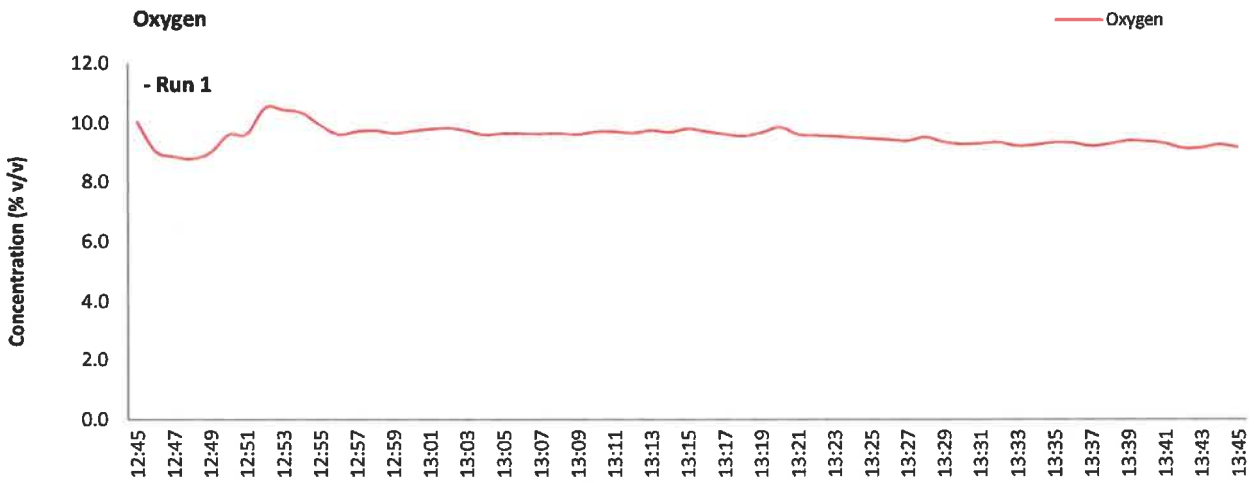
Parameter	Units	Run 1		Mean
Concentration	% v/v	9.5		9.5
Uncertainty	±% v/v	0.37		0.37

General Sampling Information

Parameter	Value	
Standard	EN 14789	
Technical Procedure	CAT-TP-21	
Probe Material	Titanium	
Filtration Type / Size	2µm Stainless Steel and 0.1µm Glass Fibre	
Heated Head Filter Used	Yes	
Heated Line Temperature	180°C	
Span Gas Type	Synthetic Air (5 Grade)	
Span Gas Reference Number	CYL 11.0348	
Span Gas Expiry Date	24/07/2023	
Span Gas Start Pressure (bar)	160	
Gas Cylinder Concentration (% v/v)	21.02	NOTE: Dilution performed to achieve correct span value
Span Gas Uncertainty (%)	2	
Zero Gas Type	Nitrogen (5 Grade)	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

OXYGEN: DATA TREND

Graphical Trend of Data



OXYGEN: SAMPLING DETAILS & QUALITY ASSURANCE

Sampling Details

Parameter	Units	Run 1
Sampling Times	-	12:45 - 13:45
Sampling Dates	-	17/09/2019
Instrument Range	% v/v	25
Span Gas Value	% v/v	10.0

Quality Assurance

Conditioning Unit Temperature	Units	Run 1
Average Temperature	°C	3.0
Allowable Temperature	< °C	4.0
Temperature Acceptable	-	Yes

	Zero Drift	Units	Run 1
CAL 1	Zero at Analyser (Pre)	% v/v	-0.01
CAL 1	Zero at Analyser (Post)	% v/v	-0.01
CAL 1	Zero Drift	% v/v	0.00
	Allowable Zero Drift	± % v/v	0.50
	Zero Drift Acceptable	-	Yes

	Span Drift	Units	Run 1
CAL 1	Span at Analyser (Pre)	% v/v	9.50
CAL 1	Span at Analyser (Post)	% v/v	9.48
CAL 1	Span Drift	% v/v	-0.02
	Allowable Span Drift	± % v/v	0.50
	Span Drift Acceptable	-	Yes

Test Conditions	Units	Run 1
Run Ambient Temperature Range	°C	14 - 15

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
All sample gas was extracted from the stack via a 3m length of pre-installed unheated stainless steel 6mm tubing.	x	

OXYGEN: MEASUREMENT UNCERTAINTY CALCULATIONS

Performance characteristics	RUN 1		Units
Limit value	N/A		%vol
TGN M2 Allowable MU	6.0		%
Measured concentration	9.54		%vol
Range Used	25.0		%vol
Cal gas conc.	21.0		%vol

Performance characteristics	RUN 1		Units
Response time	60		seconds
Number of readings in measurement	60		-
Repeatability at zero	0.04		% full scale
Repeatability at span level	0.04		% full scale
Deviation from linearity	0.07		% of value
Zero drift	0.00		% full scale
Span drift	-0.21		% full scale
Volume or pressure flow dependence	0.20		% of full scale
Atmospheric pressure dependence	0.30		% of value/kPa
Ambient temperature dependence	-0.07		% full scale/10K
Combined interference	0.56		% range
Dependence on voltage	0.02		% full scale/10V
Losses in the line (leak)	1.70		% of value
Uncertainty of calibration gas	2.00		% of value

Performance characteristic	RUN 1		Units
Standard deviation of repeatability at zero	use rep at span		%vol
Standard deviation of repeatability at span level	0.01		%vol
Lack of fit	0.01		%vol
Drift	-0.01		%vol
Volume or pressure flow dependence	0.00		%vol
Atmospheric pressure dependence	0.02		%vol
Ambient temperature dependence	-0.01		%vol
Combined interference (from MCERTS Certificate)	0.08		%vol
Dependence on voltage	0.00		%vol
Losses in the line (leak)	0.09		%vol
Uncertainty of calibration gas	0.11		%vol

			RUN 1		Units
Measurement uncertainty		**Result**	9.54		%vol
Combined uncertainty			0.19		%vol
Expanded uncertainty	k =	1.96	0.37		%vol

	RUN 1		Units
Expanded uncertainty (no O_2) - at 95% Confidence	3.83		% of Value
Result of Compliance with Uncertainty Requirement in M2	**COMPLIANT**		-

Requirement for SRM is that Uncertainty should be 0.3% vol absolute or 6% relative whichever is the lower, on a dry gas basis. Source, EN 14789.

Element Materials Technology, Unit C6, Emery Court, The Embankment Business Park, Heaton Mersey, Stockport, SK4 3GL
Your Element Contact: James Eldridge (07826 916 684)
E: james.eldridge@element.com

Stack Emissions Testing Report Commissioned by
Gwynedd Council

Installation Name & Address
Gwynedd Council
Llwyn Isaf Landfill
Clynnog Fawr
Gwynedd
LL54 5DF

PPC Permit: YP3138UJ

Stack Reference
Raw Landfill Gas

Dates of the Monitoring Campaign
17th September 2019

Job Reference Number
EST-5169

Report Written by
Dagmara Kepczynska Team Leader MCERTS Level 2 MM 15 1358 TE1 TE2 TE3 TE4

Report Approved by
Michelle Edwards Team Leader MCERTS Level 2 MM 05 659 TE1 TE2 TE3 TE4

Report Date
15th October 2019

Version
Version 1

Signature of Report Approver


CONTENTS

Opinions and interpretations expressed herein are outside the scope of Element's ISO 17025 accreditation.

Executive Summary

MONITORING OBJECTIVES

Gwynedd Council, Llwyn Isaf Landfill
Raw Landfill Gas
17th September 2019

Overall Aim of the Monitoring Campaign

Element were commissioned by Gwynedd Council to carry out stack emissions testing on the Raw Landfill Gas at Llwyn Isaf Landfill.

The aim of the monitoring campaign was to demonstrate compliance with a set of emission limit values (ELVs) as specified in the Site's Permit.

Special Requirements

There were no special requirements.

