

NANTYCAWS LANDFILL

Landfill Surface Emissions Survey 2019
Prepared for: CWM Environmental

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Executive Summary

SLR Consulting Ltd (SLR) have been commissioned by CWM Environmental to undertake a Landfill Surface Emissions Survey at Nantycaws Landfill in 2019.

The Stage 1 landfill gas surface emissions walkover survey was undertaken on 18th and 19th November 2019, with the site being divided into 2 zones to reflect the various specifications and restoration within the landfill area.

The walkover survey undertaken in November 2019 demonstrated ongoing compliance across the majority of the cap, with six distinct areas of cap and eight features requiring further investigation and remediation. Following remediation, the identified areas of cap and features were re-surveyed on 20th January 2020 and found to be compliant. There are currently no new areas of capping; as such there is no requirement for a Stage 2 flux survey.

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1.0 INTRODUCTION

SLR have been commissioned by CWM Limited (CMW) to undertake an annual survey of landfill gas surface emissions at Nantycaws Landfill Site, Carmarthenshire.

Nantycaws Landfill is located approximately 8km to the east of Carmarthen and 1.5km to the south-east of the small village Nantycaws, to the immediate south of the A48. The area surrounding Nantycaws Landfill is agricultural, with open fields to the north and east.

To comply with the Landfill Directive methane emissions through the cap of a landfill need to be monitored and any need for remediation must be prioritised as well as quantifying the total emissions of methane from the whole site area.

The Environment Agency, supported by National Resources Wales (NRW) produced the Guidance for Monitoring Landfill Gas Surface Emissions¹ (LFTGN07). The purpose of the guidance is to provide a standard set of monitoring methods for determining the emission of methane from the surface of a landfill. A two stage approach is required by the guidance. The first stage involves a walkover survey to locate any significant emission sources and to identify any failures in the gas collection. The second stage of the survey, which aims to quantify the surface emissions from the site, can only take place once any required remediation work has been completed. This report represents the annual surface emissions survey. This report describes the techniques and methodology used in the assessment, followed by analysis of the results of these surveys.

1.1 SURVEY METHODOLOGY – WALKOVER

The site has been divided into zones with similar characteristics with respect to the factors that will affect surface emissions (e.g. nature of capping). The main characteristic used for zoning of the landfill is the nature of the capping, which are described below:

- permanent capping: filled and restored phases of an operational or closed landfill with a permanent cap, where no more waste will be accepted; and
- temporarily capped zones of an operational landfill not currently accepting wastes and not expected to do so within 3 months.

Faults in the capping layer of a landfill is the primary cause of surface emissions from a landfill. Therefore, where the characteristics or age of the cap differ, surface emissions may vary. Boundaries between different areas of differing characteristics may also be areas of higher emissions. The walkover survey was undertaken on all permanent and temporary capped areas of the landfill, with the exception of any areas which were inaccessible due to gradient and surface material. Methane concentrations were monitored using a hand-held flame ionisation detector (FID) held close to the ground (< 5cm). Monitoring was undertaken on a 25m and 50m grid on temporary and permanently capped areas, respectively, or smaller transects where required, such as on side slopes and edges of the cap. Where high concentrations of methane were detected and when it was appropriate, the survey deviated to locate the source. A written record of methane levels was recorded at each location.

Gas wells, leachate wells and pipework were inspected closely, with measurement of methane concentrations taken around the well and landfill surface. A separate reading was taken from the actual gas well and associated pipeworks if it protruded above the landfill surface.

¹ Guidance on Monitoring Landfill Gas Surface Emissions V2 2010. Environment Agency.

1.2 PREVIOUS ASSESSMENTS

This report presents the 2019/20 surface emissions survey for Nantycaws Landfill. The most recent surface emission survey for Nantycaws prior to this report was the survey undertaken in 2018².

² SLR Consulting Ltd. 2018 Surface Emissions Survey Stage 1 Walkover 2018 402.0610.00031.