Target Parameters

Arsenic , Methanal (Formaldehyde) , Ethanal (Acetaldehyde) , 1,1,1-Trichloroethane , Trichloroethylene , Tetrachloroethylene , 1,1-Dichloroethane , 1,2-Dichloroethylene , Vinyl Chloride , 1,1-Dichloroethylene , 1,2-Dichloroethane , Chloroethane , Carbon Tetrachloride , Carbon Disulphide , Dimethyl Sulphide , Dimethyl Disulphide , Ethane Thiol , Methane Thiol , Trimethylbenzenes , 1,3-Butadiene , 1-Pentene , Furan , Benzene , 1-Propanethiol , 1-Butanethiol , Toluene , Ethyl Butyrate , Xylenes , Styrene , Butyric Acid , 1,1,2,2-Tetrachloroethane , Dichloromethane , Total Chlorinated Compounds , Total Fluorinated Compounds , Total Organosulphur Compounds , Total Chlorinated Compounds as Cl , Total Chlorinated Compounds as F , Total Organosulphur Compounds as S , Total Volatile Organic Compounds , Bulk Gases,Siloxanes,Hydrogen Sulphide,

Executive Summary

MONITORING RESULTS

Gwynedd Council, Llwyn Isaf Landfill
Raw Landfill Gas
17th September 2019

where MU = Measurement Uncertainty associated with the Result

		Concentration		
Parameter	**Units**	**Result**	**MU +/-**	**Limit**
Arsenic [1]	mg/m³	< 0.05	0.01	-
1,1,1-Trichloroethane [1]	mg/m³	0.03	0.01	-
Trichloroethylene [1]	mg/m³	0.01	0.00	-
Tetrachloroethylene [1]	mg/m³	0.02	0.00	-
1,1-Dichloroethane [1]	mg/m³	0.01	0.00	-
1,2-Dichloroethylene [1]	mg/m³	0.03	0.01	-
Vinyl Chloride [1]	mg/m³	0.03	0.01	-
1,1-Dichloroethylene [1]	mg/m³	0.02	0.00	-
1,2-Dichloroethane [1]	mg/m³	0.00	0.00	-
Chloroethane [1]	mg/m³	0.01	0.00	-
Carbon Tetrachloride [1]	mg/m³	0.01	0.00	-
Carbon Disulphide [1]	mg/m³	0.04	0.01	-
Dimethyl Sulphide [1]	mg/m³	0.02	0.00	-
Dimethyl Disulphide [1]	mg/m³	0.00	0.00	-
Ethane Thiol [1]	mg/m³	0.07	0.02	-
Methane Thiol [1]	mg/m³	0.22	0.05	-
Trimethylbenzenes [1]	mg/m³	0.14	0.03	-
1,3-Butadiene [1]	mg/m³	0.16	0.04	-
1-Pentene [1]	mg/m³	0.03	0.01	-
Furan [1]	mg/m³	0.02	0.00	-
Benzene [1]	mg/m³	0.06	0.01	-
1-Propanethiol [1]	mg/m³	0.02	0.01	-
1-Butanethiol [1]	mg/m³	0.01	0.00	-
Toluene [1]	mg/m³	0.08	0.02	-
Ethyl Butyrate [1]	mg/m³	0.01	0.00	-
Xylenes [1]	mg/m³	0.01	0.00	-
Styrene [1]	mg/m³	0.03	0.01	-
Butyric Acid [1]	mg/m³	0.22	0.05	-
1,1,2,2-Tetrachloroethane [1]	mg/m³	0.14	0.03	-
Dichloromethane [1]	mg/m³	0.02	0.01	-
Total Chlorinated Compounds [1]	mg/m³	0.05	0.01	-
Total Fluorinated Compounds [1]	mg/m³	0.05	0.01	-
Total Organosulphur Compounds [1]	mg/m³	0.05	0.01	-
Total Chlorinated Compounds as Cl [1]	mg/m³	0.05	0.01	-
Total Chlorinated Compounds as F [1]	mg/m³	0.05	0.01	-
Total Organosulphur Compounds as S [1]	mg/m³	0.05	0.01	-
Total Volatile Organic Compounds [1]	mg/m³	1.09	0.22	-

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary

MONITORING RESULTS

Gwynedd Council, Llwyn Isaf Landfill
Raw Landfill Gas
17th September 2019

where MU = Measurement Uncertainty associated with the Result

		Concentration		
Parameter	**Units**	**Result**	**MU +/-**	**Limit**
Hexamethylcyclotrisiloxane [1]	mg/m³	< 1.0	-	-
Octamethylcyclotrisiloxane [1]	mg/m³	< 1.0	-	-
Decamethylcyclotrisiloxane [1]	mg/m³	< 1.0	-	-
Hexamethyldisiloxane [1]	mg/m³	2.1	-	-
Octamethyltrisiloxane [1]	mg/m³	< 1.0	-	-
Decamethyltetrasiloxane [1]	mg/m³	< 1.0	-	-
Dodecamethylpentasiloxane [1]	mg/m³	< 1.0	-	-
Dodecamethylcyclohexasiloxane [1]	mg/m³	< 1.0	-	-
Trimethyl Silanol (Toluene Equivalent) [1]	mg/m³	< 1.0	-	-
Methane [1]	%	53.2	-	-
Carbon Dioxide [1]	%	20.9	-	-
Nitrogen [1]	%	22.2	-	-
Oxygen [1]	%	3.70	-	-
Hydrogen [1]	ppm	< 20.0	-	-
Ethylene [1]	ppm	< 5.0	-	-
Ethane [1]	ppm	7.0	-	-
Acetylene [1]	ppm	< 5.0	-	-
Hydrogen Sulphide [1]	ppm	< 10.0	-	-
Carbon Monoxide [1]	ppm	< 5.0	-	-

[1] Reference Conditions (REF) are: 273K, 101.3kPa, without correction for water vapour content.

Executive Summary

MONITORING DATE(S) & TIMES

Gwynedd Council, Llwyn Isaf Landfill
Raw Landfill Gas
17th September 2019

Parameter		Units	Concentration	Sampling Date(s)	Sampling Times	Duration mins
Arsenic	R1	mg/m³	< 0.05	17/09/2019	12:50 - 13:10	20
Methanal (Formaldehyde)	R1	mg/m³	0.06	17/09/2019	13:11 - 13:31	20
Ethanal (Acetaldehyde)	R1	mg/m³	0.04	17/09/2019	13:11 - 13:31	20
1,1,1-Trichloroethane	R1	mg/m³	0.03	17/09/2019	13:35 - 13:50	5
Trichloroethylene	R1	mg/m³	0.01	17/09/2019	13:35 - 13:50	5
Tetrachloroethylene	R1	mg/m³	0.02	17/09/2019	13:35 - 13:50	5
1,1-Dichloroethane	R1	mg/m³	0.01	17/09/2019	13:35 - 13:50	5
1,2-Dichloroethylene	R1	mg/m³	0.03	17/09/2019	13:35 - 13:50	5
Vinyl Chloride	R1	mg/m³	0.03	17/09/2019	13:35 - 13:50	5
1,1-Dichloroethylene	R1	mg/m³	0.02	17/09/2019	13:35 - 13:50	5
1,2-Dichloroethane	R1	mg/m³	0.00	17/09/2019	13:35 - 13:50	5
Chloroethane	R1	mg/m³	0.01	17/09/2019	13:35 - 13:50	5
Carbon Tetrachloride	R1	mg/m³	0.01	17/09/2019	13:35 - 13:50	5
Carbon Disulphide	R1	mg/m³	0.04	17/09/2019	13:35 - 13:50	5
Dimethyl Sulphide	R1	mg/m³	0.02	17/09/2019	13:35 - 13:50	5
Dimethyl Disulphide	R1	mg/m³	0.00	17/09/2019	13:35 - 13:50	5
Ethane Thiol	R1	mg/m³	0.07	17/09/2019	13:35 - 13:50	5
Methane Thiol	R1	mg/m³	0.22	17/09/2019	13:35 - 13:50	5
Trimethylbenzenes	R1	mg/m³	0.14	17/09/2019	13:35 - 13:50	5
1,3-Butadiene	R1	mg/m³	0.16	17/09/2019	13:35 - 13:50	5
1-Pentene	R1	mg/m³	0.03	17/09/2019	13:35 - 13:50	5
Furan	R1	mg/m³	0.02	17/09/2019	13:35 - 13:50	5
Benzene	R1	mg/m³	0.06	17/09/2019	13:35 - 13:50	5
1-Propanethiol	R1	mg/m³	0.02	17/09/2019	13:35 - 13:50	5
1-Butanethiol	R1	mg/m³	0.01	17/09/2019	13:35 - 13:50	5
Toluene	R1	mg/m³	0.08	17/09/2019	13:35 - 13:50	5
Ethyl Butyrate	R1	mg/m³	0.01	17/09/2019	13:35 - 13:50	5
Xylenes	R1	mg/m³	0.01	17/09/2019	13:35 - 13:50	5
Styrene	R1	mg/m³	0.03	17/09/2019	13:35 - 13:50	5
Butyric Acid	R1	mg/m³	0.22	17/09/2019	13:35 - 13:50	5
1,1,2,2-Tetrachloroethane	R1	mg/m³	0.14	17/09/2019	13:35 - 13:50	5
Dichloromethane	R1	mg/m³	0.02	17/09/2019	13:35 - 13:50	5
Total Chlorinated Compounds	R1	mg/m³	0.05	17/09/2019	13:35 - 13:50	5
Total Fluorinated Compounds	R1	mg/m³	0.05	17/09/2019	13:35 - 13:50	5
Total Organosulphur Compounds	R1	mg/m³	0.05	17/09/2019	13:35 - 13:50	5
Total Chlorinated Compounds as Cl	R1	mg/m³	0.05	17/09/2019	13:35 - 13:50	5
Total Chlorinated Compounds as F	R1	mg/m³	0.05	17/09/2019	13:35 - 13:50	5
Total Organosulphur Compounds as S	R1	mg/m³	0.05	17/09/2019	13:35 - 13:50	5
Total Volatile Organic Compounds	R1	mg/m³	1.09	17/09/2019	13:35 - 13:50	5

All results are expressed at the respective reference conditions.