2.0 DEFINITION OF ZONES

For the purposes of this assessment, Nantycaws landfill has been divided into two zones according to the type of capping in place as shown in Drawing AQ1. Zone 1 represents the permanently capped areas of the landfill and Zone 2 represents the areas of the landfill with temporary capping in place. Deposition of waste into the landfill has not been undertaken since December 2016, with no changes to the capped areas since the 2018 surface emissions survey.

2.1 DESCRIPTION OF ZONE 1

Zone 1 comprises all the permanently capped areas of Nantycaws Landfill; this zone has been subdivided into five subzones due to the date or type of capping in place as described below.

2.1.1 Zone 1A

Zone 1A comprises the majority of Cell 1; this zone has been permanently capped with 300mm of clay soils, 1.0mm HDPE geomembrane and completed with restoration soils. The zone is fully restored and is covered with dense vegetation to the north of the access track and short vegetation to the south of the track. This area was capped in 1999.

2.1.2 Zone 1B

Zone 1B comprises of a large grassed area which includes the grassed plateau of Cells 2, 4 and 5 and the densely vegetated flank of Cells 4, 5 and 6. The permanent capping installed within this area includes 1.0mm LLDPE geomembrane cap followed by 1m of restoration soils.

2.1.3 Zone 1C

Zone 1C comprises permanent areas of capping incorporating the western flanks of Cells 3 and 4. Restoration soils have been placed on Zone 1C in September 2014. This area comprises of short grass vegetation.

2.1.4 Zone 1D

Zone 1D comprises permanent capping installed in October 2012, on the western corner of Cell 2 and western edge of Cell 6. This area is defined by short grasses and small shrubbery. This is capped with 1.0 LLDPE geomembrane cap and covered with 1m of restoration soils.

2.1.5 Zone 1E

Zone 1E comprises permanent capping characterised by 1mm LLDPE geomembrane cap and 1m restoration soils. This area comprises of long grasses and partially dense vegetation.

2.2 DESCRIPTION OF ZONE 2

Zone 2 comprises of all temporarily capped areas of Nantycaws Landfill; this zone has been subdivided into four subzones due to either the date or type of capping in place. The zones are described below.

2.2.1 Zone 2A

Zone 2A is a small area of temporary cap within Cell 1. This area is capped with a minimum of 250-300mm of clay and is covered in dense vegetation.

2.2.2 Zone 2B

Zone 2B comprises temporarily capped areas of the northern flank of Cell 3 and Cell 6. The capping in Zone 2B comprises of 1mm LLDPE geomembrane.

2.2.3 Zone 2C

Zone 2C comprises temporarily capped area of the northern and western slope of Cell 7A. This is capped with 1mm LLDPE geomembrane in February 2015.

2.2.4 Zone 2D

Zone 2D comprises of a temporary capped area of the north-eastern slope of Cell 3 and north-western slope of Cell 2. It also comprises a small area in the southern extent of Cell 7A. This was capped with 1mm LLDPE geomembrane in December 2016.

3.0 WALKOVER SURVEY

3.1 CLIMATIC CONDITIONS

The Stage 1 walkover was completed on 18th and 19th November 2019. Data from a walkover survey can be directly influenced by the meteorological conditions prevailing before and during the monitoring period. Weather data using on-site observations and local meteorological station data are presented in Table 3-1.

Table 3-1
Weather Conditions during the Walkover Survey: 18th and 19th November 2019

Date	Weather Conditions (Daytime)			
	Wind (mph)	Wind Direction	Avg. Temperature (°C)	Pressure (bar)
15.11.19	-	-	-	1009
16.11.19	-	-	-	1010
17.11.19	3 – 6	Northerly	6 °C	1013
18.11.19 AM	3 – 5	Easterly	5 °C	1018 steady
18.11.19 PM	4 – 8	Easterly	6 °C	1017 steady
19.11.19 AM	6 – 8	South-easterly	6 °C	1014 steady
19.11.19 PM	5 – 7	South-easterly	6 °C	1014 steady

For landfill surface emissions surveys, the EA Guidance Note LFTGN 07 suggests wind speeds of Beaufort scale 2 or below (equal to 7 mph or below). From the data presented in Table 3-1, it can be seen for the majority of the time wind speeds were less than 7 mph.

3.2 GAS MANAGEMENT SYSTEM CONDITIONS

The site currently has two engines and one flare in operation. Gas abstraction system data between September and November 2019 was provided by Nantycaws landfill management and is presented in Appendix C.

3.3 WALKOVER SURVEY RESULTS

The results of the Stage 1 walkover survey have been presented in Appendix A, presenting the monitoring locations and corresponding concentrations. The results are summarised in the following subsections.

The instrument used to measure methane concentration was a Gastec Flame Ionisation Detector (FID). The Gastec FID has a range of 0 – 10,000ppm with a minimum detectable limit of 1ppm. The instrument used had been calibrated on 30th October 2019 (Serial Number 6335). The calibration certificate is presented in Appendix D.

According to LFTGN07, a quantitative flux survey will be of little value until the concentration of methane in the air is:

- less than 100 parts per million by volume (ppmv) immediately above the surface on the main zones of
- the cap; and
- less than 1,000 ppmv close to any discrete feature.

Observations of methane levels from the surface of the cap found six locations and eight features recording concentrations above the guidance criteria of 100ppm and 1000ppm, respectively. Results are shown in Table 3-2 and Table 3-3 below and photos of the areas / features requiring investigation are presented in Appendix 2.

Table 3-2
Stage 1 Survey Results: Cap

Ref	Grid Reference (NGR)	Maximum Concentration (ppm)	Exceedance Information
Cap1	246934, 217536	>5000	Near Well #1006
Cap2	246922, 217431	>5000	Near Well #0906
Cap 3	Area of 246841, 217444	>5000	Near Well# 1410
Cap 4		>5000	Near Well #1410
Cap 5		>5000	Near Well #1410
Cap 6		400	Near Well #1410

Table 3-3
Stage 1 Survey Results – Gas / Leachate Infrastructure

Ref	Grid Reference (NGR)	Maximum Concentration (ppm)	Exceedance Information
F1	246894, 217385	>5000	Rip in Seam of Base, Well 1206
F2	246910, 217428	>5000	No Reference on Feature, Source = Collar Seal
F3	246900, 217439	1000	No Reference on Feature, Source = Collar Seal
F4	246881, 217430	1000	No Reference on Feature, Source = Collar Seal
F5	246884, 217418	>5000	No Reference on Feature, Source = Collar Seal
F6	246825, 217424	>5000	No Reference on Feature, Base of Well
F7	246922, 217203	>5000	Well NYCL0010, Base of Well
F8	246848, 217380	>5000	No Reference on Feature, located between Wells 1407 & 1412

4.0 PHASE 2 SURFACE EMISSIONS SURVEY – RE-MONITORING AND FLUX REQUIREMENTS

4.1 RE-MONITORING RESULTS

Following the findings of the Stage 1 walkover survey, six areas of cap and eight features were identified as requiring further investigation and possible remediation. CWM Environmental investigated both areas and remediation was undertaken. Re-monitoring of the areas identified was undertaken on 20th January 2020, the results of which are detailed below in Table 4-1.

Table 4-1
Re-Monitoring Results 20th January 2020

Reference	Remediation undertaken	Maximum Concentration (ppm)
Cap 1	Extrusion weld	0
Cap 2	Extrusion weld	0
Cap 3	Extrusion weld	50
Cap 4	Extrusion weld	0
Cap 5	Extrusion weld	5
Cap 6	Extrusion weld	40
Feature 1	Extrusion weld	0
Feature 2	Extrusion weld	100
Feature 3	Extrusion weld	0
Feature 4	Extrusion weld	50
Feature 5	Extrusion weld	0
Feature 6	Extrusion weld	900
Feature 7	Extrusion weld	0
Feature 8	Extrusion weld	500

Concentrations recorded at feature 6 and feature 8 remained elevated but did not exceed the relevant criteria. These features are to be further looked at by CWM to ensure they don't deteriorate further and remain below the relevant criteria.