MONITORING DATE(S) & TIMES

Gwynedd Council, Llwyn Isaf Landfill
Raw Landfill Gas
17th September 2019

Parameter		Units	Concentration	Sampling Date(s)	Sampling Times	Duration mins
Hexamethylcyclotrisiloxane	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Octamethylcyclotrisiloxane	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Decamethylcyclotrisiloxane	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Hexamethyldisiloxane	R1	mg/m³	2.1	17/09/2019	14:00 - 14:05	5
Octamethyltrisiloxane	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Decamethyltetrasiloxane	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Dodecamethylpentasiloxane	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Dodecamethylcyclohexasiloxane	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Trimethyl Silanol (Toluene Equivalent)	R1	mg/m³	< 1.0	17/09/2019	14:00 - 14:05	5
Methane	R1	%	53.2	17/09/2019	14:00 - 14:05	5
Carbon Dioxide	R1	%	20.9	17/09/2019	14:00 - 14:05	5
Nitrogen	R1	%	22.2	17/09/2019	14:00 - 14:05	5
Oxygen	R1	%	3.7	17/09/2019	14:00 - 14:05	5
Hydrogen	R1	ppm	< 20.0	17/09/2019	14:00 - 14:05	5
Ethylene	R1	ppm	< 5.0	17/09/2019	14:00 - 14:05	5
Ethane	R1	ppm	7.0	17/09/2019	14:00 - 14:05	5
Acetylene	R1	ppm	< 5.0	17/09/2019	14:00 - 14:05	5
Hydrogen Sulphide	R1	ppm	< 10.0	17/09/2019	14:00 - 14:05	5
Carbon Monoxide	R1	ppm	< 5.0	17/09/2019	14:00 - 14:05	5

PROCESS DETAILS

Gwynedd Council, Llwyn Isaf Landfill
Raw Landfill Gas
17th September 2019

Standard Operating Conditions

Parameter	Value
Process Status	Normal Operation
Capacity (of 100%) and Tonnes / Hour	N/A
Continuous or Batch Process	Continuous
Feedstock (if applicable)	Raw Gas Supply
Abatement System	N/A
Abatement System Running Status	N/A
Fuel	N/A
Plume Appearance	None Visible

MONITORING & ANALYTICAL METHODS

Gwynedd Council, Llwyn Isaf Landfill
Raw Landfill Gas
17th September 2019

	Monitoring				Analysis					
Parameter	Standard	Technical Procedure	ISO 17025 Testing	Testing Lab	Analytical Procedure	Analytical Technique	ISO 17025 Analysis	Analysis Lab	MCERTS Testing	LOD (Average)
Arsenic	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.049 mg/m³
Methanal (Formaldehyde)	CEN/TS 13649	CAT-TP-16	Yes	EET	Not listed	Not Listed	No	LUC	No	0.02 mg/m³
Ethanal (Acetaldehyde)	CEN/TS 13649	CAT-TP-16	Yes	EET	Not listed	Not Listed	No	LUC	No	0.02 mg/m³
1,1,1-Trichloroethane	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.031 mg/m³
Trichloroethylene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.013 mg/m³
Tetrachloroethylene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.018 mg/m³
1,1-Dichloroethane	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.015 mg/m³
1,2-Dichloroethylene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.026 mg/m³
Vinyl Chloride	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.025 mg/m³
1,1-Dichloroethylene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.015 mg/m³
1,2-Dichloroethane	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.003 mg/m³
Chloroethane	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.011 mg/m³
Carbon Tetrachloride	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.008 mg/m³
Carbon Disulphide	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.038 mg/m³
Dimethyl Sulphide	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.015 mg/m³
Dimethyl Disulphide	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.003 mg/m³
Ethane Thiol	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.065 mg/m³
Methane Thiol	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.218 mg/m³
Trimethylbenzenes	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.136 mg/m³
1,3-Butadiene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.163 mg/m³
1-Pentene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.027 mg/m³
Furan	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.016 mg/m³
Benzene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.005 mg/m³
1-Propanethiol	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.022 mg/m³
1-Butanethiol	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.011 mg/m³
Toluene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.016 mg/m³
Ethyl Butyrate	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.011 mg/m³
Xylenes	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.011 mg/m³
Styrene	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.027 mg/m³
Butyric Acid	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.218 mg/m³
1,1,2,2-Tetrachloroethane	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.136 mg/m³
Dichloromethane	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.024 mg/m³
Total Chlorinated Compounds	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.054 mg/m³
Total Fluorinated Compounds	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.054 mg/m³
Total Organosulphur Compounds	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.054 mg/m³
Total Chlorinated Compounds as Cl	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.054 mg/m³
Total Chlorinated Compounds as F	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.054 mg/m³
Total Organosulphur Compounds as S	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	0.054 mg/m³
Total Volatile Organic Compounds	CEN/TS 13649	CAT-TP-16	Yes	EET	Not Listed	Not Listed	No	LUC	No	1.088 mg/m³
Bulk Gases	In House	CAT-TP-27	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	0.1 % v/v
Hydrogen Sulphide	In House	CAT-TP-27	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	5ppm
Siloxanes	In House	CAT-TP-27	Yes	EET	Not Listed	Not Listed	Yes	LUC	Yes	1.0 mg/m³

ANALYSIS LABORATORIES

(with short name reference as appears in the table above)

Lucideon (LUC)	ISO 17025 Accreditation Number: 0013

SUMMARY OF SAMPLING DEVIATIONS

Parameter	Run	Deviation
Benzene & Toluene	All	The absorption efficiency was less than the required 90%. [75 - 90%]

SUITABILITY OF SAMPLING LOCATION

Duct Characteristics

Parameter	Units	Value
Type	-	Circular
Depth	m	-
Width	m	-
Area	m^2	-
Port Depth	cm	-
Orientation of Duct	-	Vertical
Number of Ports	-	1
Sample Port Size	-	Valve

Location of Sampling Platform

General Platform Information	Value
Permanent / Temporary Platform	On Ground
Inside / Outside	Outside

Platform Details

EA Technical Guidance Note M1 / EN 15259 Platform Requirements	Value
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m & 1.0m high)	N/A
Platform has vertical base boards (approx. 0.25m high)	N/A
Platform has chains / self closing gates at top of ladders	N/A
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

Sampling Location / Platform Improvement Recommendations

The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations.

EN 15259 Homogeneity Test Requirements

There is no requirement to perform a EN 15259 Homogeneity Test on this Stack.

Executive Summary

(Page 7 of 7)

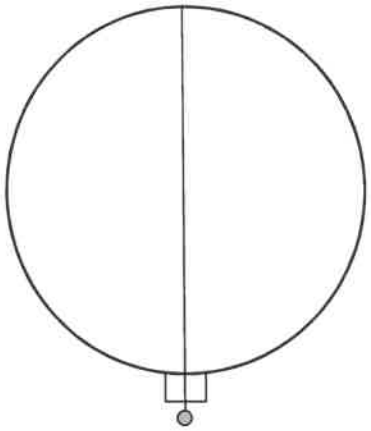
PLANT PHOTOS

Photo 1

Photo 2

Photo 3

SAMPLE POINTS



where ○ = isokinetic point sampled at
● = isokinetic point not sampled at
● = combustion gases sample point
● = non-isokinetic sample point

APPENDIX CONTENTS

APPENDIX 1

STACK EMISSIONS MONITORING PERSONNEL

Position	Name	MCERTS Accreditation	MCERTS Number	Technical Endorsements
Team Leader	Dagmara Kepczynska	MCERTS Level 2	MM 15 1358	TE1 TE2 TE3 TE4
Trainee	Waqas Khan	MCERTS Trainee	MM 19 1932	None

LIST OF EQUIPMENT

Extractive Sampling	
Equipment Type	**Equipment I.D.**
Control Box DGM (1)	-
Control Box DGM (2)	-
Box Thermocouples (1)	-
Box Thermocouples (2)	-
Umbilical (1)	-
Umbilical (2)	-
Oven Box (1)	-
Oven Box (2)	-
Heated Probe (1)	-
Heated Probe (2)	-
Heated Probe (3)	-
S-Pitot (1)	-
S-Pitot (2)	-
L-Pitot	-
Site Balance	-
500g / 1Kg Check Weights	-
Last Impinger Arm	-
Callipers	-
Tubes Kit Thermocouple	-

Instrumental Analysers	
Equipment Type	**Equipment I.D.**
Horiba PG-250	-
Horiba PG-350E	-
Servomex 4900	-
Eco Physics CLD 822Mh	-
ABB AO2020-URAS26	-
Testo 350 XL	-
JCT JCC P1 Cooler	-
Gasmet DX4000	-
Gasmet Sampling System	-
Bernath 3006 FID	-
M&C PSS	-
Mass Flow Controller (1)	-
Mass Flow Controller (2)	-
Mass View (1)	CAT 25.16
Mass View (2)	CAT 25.35
Easylogger EN-EL-12 Bit	-
Hioki 5043 (V)	-
Bioaerosols Temperature Logger	-
Electronic Refrigerator	-

Miscellaneous Items	
Equipment Type	**Equipment I.D.**
Digital Manometer (1)	-
Digital Manometer (2)	-
Digital Temperature Meter	-
Stopwatch	CAT 14.53
Barometer	-
Stack Thermocouple (1)	-
Stack Thermocouple (2)	-
Stack Thermocouple (3)	-
1m Heated Line (1)	-
1m Heated Line (2)	-
1m Heated Line (3)	-
5m Heated Line (1)	-
15m Heated Line (1)	-
20m Heated Line (1)	-
20m Heated Line (2)	-
Dual Channel Heater Controller	-
Single Channel Heater Controller	-
Laboratory Balance	
Tape Measure	-

APPENDIX 1

METHODS & TECHNICAL PROCEDURES USED

Parameter	Standard	Technical Procedure
Arsenic	CEN/TS 13649	CAT-TP-16
Methanal (Formaldehyde)	CEN/TS 13649	CAT-TP-16
Ethanal (Acetaldehyde)	CEN/TS 13649	CAT-TP-16
1,1,1-Trichloroethane	CEN/TS 13649	CAT-TP-16
Trichloroethylene	CEN/TS 13649	CAT-TP-16
Tetrachloroethylene	CEN/TS 13649	CAT-TP-16
1,1-Dichloroethane	CEN/TS 13649	CAT-TP-16
1,2-Dichloroethylene	CEN/TS 13649	CAT-TP-16
Vinyl Chloride	CEN/TS 13649	CAT-TP-16
1,1-Dichloroethylene	CEN/TS 13649	CAT-TP-16
1,2-Dichloroethane	CEN/TS 13649	CAT-TP-16
Chloroethane	CEN/TS 13649	CAT-TP-16
Carbon Tetrachloride	CEN/TS 13649	CAT-TP-16
Carbon Disulphide	CEN/TS 13649	CAT-TP-16
Dimethyl Sulphide	CEN/TS 13649	CAT-TP-16
Dimethyl Disulphide	CEN/TS 13649	CAT-TP-16
Ethane Thiol	CEN/TS 13649	CAT-TP-16
Methane Thiol	CEN/TS 13649	CAT-TP-16
Trimethylbenzenes	CEN/TS 13649	CAT-TP-16
1,3-Butadiene	CEN/TS 13649	CAT-TP-16
1-Pentene	CEN/TS 13649	CAT-TP-16
Furan	CEN/TS 13649	CAT-TP-16
Benzene	CEN/TS 13649	CAT-TP-16
1-Propanethiol	CEN/TS 13649	CAT-TP-16
1-Butanethiol	CEN/TS 13649	CAT-TP-16
Toluene	CEN/TS 13649	CAT-TP-16
Ethyl Butyrate	CEN/TS 13649	CAT-TP-16
Xylenes	CEN/TS 13649	CAT-TP-16
Styrene	CEN/TS 13649	CAT-TP-16
Butyric Acid	CEN/TS 13649	CAT-TP-16
1,1,2,2-Tetrachloroethane	CEN/TS 13649	CAT-TP-16
Dichloromethane	CEN/TS 13649	CAT-TP-16
INPUT	CEN/TS 13649	CAT-TP-16
Total Chlorinated Compounds	CEN/TS 13649	CAT-TP-16
Total Fluorinated Compounds	CEN/TS 13649	CAT-TP-16
Total Organosulphur Compounds	CEN/TS 13649	CAT-TP-16
Total Chlorinated Compounds as Cl	CEN/TS 13649	CAT-TP-16
Total Chlorinated Compounds as F	CEN/TS 13649	CAT-TP-16
Total Organosulphur Compounds as S	CEN/TS 13649	CAT-TP-16
Total Volatile Organic Compounds	CEN/TS 13649	CAT-TP-16

APPENDIX 2

ARSENIC : RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill

Raw Landfill Gas

Sample Runs

Parameter	Units	Run 1		Mean
Arsenic	mg/m³	< 0.05		< 0.05

General Sampling Information

Parameter	Value	
Standard	CEN/TS 13649	
Technical Procedure	CAT-TP-16	
Name of Analytical Laboratory	LUC	
Analytical Laboratory's Procedure	Not Listed	
ISO 17025 Accredited Analysis?	See Executive Summary	
Date of Sample Analysis	10/10/2019	
Probe Material	Stainless Steel	
Sample Tube Type	Coconut Shell Charcoal	
Dynamic Dilution Employed	No	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

APPENDIX 2

ARSENIC : SAMPLING DETAILS

RUN 1

Parameter	Units	Value
Sampling Times	-	12:50 - 13:10
Sampling Dates	-	17/09/2019
Sampling Device	-	MV
Duration	mins	20
N_2 to Stack Gas Dilution Ratio	: 1	0
Volume Sampled (REF)	m^3	0.0041

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	LOD (Front) µg	LOD (Back) µg	LOD (Total) µg	Concentration mg/m^3	Reported Concentration (Blank Reviewed) mg/m^3	Reported LOD mg/m^3	Adsorption Efficiency %
Arsenic	< 0.1	< 0.1	0.2	0.1	0.1	0.2	< 0.049	< 0.049	0.049	100.0

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

ARSENIC : SAMPLING DETAILS

BLANK 1

Parameter	Units	Value
Sampling Dates	-	17/09/2019
Sampling Device	-	MV
Average Volume Sampled (REF)	m^3	0.0041

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	Concentration mg/m^3
Arsenic	< 0.1	< 0.1	0.2	< 0.049

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

ARSENIC : QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	0.2
Pre-Sampling Leak Rate	l/min	0.00
Post-Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.01
Leak Test Acceptable	-	Yes

Adsorption Efficiency	Units	Run 1
Arsenic	%	100.0
Allowable Adsorption Efficiency	%	95
Adsorption Efficiency Acceptable	-	Yes

Temperature at Sample Tubes	Units	Run 1
Temperature	°C	16
Allowable Temperature	°C	40
Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

ARSENIC : QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	0.2
Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.01
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1	Allowed
Allowable for Arsenic	mg/m^3	0.05	N/A
Allowable for TOTAL	mg/m^3	0.05	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

APPENDIX 2

ARSENIC : MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (STP)	V_m	0.0040	uV_m	m^3	0.0001
Leak	L	0.00	uL	%	-
Laboratory Result	L_r	10.00	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (STP)	%	2.00	≤2%
Leak	%	0.00	≤5%
Laboratory Result	%	10.00	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.0040	12.31
Leak	L	mg/m^3	0.000	1.00
Laboratory Result	L_r	mg/m^3	0.005	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.001
Leak	mg/m^3	0.0000
Laboratory Result	mg/m^3	0.0049

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.005
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.010
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.010
Reported Uncertainty	mg/m^3	0.010
Expanded uncertainty (95% confidence), without Oxygen Correction	%	20.0
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	20.0
Reported Uncertainty	%	20.0

NOTE: Uncertainties reported in mg/m^3 are based upon the summation of all Speciated VOCs Measured.