4.2 STAGE 2 FLUX REQUIREMENTS

Nantycaws Landfill has not received any additional waste into the landfill since 2016. Since the 2018 surface emissions survey, no additional areas of landfill have been capped and completed that would require a Stage 2 flux survey. Equally, no existing areas of the landfill have changed the nature of the cap that would require a

Stage 2 flux survey. As such, there is no requirement for a flux survey to be undertaken as part of the 2019 Surface Emissions Survey.

5.0 CONCLUSIONS

The 2019 walkover survey has demonstrated ongoing compliance across the cap, with six areas of cap and eight features identified in Stage 1 that required investigation. Following remediation, the identified areas of cap and features were re-monitored and found to be compliant. As such, it can be concluded that Nantycaws Landfill continues to be in compliance with the Landfill Directive.

Nantycaws Landfill has not received any additional waste into the landfill since 2016. There have been no new areas of cap since the previous surface emissions survey undertaken in 2018. As such, there is no requirement at present for a Stage 2 flux survey to be undertaken.

APPENDIX A

Stage 1 Walkover Results

Feature	Base (ppm)	Boot Cover Top and Pipe-Work (ppm)
KOP02	0	0
CW0035	0	0
CW0056	0	0
CW1019	0	0
CW0055	0	0
CW1020	0	0
CW0036	0	0
NYCL0003	0	0
CW0054	0	0
CW0053	0	0
NYCL0013	0	0
NYCW0902	0	0
NYCW0004	0	0
NYCW1002	0	0
NYCW1003	0	0
NOD1	0	0
1006	200	0
901	0	0
908	0	0
1005	0	0
1209	0	0
1210	0	0
NYCL0004	0	0
53	0	0
37	0	0
904	0	0
1101	0	0
1102	0	0
KOP5	0	0
1103	0	1000
703	0	0
NYCW1010	0	0
704	0	0
1011	0	0
1012	0	0

Feature	Base (ppm)	Boot Cover Top and Pipe-Work (ppm)
911	0	0
710	0	0
709	0	0
913	0	0
1104	0	0
1001	0	0
912	0	0
910	0	0
711	0	0
1009	0	0
1206	>5000	0
NYCL0006	0	0
906	0	0
UNNAMED WELL #1	0	>5000
UNNAMED WELL #2	0	1000
UNNAMED WELL #3	0	1000
UNNAMED WELL #4	0	>5000
1412	10	0
1411	500	0
NYCL016 (UNNAMED #5)	100	0
NYCL015 (UNNAMED #6)	100	0
NYCR1202	0	0
NYCL1410	50	0
NYCLW017 (UNNAMED #7)	>5000	0
1405	100	0
1404	800	0
"NO REF" (ON MAP)	0	0
1403	0	0
1402	0	0
"NO REF #2"	100	0
KOP7	0	0
1203	0	0
1004	0	0
NYCL0014	0	0
KOP04	0	0

Feature	Base (ppm)	Boot Cover Top and Pipe-Work (ppm)
NYCL0001	0	0
NYCL0012 (UNSURE, NO LABEL)	0	0
SP07	0	0
BELOW 1016	0	0
2ND BELOW 1016	0	0
1408 OR 1406 (MAYBE MISLABEL)	0	0
1407	<100	0
UNNAMED BETWEEN 1407 + 1412	>5000	0
NYCW0909	0	0
NYCW1016	0	0
NYCW1015	0	0
NYCW1014	0	0
UNNAMED NEAR 1014	0	0
NYCL0007	0	0
NYCW0502	0	0
UNNAMED NEAR 0007	0	0
NYCW1013	0	0
UNNAMED NEAR 1013	0	0
NYCL0009	0	0
NWCW511	100	0
NYCW0509	0	0
KOP6	0	0
NYCP1013	0	0
NYCL0008	0	0
NYCL0508	0	0
NYCW0907	0	0
NYCW0909	0	0
NYCL0010	>5000	0
NYCW1103	0	0
NYCW1021	0	0
KOP1	0	0
NOID3	0	0