APPENDIX 2

SELECT (SPECIATED 2) : RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill

Raw Landfill Gas

Sample Runs

Parameter	Units	Run 1		Mean
Methanal (Formaldehyde)	mg/m³	0.06		0.06
Ethanal (Acetaldehyde)	mg/m³	0.04		0.04

General Sampling Information

Parameter	Value	
Standard	CEN/TS 13649	
Technical Procedure	CAT-TP-16	
Name of Analytical Laboratory	LUC	
Analytical Laboratory's Procedure	Not listed	
ISO 17025 Accredited Analysis?	See Executive Summary	
Date of Sample Analysis	10/10/2019	
Probe Material	Stainless Steel	
Sample Tube Type	DNPH Coated Silica Gel	
Dynamic Dilution Employed	No	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

APPENDIX 2

SELECT (SPECIATED 2) : SAMPLING DETAILS

RUN 1

Parameter	Units	Value
Sampling Times	-	13:11 - 13:31
Sampling Dates	-	17/09/2019
Sampling Device	-	MV
Duration	mins	20
N_2 to Stack Gas Dilution Ratio	: 1	0
Volume Sampled (REF)	m^3	0.0040

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	LOD (Front) µg	LOD (Back) µg	LOD (Total) µg	Concentration mg/m^3	Reported Concentration (Blank Reviewed) mg/m^3	Reported LOD mg/m^3	Adsorption Efficiency %
Methanal (Formaldehyde)	0.2	< 0.0	0.2	0.0	0.0	0.1	0.061	0.061	0.020	100.0
Ethanal (Acetaldehyde)	0.1	< 0.0	0.1	0.0	0.0	0.1	0.035	0.035	0.020	100.0

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SELECT (SPECIATED 2) : SAMPLING DETAILS

BLANK 1

Parameter	Units	Value
Sampling Dates	-	17/09/2019
Sampling Device	-	MV
Average Volume Sampled (REF)	m^3	0.0040

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	Concentration mg/m^3
Methanal (Formaldehyde)	< 0.04	< 0.04	0.08	< 0.020
Ethanal (Acetaldehyde)	< 0.04	< 0.04	0.08	< 0.020

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SELECT (SPECIATED 2) : QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	0.2
Pre-Sampling Leak Rate	l/min	0.00
Post-Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.01
Leak Test Acceptable	-	Yes

Adsorption Efficiency	Units	Run 1
Methanal (Formaldehyde)	%	100.0
Ethanal (Acetaldehyde)	%	100.0
Allowable Adsorption Efficiency	%	95
Adsorption Efficiency Acceptable	-	Yes

Temperature at Sample Tubes	Units	Run 1
Temperature	°C	16
Allowable Temperature	°C	40
Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SELECT (SPECIATED 2) : QUALITY ASSURANCE

(PAGE 2 OF 2)

Blank Runs

Leak Test Results	Units	Blank 1
Expected Sampling Rate	l/min	0.2
Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.01
Leak Test Acceptable	-	Yes

Validity of Blank vs ELV	Units	Blank 1	Allowed
Allowable for Methanal (Formaldehyde)	mg/m^3	0.02	N/A
Allowable for Ethanal (Acetaldehyde)	mg/m^3	0.02	N/A
Allowable for TOTAL	mg/m^3	0.04	N/A

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

APPENDIX 2

SELECT (SPECIATED 2) : MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (STP)	V_m	0.0039	uV_m	m^3	0.0001
Leak	L	0.00	uL	%	-
Laboratory Result	L_r	10.00	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (STP)	%	2.00	≤2%
Leak	%	0.00	≤5%
Laboratory Result	%	10.00	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.0039	24.60
Leak	L	mg/m^3	0.000	1.00
Laboratory Result	L_r	mg/m^3	0.010	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.002
Leak	mg/m^3	0.0000
Laboratory Result	mg/m^3	0.0096

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.010
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.019
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.019
Reported Uncertainty	mg/m^3	0.019
Expanded uncertainty (95% confidence), without Oxygen Correction	%	20.0
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	20.0
Reported Uncertainty	%	20.0

NOTE: Uncertainties reported in mg/m^3 are based upon the summation of all Speciated VOCs Measured.

SPECIATED VOC SCREEN : RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill

Raw Landfill Gas

Sample Runs

Parameter	Units	Run 1	Mean
1,1,1-Trichloroethane	mg/m³	0.03	0.03
Trichloroethylene	mg/m³	0.01	0.01
Tetrachloroethylene	mg/m³	0.02	0.02
1,1-Dichloroethane	mg/m³	0.01	0.01
1,2-Dichloroethylene	mg/m³	0.03	0.03
Vinyl Chloride	mg/m³	0.03	0.03
1,1-Dichloroethylene	mg/m³	0.02	0.02
1,2-Dichloroethane	mg/m³	0.00	0.00
Chloroethane	mg/m³	0.01	0.01
Carbon Tetrachloride	mg/m³	0.01	0.01
Carbon Disulphide	mg/m³	0.04	0.04
Dimethyl Sulphide	mg/m³	0.02	0.02
Dimethyl Disulphide	mg/m³	0.00	0.00
Ethane Thiol	mg/m³	0.07	0.07
Methane Thiol	mg/m³	0.22	0.22
Trimethylbenzenes	mg/m³	0.14	0.14
1,3-Butadiene	mg/m³	0.16	0.16
1-Pentene	mg/m³	0.03	0.03
Furan	mg/m³	0.02	0.02
Benzene	mg/m³	0.06	0.06
1-Propanethiol	mg/m³	0.02	0.02
1-Butanethiol	mg/m³	0.01	0.01
Toluene	mg/m³	0.08	0.08
Ethyl Butyrate	mg/m³	0.01	0.01
Xylenes	mg/m³	0.01	0.01
Styrene	mg/m³	0.03	0.03
Butyric Acid	mg/m³	0.22	0.22
1,1,2,2-Tetrachloroethane	mg/m³	0.14	0.14
Dichloromethane	mg/m³	0.02	0.02

General Sampling Information

Parameter	Value	
Standard	CEN/TS 13649	
Technical Procedure	CAT-TP-16	
Name of Analytical Laboratory	LUC	
Analytical Laboratory's Procedure	Not Listed	
ISO 17025 Accredited Analysis?	See Executive Summary	
Date of Sample Analysis	10/10/2019	
Probe Material	Stainless Steel	
Sample Tube Type	ATD	
Dynamic Dilution Employed	No	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

APPENDIX 2

SPECIATED VOC SCREEN : SAMPLING DETAILS

RUN 1

Parameter	Units	Value
Sampling Times	-	13:35 - 13:50
Sampling Dates	-	17/09/2019
Sampling Device	-	MV
Duration	mins	5
N_2 to Stack Gas Dilution Ratio	: 1	0
Volume Sampled (REF)	m^3	0.0037

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	LOD (Front) µg	LOD (Back) µg	LOD (Total) µg	Concentration mg/m^3	Reported Concentration (Blank Reviewed) mg/m^3	Reported LOD mg/m^3	Adsorption Efficiency %
1,1,1-Trichloroethane	< 0.06	< 0.06	0.11	0.06	0.06	0.11	< 0.031	0.031	0.031	100.0
Trichloroethylene	< 0.02	< 0.02	0.05	0.02	0.02	0.05	< 0.013	0.013	0.013	100.0
Tetrachloroethylene	< 0.03	< 0.03	0.07	0.03	0.03	0.07	< 0.018	0.018	0.018	100.0
1,1-Dichloroethane	< 0.03	< 0.03	0.05	0.03	0.03	0.05	< 0.015	0.015	0.015	100.0
1,2-Dichloroethylene	< 0.05	< 0.05	0.10	0.05	0.05	0.10	< 0.026	0.026	0.026	100.0
Vinyl Chloride	< 0.05	< 0.05	0.09	0.05	0.05	0.09	< 0.025	0.025	0.025	100.0
1,1-Dichloroethylene	< 0.03	< 0.03	0.06	0.03	0.03	0.06	< 0.015	0.015	0.015	100.0
1,2-Dichloroethane	< 0.01	< 0.01	0.01	0.01	0.01	0.01	< 0.003	0.003	0.003	100.0
Chloroethane	< 0.02	< 0.02	0.04	0.02	0.02	0.04	< 0.011	0.011	0.011	100.0
Carbon Tetrachloride	< 0.01	< 0.01	0.03	0.01	0.01	0.03	< 0.008	0.008	0.008	100.0
Carbon Disulphide	< 0.07	< 0.07	0.14	0.07	0.07	0.14	< 0.038	0.038	0.038	100.0
Dimethyl Sulphide	< 0.03	< 0.03	0.06	0.03	0.03	0.06	< 0.015	0.015	0.015	100.0
Dimethyl Disulphide	< 0.01	< 0.01	0.01	0.01	0.01	0.01	< 0.003	0.003	0.003	100.0
Ethane Thiol	< 0.12	< 0.12	0.24	0.12	0.12	0.24	< 0.065	0.065	0.065	100.0
Methane Thiol	< 0.40	< 0.40	0.80	0.40	0.40	0.80	< 0.218	0.218	0.218	100.0
Trimethylbenzenes	< 0.25	< 0.25	0.50	0.25	0.25	0.50	< 0.136	0.136	0.136	100.0
1,3-Butadiene	< 0.30	< 0.30	0.60	0.30	0.30	0.60	< 0.163	0.163	0.163	100.0
1-Pentene	< 0.05	< 0.05	0.10	0.05	0.05	0.10	< 0.027	0.027	0.027	100.0
Furan	< 0.03	< 0.03	0.06	0.03	0.03	0.06	< 0.016	0.016	0.016	100.0
Benzene	0.20	0.02	0.22	0.01	0.01	0.02	0.060	0.060	0.005	90.9
1-Propanethiol	< 0.04	< 0.04	0.08	0.04	0.04	0.08	< 0.022	0.022	0.022	100.0
1-Butanethiol	< 0.02	< 0.02	0.04	0.02	0.02	0.04	< 0.011	0.011	0.011	100.0
Toluene	0.25	0.03	0.28	0.03	0.03	0.06	0.076	0.076	0.016	89.3
Ethyl Butyrate	< 0.02	< 0.02	0.04	0.02	0.02	0.04	< 0.011	0.011	0.011	100.0
Xylenes	< 0.02	< 0.02	0.04	0.02	0.02	0.04	< 0.011	0.011	0.011	100.0
Styrene	< 0.05	< 0.05	0.10	0.05	0.05	0.10	< 0.027	0.027	0.027	100.0
Butyric Acid	< 0.40	< 0.40	0.80	0.40	0.40	0.80	< 0.218	0.218	0.218	100.0
1,1,2,2-Tetrachloroethane	< 0.25	< 0.25	0.50	0.25	0.25	0.50	< 0.136	0.136	0.136	100.0
Dichloromethane	< 0.05	< 0.05	0.09	0.05	0.05	0.09	< 0.024	0.024	0.024	100.0

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

SPECIATED VOC SCREEN : QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	0.7
Pre-Sampling Leak Rate	l/min	0.00
Post-Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.04
Leak Test Acceptable	-	Yes

Adsorption Efficiency	Units	Run 1
1,1,1-Trichloroethane	%	100.0
Trichloroethylene	%	100.0
Tetrachloroethylene	%	100.0
1,1-Dichloroethane	%	100.0
1,2-Dichloroethylene	%	100.0
Vinyl Chloride	%	100.0
1,1-Dichloroethylene	%	100.0
1,2-Dichloroethane	%	100.0
Chloroethane	%	100.0
Carbon Tetrachloride	%	100.0
Carbon Disulphide	%	100.0
Dimethyl Sulphide	%	100.0
Dimethyl Disulphide	%	100.0
Ethane Thiol	%	100.0
Methane Thiol	%	100.0
Trimethylbenzenes	%	100.0
1,3-Butadiene	%	100.0
1-Pentene	%	100.0
Furan	%	100.0
Benzene	%	90.9
1-Propanethiol	%	100.0
1-Butanethiol	%	100.0
Toluene	%	89.3
Ethyl Butyrate	%	100.0
Xylenes	%	100.0
Styrene	%	100.0
Butyric Acid	%	100.0
1,1,2,2-Tetrachloroethane	%	100.0
Dichloromethane	%	100.0
Allowable Adsorption Efficiency	%	95
Adsorption Efficiency Acceptable	-	No

Temperature at Sample Tubes	Units	Run 1
Temperature	°C	16
Allowable Temperature	°C	40
Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

SPECIATED VOC SCREEN : QUALITY ASSURANCE

(PAGE 2 OF 2)

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
The absorption efficiency was less than the required 90%. [75 - 90%]	x	

SPECIATED VOC SCREEN : MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (STP)	V_m	0.0036	uV_m	m^3	0.0001
Leak	L	0.00	uL	%	-
Laboratory Result	L_r	10.00	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (STP)	%	2.00	≤2%
Leak	%	0.00	≤5%
Laboratory Result	%	10.00	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.0036	396.58
Leak	L	mg/m^3	0.000	1.00
Laboratory Result	L_r	mg/m^3	0.144	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.029
Leak	mg/m^3	0.0000
Laboratory Result	mg/m^3	0.1443

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.147
Expanded uncertainty (95% confidence), without Oxygen Correction	mg/m^3	0.288
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.346
Reported Uncertainty	mg/m^3	0.346
Expanded uncertainty (95% confidence), without Oxygen Correction	%	20.0
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	24.0
Reported Uncertainty	%	24.0

NOTE: Uncertainties reported in mg/m^3 are based upon the summation of all Speciated VOCs Measured.

APPENDIX 2

TOTAL CHLORINATED COMPOUNDS : RESULTS SUMMARY

Gwynedd Council, Llwyn Isaf Landfill

Raw Landfill Gas

Sample Runs

Parameter	Units	Run 1	Mean
Total Chlorinated Compounds	mg/m³	0.05	0.05
Total Fluorinated Compounds	mg/m³	0.05	0.05
Total Organosulphur Compounds	mg/m³	0.05	0.05
Total Chlorinated Compounds as Cl	mg/m³	0.05	0.05
Total Chlorinated Compounds as F	mg/m³	0.05	0.05
Total Organosulphur Compounds as S	mg/m³	0.05	0.05
Total Volatile Organic Compounds	mg/m³	1.09	1.09

General Sampling Information

Parameter	Value	
Standard	CEN/TS 13649	
Technical Procedure	CAT-TP-16	
Name of Analytical Laboratory	LUC	
Analytical Laboratory's Procedure	Not Listed	
ISO 17025 Accredited Analysis?	See Executive Summary	
Date of Sample Analysis	10/10/2019	
Probe Material	Stainless Steel	
Sample Tube Type	ATD	
Dynamic Dilution Employed	No	
Number of Sampling Lines Used	1 / 1	FORMAT: Number Used / Number Required
Number of Sampling Points Used	1 / 1	FORMAT: Number Used / Number Required
Sample Point I.D.'s	A1	

Reference Conditions

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL CHLORINATED COMPOUNDS : SAMPLING DETAILS

RUN 1

Parameter	Units	Value
Sampling Times	-	13:35 - 13:50
Sampling Dates	-	17/09/2019
Sampling Device	-	MV
Duration	mins	5
N_2 to Stack Gas Dilution Ratio	: 1	0
Volume Sampled (REF)	m^3	0.0037

Where: MV stands for Mass View (Mass Flow Controller Technology)

Parameter	Lab Result (Front) µg	Lab Result (Back) µg	Lab Result (Total) µg	LOD (Front) µg	LOD (Back) µg	LOD (Total) µg	Concentration mg/m^3	Reported Concentration (Blank Reviewed) mg/m^3	Reported LOD mg/m^3	Adsorption Efficiency %
Total Chlorinated Compounds	< 0.10	< 0.10	0.20	0.10	0.10	0.20	< 0.054	0.054	0.054	100.0
Total Fluorinated Compounds	< 0.10	< 0.10	0.20	0.10	0.10	0.20	< 0.054	0.054	0.054	100.0
Total Organosulphur Compounds	< 0.10	< 0.10	0.20	0.10	0.10	0.20	< 0.054	0.054	0.054	100.0
Total Chlorinated Compounds as Cl	< 0.10	< 0.10	0.20	0.10	0.10	0.20	< 0.054	0.054	0.054	100.0
Total Chlorinated Compounds as F	< 0.10	< 0.10	0.20	0.10	0.10	0.20	< 0.054	0.054	0.054	100.0
Total Organosulphur Compounds as S	< 0.10	< 0.10	0.20	0.10	0.10	0.20	< 0.054	0.054	0.054	100.0
Total Volatile Organic Compounds	< 2.0	< 2.0	4.0	2.0	2.0	4.0	< 1.088	1.088	1.088	100.0

Reference Conditions are: 273K, 101.3kPa, without correction for water vapour content.