APPENDIX B

Stage 1 Walkover Photos

Photo 1: Cap Exceedance #1



Photo 2: Cap Exceedance #2



Photo 3: Cap Exceedance #3 and #4



Photo 4: Cap Exceedance #5



Photo 5: Cap Exceedance #6



Photo 6: Feature #1 (1206)



Photo 7: Feature #2



Photo 8: Feature #3



Photo 9: Feature #4



Photo 10: Feature #5



Photo 11: Feature #6



Photo 12: Feature #7



Photo 13: Feature #8



APPENDIX C

Gas Management Abstraction System Data (05.11.19 & 11.11.19)

Reference	Reading Taken On	CH4 (%)	CO2 (%)	O2 (%)	Depart valve (%)
NYCW0035	05/11/2019 08:30	1.3	2.3	20.5	0
NYCW0055	05/11/2019 08:33	16.7	6.3	14.4	0
NYCW0056	05/11/2019 08:35	54.5	25.1	0.1	22
NYCW0056	05/11/2019 08:37	54	26.6	0	22
NYCW1019	05/11/2019 08:40	23.1	17	1.2	0
NYCW1020	05/11/2019 08:43	17	18.2	0	0
NYCW1021	05/11/2019 08:47	1.2	3.8	19.4	0
NYCW0054	05/11/2019 08:50	35.9	16	5.2	0
NYCW0036	05/11/2019 08:59	2.2	3.3	20.8	0
NYCW0037	05/11/2019 09:02	40	14.5	6.6	100
NYCW0053	05/11/2019 09:05	24	14.2	7.9	0
NYCW0901	05/11/2019 09:26	43.2	29.1	0.1	5
NYCW0902	05/11/2019 09:29	32.1	28.6	0	25
NYCW0902	05/11/2019 09:31	32.2	28	0	25
NYCW0903	05/11/2019 09:34	59.6	40.5	0	100
NYCW1002	05/11/2019 09:36	57.9	37.3	0	100
NYCW1003	05/11/2019 09:39	43.8	35.4	0	20
NYCW1006	05/11/2019 09:42	52.1	37.7	0	47
NYCW1006	05/11/2019 09:45	49.8	36	0	47
NYCW1007	05/11/2019 09:48	59.2	41.7	0	5
NYCW1007	05/11/2019 09:52	59.2	41.3	0	5
NYCW1008	05/11/2019 09:55	58.3	42.5	0	7
NYCW1008	05/11/2019 09:57	58.5	42.6	0	7
NYCW1005	05/11/2019 10:00	39	34	0	12
NYCW1005	05/11/2019 10:03	42.4	34.9	0	12
NYCW1004	05/11/2019 10:05	57.7	43	0	100
NYCR1001	05/11/2019 10:09	56.8	41	0	100
NYCR0905	05/11/2019 10:13	55.4	32.9	0	12
NYCR0905	05/11/2019 10:15	55.8	32	0	12
NYCW0906	05/11/2019 10:18	59.2	41.4	0	100
NYCR1201	05/11/2019 10:25	56.3	44	0	100
NYCR1202	05/11/2019 10:30	47.7	39.3	0.3	100
NYCW1206	05/11/2019 10:34	55.2	45.4	0	100
NYCW1411	05/11/2019 10:37	54.8	45.8	0	100