TOTAL CHLORINATED COMPOUNDS : QUALITY ASSURANCE

(PAGE 1 OF 2)

Sample Runs

Leak Test Results	Units	Run 1
Mean Sampling Rate	l/min	0.7
Pre-Sampling Leak Rate	l/min	0.00
Post-Sampling Leak Rate	l/min	0.00
Allowable Leak Rate	l/min	0.04
Leak Test Acceptable	-	Yes

Adsorption Efficiency	Units	Run 1
Total Chlorinated Compounds	%	100.0
Total Fluorinated Compounds	%	100.0
Total Organosulphur Compounds	%	100.0
Total Chlorinated Compounds as Cl	%	100.0
Total Chlorinated Compounds as F	%	100.0
Total Organosulphur Compounds as S	%	100.0
Total Volatile Organic Compounds	%	100.0
Allowable Adsorption Efficiency	%	95
Adsorption Efficiency Acceptable	-	Yes

Temperature at Sample Tubes	Units	Run 1
Temperature	°C	16
Allowable Temperature	°C	40
Temperature Acceptable	-	Yes

Test Conditions	Units	Run 1
Ambient Temperature Recorded?	-	Yes

TOTAL CHLORINATED COMPOUNDS : QUALITY ASSURANCE

(PAGE 2 OF 2)

Method Deviations

Nature of Deviation (x = deviation applies to the associated run)	Run Number 1	
There are no deviations associated with the sampling employed.	x	

TOTAL CHLORINATED COMPOUNDS : MEASUREMENT UNCERTAINTY CALCULATIONS

	Value		Standard uncertainty		
Measured Quantities	**Symbol**	**Run 1**	**Symbol**	**Units**	**Run 1**
Sampled Volume (STP)	V_m	0.0036	uV_m	m^3	0.0001
Leak	L	0.00	uL	%	-
Laboratory Result	L_r	10.00	uL_r	%	-

	Uncertainty as a Percentage		
Measured Quantities	**Units**	**Run 1**	**Requirement of Standard**
Sampled Volume (STP)	%	2.00	≤2%
Leak	%	0.00	≤5%
Laboratory Result	%	10.00	No Requirement

	Uncertainty in Measurement Units			Sensitivity Coefficient
Measured Quantities	**Symbol**	**Units**	**Run 1**	**Run 1**
Sampled Volume (STP)	V_m	m^3	0.0036	388.95
Leak	L	mg/m^3	0.000	1.00
Laboratory Result	L_r	mg/m^3	0.142	1.00

	Uncertainty in Result	
Measured Quantities	**Units**	**Run 1**
Sampled Volume (STP)	mg/m^3	0.028
Leak	mg/m^3	0.0000
Laboratory Result	mg/m^3	0.1415

	Oxygen Correction Part of MU Budget	
Measured Quantities	**Units**	**Run 1**
O_2 Correction Factor	-	N/A
Stack Gas O_2 Content	% v/v	N/A
MU for O_2 Correction	-	N/A
Overall MU For O_2 Measurement	%	N/A

Parameter	**Units**	**Run 1**
Combined uncertainty	mg/m^3	0.144
Expanded uncertainty (95% confidence)	mg/m^3	0.283
Expanded uncertainty (95% confidence), with Oxygen Correction	mg/m^3	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	mg/m^3	0.283
Reported Uncertainty	mg/m^3	0.283
Expanded uncertainty (95% confidence)	%	20.0
Expanded uncertainty (95% confidence), with Oxygen Correction	%	N/A
Expanded uncertainty (95% confidence), estimated with Method Deviations	%	20.0
Reported Uncertainty	%	20.0

NOTE: Uncertainties reported in mg/m^3 are based upon the summation of all Speciated VOCs Measured.

APPENDIX 7 –

Laboratory Analysis Certificate References

Month	ALS Report number	
January (8th & 22nd)	1658702	1664090
February (05th)	1670247	
March (5th)	1682749	
April (17th)	1701848	
May (7th & 21st)	1709833	1716632
June (3rd)	1722564	
July (1st)	1735783	
August (13th)	1756092	
September (3rd & 10th)	1765811	1769029
October (8th)	1782392	
November (7th & 26th)	1795149	1804835
December (16th)	1815152	

APPENDIX 8 –

Schedule 6 notifications 2019

Francis Susan Jane (PAB)

From: Roberts, Anthony <Anthony.Roberts@cyfoethnaturiolcymru.gov.uk>
Sent: 06 January 2020 09:49
To: Francis Susan Jane (PAB); North Wales PPC
Cc: Baldwin Rhian Haf (PAB); Edwards Steven (PAB)
Subject: RE: May 2019 schedule 6 (LI) PART B (19.07.19)

Dear Steve and Sue,

Apologies for the long delay in responding to this Schedule 6 for the ammonia breach at Llwyn Isaf. This is due to unprecedented workload and reduction in resources.

I can confirm that no further action will be taken in regard to this matter as the following sample was in compliance and there is very little risk to the environment from this single breach.

This does not however preclude scoring of such breaches at any time in the future.

Best wishes

Tony

From: Francis Susan Jane (PAB) <susanjanefrancis@gwynedd.llyw.cymru>
Sent: 24 July 2019 11:00
To: North Wales PPC <north.wales.ppc@cyfoethnaturiolcymru.gov.uk>
Cc: Roberts, Anthony <Anthony.Roberts@cyfoethnaturiolcymru.gov.uk>; Baldwin Rhian Haf (PAB) <rhianhafgibson@gwynedd.llyw.cymru>
Subject: May 2019 schedule 6 (LI) PART B (19.07.19)

Good morning,

Please find attached the schedule 6 Part B notification for :-
YP313UJ, Llwyn Isaf Landfill Site

Following repeat sampling at location GW4, no further breaches were recorded.
No further action will be taken.

Regards
Sue

Francis Susan Jane (PAB)

From:	Francis Susan Jane (PAB)
Sent:	24 July 2019 11:00
To:	'north.wales.ppc@cyfoethnaturiolcymru.gov.uk'
Cc:	'Roberts, Anthony'; Baldwin Rhian Haf (PAB)
Subject:	May 2019 schedule 6 (LI) PART B (19.07.19)
Attachments:	May 2019 schedule 6 (LI) PART B (19.07.19).doc; Llwyn Isaf Schedule 6 Part A (YP3138UJ)

Good morning,

Please find attached the schedule 6 Part B notification for :-
YP313UJ, Llwyn Isaf Landfill Site

Following repeat sampling at location GW4, no further breaches were recorded.
No further action will be taken.

Regards
Sue

Schedule 6 – Notification

This page outlines the information that the operator must provide.

Units of measurement in the information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the PPC Regulations.

Part A

Permit number	YP3138UJ
Name of operator	Gwynedd Council
Location of installation	Llwyn Isaf Landfill, Gwynedd Council, Clynnog Fawr,
	Gwynedd, LL54 5DF
Time and date of detection	Results recived off the lab on 11/07/19

(a) Notification requirements for any malfunction, breakdown or failure of equipment or technique, accident, or fugitive emission which has caused, is causing or may cause significant pollution
To be notified within 24 hours of detection

Date and Time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substance(s) potentially released	
Best estimate of the quality or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/source	GW4
Parameter(s)	NH4
Limit	0.48 mg/l
Measured value and uncertainty	1.61 mg/l
Date and time of monitoring	21/05/19
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	**Notification period**

(c) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
Description of where the effect on the environment was detected	
Substance(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B to be supplied as soon as practicable

Any more accurate information on the matters for notification under Part A	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	A sample taken on the 19th of July at GW4, recorded an ammoniacal nitrogen level of 0.14mg/l. This result is below the 0.48mg/l limit for NH4 at this location. No further measures will be taken.
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the installation in the proceeding 24 months	

Name *	Susan Francis
Post	Assistant Engineer
Signature	
Date	24.07.19

* authorised to sign on behalf of Gwynedd Council

Francis Susan Jane (PAB)

From: Francis Susan Jane (PAB)
Sent: 12 July 2019 09:16
To: 'north.wales.ppc@cyfoethnaturiolcymru.gov.uk'
Cc: 'Ross, Stuart'; 'Braid, Ana'; Parry Michael Lloyd (PAB)
Subject: Llwyn Isaf Schedule 6 Part A (YP3138UJ)
Attachments: May 2019 schedule 6 (LI).doc

Good morning,

Please find attached schedule 6 part A notification for permit :-

YP3138UJ, Llwyn Isaf Landfill Site.

A breach of the NH4 level in GW4 has occurred in a sample collected at the site in May 2019.
Due to delays at the laboratory, the results were only released yesterday.

We will re sample at the site within the next week and issue the results as soon as they become available.

Regards
Sue

Susan Francis
Assistant Engineer/Peiriannydd Cynorthwyol
Tel : 01286 679508

Schedule 6 – Notification

This page outlines the information that the operator must provide.

Units of measurement in the information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the PPC Regulations.