Reference	Reading Taken On	CH4 (%)	CO2 (%)	O2 (%)	Depart valve (%)
NYCW1412	05/11/2019 10:41	39	36.2	0	10
NYCW1410	05/11/2019 10:46	41	35.3	0	10
NYCW1203	05/11/2019 10:48	46.6	35	0	22
NYCW1209	05/11/2019 10:58	58.8	41	0.2	7
NYCW1210	05/11/2019 11:02	60.3	28.5	2.1	5
NYCW1210	05/11/2019 11:05	60.4	28.1	2.1	5
NYCW1402	05/11/2019 11:08	40.6	32.5	0	50
NYCW1403	05/11/2019 11:10	34.4	26.4	0	7
NYCW1403	05/11/2019 11:13	35	26.2	0	7
NYCW1404	05/11/2019 11:16	45.3	36.3	0	7
NYCW1405	05/11/2019 11:18	31.8	30.4	1.1	5
NYCW1405	05/11/2019 11:20	32.1	30.3	1.1	5
NYCW1406	05/11/2019 11:23	35.2	32.7	0.5	7
NYCW1406	05/11/2019 11:25	35.6	33.6	0.1	7
NYCW1407	05/11/2019 11:28	55.8	37.9	1	5
NYCW0909	05/11/2019 11:32	16.3	20.6	4.1	0
NYCW0904	05/11/2019 11:39	42.7	25.3	0	30
NYCW1101	05/11/2019 11:42	38.7	17.2	0.2	0
NYCW1102	05/11/2019 11:46	24.3	22.4	0.9	0
NYCW1103	05/11/2019 11:48	45	33.8	0	100
NYCW1104	05/11/2019 11:51	47.7	33.8	0	37
NYCW0912	05/11/2019 13:03	53.7	34.3	0	10
NYCW0912	05/11/2019 13:05	53.6	35.1	0	10
NYCW0913	05/11/2019 13:11	8.1	6	17.5	100
NYCW0913	05/11/2019 13:16	18.5	10.1	14.4	0
NYCW1010	05/11/2019 13:19	43.9	34.3	0.1	13
NYCW1011	05/11/2019 13:22	42.7	34.6	0.1	28
NYCW1011	05/11/2019 13:24	44.2	35.6	0.1	28
NYCW1012	05/11/2019 13:27	48.7	35.3	0	25
NYCW0710	05/11/2019 13:30	30.5	29	0	5
NYCW0710	05/11/2019 13:36	30.6	28.7	0.1	5
NYCW0709	05/11/2019 13:39	49.2	39.7	0	85
NYCW0910	05/11/2019 13:42	53	38.6	0	18
NYCW1009	05/11/2019 13:56	47	34	0.1	50

Reference	Reading Taken On	CH4 (%)	CO2 (%)	O2 (%)	Depart valve (%)
NYCW0711	05/11/2019 13:58	58.6	41.8	0	100
NYCW0911	05/11/2019 14:01	45.7	35.3	0	100
NYCW1013	05/11/2019 14:07	0.3	6.3	16.9	0
NYCW1014	05/11/2019 14:10	44.3	29.8	0	15
NYCW1015	05/11/2019 14:12	30.1	24.3	0	0
NYCW1016	05/11/2019 14:16	27.7	20.3	0	5
NYCW0913	05/11/2019 14:22	29.9	17.7	10.2	0
NYCW0508	11/11/2019 09:09	67	22.9	0.2	7
NYCW1017	11/11/2019 09:12	49.1	21.1	0.1	12
NYCW0509	11/11/2019 09:17	46.2	22.7	0.1	17
NYCW1018	11/11/2019 09:20	28.4	22.7	0.1	0
NYCW0512	11/11/2019 09:37	45.9	24.8	0.1	10
NYCW0513	11/11/2019 09:43	65.6	35.4	0.1	10
NYCW0513	11/11/2019 09:45	65.7	35.4	0	10
NYCW0704	11/11/2019 10:17	39.5	28.1	0.7	10
NYCW0703	11/11/2019 10:22	44	33.8	0.1	100
NYCW0605	11/11/2019 10:24	36.6	26.9	0	10
NYCW0033	11/11/2019 11:49	47.6	30.9	0.1	20
NYCW0027	11/11/2019 11:54	64	20.5	0.2	20
NYCW0029	11/11/2019 11:56	44.8	27.8	0	20
NYCW0029	11/11/2019 11:58	44.7	27.5	0	20
NYCW0025	11/11/2019 12:01	37.9	24.5	0	5
NYCW0025	11/11/2019 12:04	37.8	24.4	0	5
NYCW0023	11/11/2019 12:06	42.1	26.7	0	25
NYCW0013	11/11/2019 12:09	45.3	27.5	0	10
NYCW0017	11/11/2019 12:11	-	-	-	-
NYCW0018	11/11/2019 12:14	39.1	27.5	0	20
NYCW0018	11/11/2019 12:16	37.2	27.7	0	20
NYCW0019	11/11/2019 12:22	-	-	-	-
NYCW0002	11/11/2019 13:58	61.7	34.2	0.1	5
NYCW0002	11/11/2019 14:01	61.7	34.4	0.1	5
NYCW0012	11/11/2019 14:19	49.1	27.7	0	17
NYCW0006	11/11/2019 14:23	50.4	23.6	0	30
NYCW0007	11/11/2019 14:26	51.7	27.2	0	35