Part A

Permit number	YP3138UJ
Name of operator	Gwynedd Council
Location of installation	Llwyn Isaf Landfill, Gwynedd Council, Clynnog Fawr,
	Gwynedd, LL54 5DF
Time and date of detection	Results recived off the lab on 11/07/19

(a) Notification requirements for any malfunction, breakdown or failure of equipment or technique, accident, or fugitive emission which has caused, is causing or may cause significant pollution
To be notified within 24 hours of detection

Date and Time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substance(s) potentially released	
Best estimate of the quality or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/source	GW4
Parameter(s)	NH4
Limit	0.48 mg/l
Measured value and uncertainty	1.61 mg/l
Date and time of monitoring	21/05/19
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	**Notification period**

(c) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
Description of where the effect on the environment was detected	
Substance(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B to be supplied as soon as practicable

Any more accurate information on the matters for notification under Part A	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	A sample will be taken in the next week and the agency will be notified of the result once they are available.
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the installation in the proceeding 24 months	

Name *	Susan Francis
Post	Assistant Engineer
Signature	
Date	12.07.19

* authorised to sign on behalf of Gwynedd Council

APPENDIX 9 –

Tank Incident

Francis Susan Jane (PAB)

From: Roberts, Anthony <Anthony.Roberts@cyfoethnaturiolcymru.gov.uk>
Sent: 28 November 2019 13:39
To: Francis Susan Jane (PAB)
Cc: Edwards Steven (PAB)
Subject: Re: Leachate Holding Tank, Llwyn Isaf Landfill Site/Cilgwyn LTP Permit Surrender and Closure

Hi Susan,

Leachate Spill Llwyn Isaf

Thank you for submitting the part B of the schedule 6 for the leachate spill at Llwyn Isaf. I believe you have taken all of the necessary measures to avoid pollution and the sample results show that the spill was contained. The follow up failsafe installation is exemplary. As such I do not propose to take any further action in this case.

Permit surrender Cilgwyn LTP

With regard to the closure/Surrender of the permit for Cilgwyn LTP. I have read the proposed document in detail and I believe that all of the information required to surrender the permit is in the document. However I think a small section stating that there is no need to monitor the environment or the area within the permit boundary
as there could be no impact on the land or surroundings as it was a totally enclosed process might not go amiss.
Please ensure permitting understand that this is a surrender application as well as permanent closure.

If you require any further assistance or advice, please do not hesitate to contact me.

Best wishes

Tony

Tony Roberts
Cyfoeth Naturiol Cymru / Natural Resources Wales
Senior Officer
Waste and Industry Regulation Team, Maes Y Fynnon,
Bangor. LL57 2DW
Ffôn/Tel: 03000 653752
Ffôn symudol / Mobile: 07468 742602

E-Bost/E-mail

Anthony.Roberts@naturalresourceswales.gov.uk

From: Francis Susan Jane (PAB) <susanjanefrancis@gwynedd.llyw.cymru>
Sent: 27 November 2019 14:06
To: Roberts, Anthony <Anthony.Roberts@cyfoethnaturiolcymru.gov.uk>
Cc: Edwards Steven (PAB) <stevenedwards@gwynedd.llyw.cymru>
Subject: Leachate Holding Tank, Llwyn Isaf Landfill Site

Hi Tony,

Following the recent incident in Llwyn Isaf please find attached a copy of the completed Schedule 6 – Part B.

In addition we were wondering if you've had the opportunity to look at our Draft Permit Surrender Proposal for Cilgwyn LPT ?

We look forward to hearing from you.

Regards
Sue

Susan Francis
Assistant Engineer/Peiriannydd Cynorthwyol
Tel : 01286 679508

Francis Susan Jane (PAB)

From: Francis Susan Jane (PAB)
Sent: 27 November 2019 14:06
To: 'Roberts, Anthony'
Cc: Edwards Steven (PAB)
Subject: Leachate Holding Tank, Llwyn Isaf Landfill Site
Attachments: FW: Cilgwyn LTP - Draft Permit Surrender Proposal; October 2019 schedule 6 (LI) leachate tank PART B (27.11.19).doc

Hi Tony,

Following the recent incident in Llwyn Isaf please find attached a copy of the completed Schedule 6 – Part B.

In addition we were wondering if you've had the opportunity to look at our Draft Permit Surrender Proposal for Cilgwyn LPT ?

We look forward to hearing from you.

Regards
Sue

Susan Francis
Assistant Engineer/Peiriannydd Cynorthwyol
Tel : 01286 679508

Schedule 6 – Notification

This page outlines the information that the operator must provide.

Units of measurement in the information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the PPC Regulations.

Part A

Permit number	YP3138UJ
Name of operator	Gwynedd Council
Location of installation	Llwyn Isaf Landfill, Gwynedd Council, Clynnog Fawr,
	Gwynedd, LL54 5DF
Time and date of detection	22/10/19

(a) Notification requirements for any malfunction, breakdown or failure of equipment or technique, accident, or fugitive emission which has caused, is causing or may cause significant pollution
To be notified within 24 hours of detection

Date and Time of the event	22/10/19
Reference or description of the location of the event	Leachate holding tank, Llwyn Isaf Landfill Site.
Description of where any release into the environment took place	As a result of a malfunction of a float / electrical pump control system failure within the bunded tank. As a consequence the pump did not switch off when the tank was full and overflowed.
Substance(s) potentially released	Leachate (Cell 2)
Best estimate of the quality or rate of release of substances	Estimated quantity of liquid/leachate spilled is between 1 and 4 m^3.
Measures taken, or intended to be taken, to stop any emission	1) The pump into the cell was switched off manually. 2) The bund was emptied on the day, 22/10/19, the majority of the remaining leachate was removed on 23/10/19. 3) Absorbent material/matting/booms were deployed to absorb the standing leachate on the concrete surface. 4) Some leachate did reach permeable ground. 5) Engineer report on the 24/10/19, confirmed malfunction of the float / electrical pump control.
Description of the failure or accident.	Release of leachate from holding tank. Visual inspection showed no oily film, light in colour and no odour was noted. As a result of recent heavy rainfall; it is possible the bund contained an amount of rainwater, resulting in the spilled liquid being very light in colour and not what we wound normally expect leachate to be.

(b) Notification requirements for the breach of limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	**Notification period**

(c) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
Description of where the effect on the environment was detected	
Substance(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B to be supplied as soon as practicable

Any more accurate information on the matters for notification under Part A	Please see details above
Measures taken, or intended to be taken, to prevent a recurrence of the incident	Remedial measures as noted above already undertaken.
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	The existing float / electrical pump control system has been repaired. In addition a further float has been installed in the tank to serve as a back up should failure occur again. It is also worth noting that this recent failure has been the 1st incidence of its kind during the sites 10 year history. A representative sample of the liquid spilled (Tank bund) was sent for laboratory for analysis to determine its chemical make up. A downgradient sample (GW3) of ground water was taken at weekly intervals for a period of a month and compared to pre-spill data from the 21/05/19. A summary of the results are presented in the table -

	Sampling following bund breach at Llwyn Isaf Landfill Site on 22/10/19. Comparison of the ground water results from May 2019 when compared with the 4 sets taken following the spill show no significant changes, suggesting that the spill was contained before entering the groundwater. We do not intend to taken any further action following this incident.
The dates of any unauthorised emissions from the installation in the proceeding 24 months	

Name *	Susan Francis
Post	Assistant Engineer
Signature	
Date	27.11.19

* authorised to sign on behalf of Gwynedd Council

Sampling following bund breach at Llwyn Isaf landfill site on the 22/10/19

			Tank Bund		GW 3				
			24/10/2019	29/10/2019	pre spill analysis 21/5/2019	24/10/2019	29/10/2019	5/11/2019	12/11/2019
Cadmium , Total as Cd	WAS049	ug/l	<0.6	<0.6	<0.6	<0.6	0.6	<0.6	<0.6
Calcium , Total as Ca	WAS049	mg/l	155	147	-	-	-	-	-
Magnesium, Total as Mg	WAS049	mg/l	26.5	24.9	8.3	7.4	7.5	8.3	8.8
Potassium , Total as K	WAS049	mg/l	165	156	0.94	1.12	1.24	1.13	3.33
Sodium , Total as Na	WAS049	mg/l	364	340	8.34	8.36	7.89	8.79	15.6
Zinc , Total as Zn	WAS049	ug/l	-	-	<18	20.2	23.6	<18	20.6
pH	WAS039	pH units	7.5	7.4	7.2	7.3	7.2	7.4	7.6
Conductivity- Electrical 20C	WAS039	uS/cm	4470	4480	338	332	343	351	366
Alkalinity as CaCO3	WAS025	mg/l	1950	1960	174	170	181	187	179
Ammoniacal Nitrogen as N	WAS036	mg/l	292	301	<0.41	<0.41	<0.41	<0.41	<0.41
Chloride as Cl	WAS036	mg/l	466	466	11	14	12.8	9.5	23.4
Nitrogen, Total Oxidised as N	WAS036	mg/l	1.3	<0.7	<3.5	<0.7	<0.7	<0.7	<0.7
Sulphate as SO4	WAS036	mg/l	<2.00	<2.00	8.33	5.2	5.3	5.7	4.4
BOD + ATU (5 day)	WAS001	mg/l	12	12	-	-	-	-	-
COD (Total)	WAS040	mg/l	242	219	-	-	-	-	-
TOC (Filtered)	WAS005	mg/l	57.3	57	4.5	1.8	2.1	0.9	5.3
Dissolved Oxygen, Unfixed	WAS052	mg/l	-	-	2.5	8.4	8.6	3.1	4.7