Reference	Reading Taken On	CH4 (%)	CO2 (%)	O2 (%)	Depart valve (%)
NYCW0004	11/11/2019 14:29	51.8	26.6	0	30
NYCW0003	11/11/2019 14:33	51.7	26	2.4	5
NYCW0008	11/11/2019 14:36	65.1	32.1	0	100
NYCW0010	11/11/2019 14:39	62.7	32.7	0	100
NYCW0022	11/11/2019 14:43	42.5	30.3	0	10
NYCW0035	05/11/2019 08:30	1.3	2.3	20.5	0
NYCW0055	05/11/2019 08:33	16.7	6.3	14.4	0
NYCW0056	05/11/2019 08:35	54.5	25.1	0.1	22
NYCW0056	05/11/2019 08:37	54	26.6	0	22
NYCW1019	05/11/2019 08:40	23.1	17	1.2	0
NYCW1020	05/11/2019 08:43	17	18.2	0	0
NYCW1021	05/11/2019 08:47	1.2	3.8	19.4	0
NYCW0054	05/11/2019 08:50	35.9	16	5.2	0
NYCW0036	05/11/2019 08:59	2.2	3.3	20.8	0
NYCW0037	05/11/2019 09:02	40	14.5	6.6	100
NYCW0053	05/11/2019 09:05	24	14.2	7.9	0
NYCW0901	05/11/2019 09:26	43.2	29.1	0.1	5
NYCW0902	05/11/2019 09:29	32.1	28.6	0	25
NYCW0902	05/11/2019 09:31	32.2	28	0	25
NYCW0903	05/11/2019 09:34	59.6	40.5	0	100
NYCW1002	05/11/2019 09:36	57.9	37.3	0	100
NYCW1003	05/11/2019 09:39	43.8	35.4	0	20
NYCW1006	05/11/2019 09:42	52.1	37.7	0	47
NYCW1006	05/11/2019 09:45	49.8	36	0	47
NYCW1007	05/11/2019 09:48	59.2	41.7	0	5
NYCW1007	05/11/2019 09:52	59.2	41.3	0	5
NYCW1008	05/11/2019 09:55	58.3	42.5	0	7
NYCW1008	05/11/2019 09:57	58.5	42.6	0	7
NYCW1005	05/11/2019 10:00	39	34	0	12
NYCW1005	05/11/2019 10:03	42.4	34.9	0	12
NYCW1004	05/11/2019 10:05	57.7	43	0	100
NYCR1001	05/11/2019 10:09	56.8	41	0	100
NYCR0905	05/11/2019 10:13	55.4	32.9	0	12
NYCR0905	05/11/2019 10:15	55.8	32	0	12

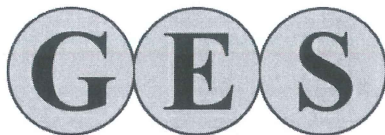
Reference	Reading Taken On	CH4 (%)	CO2 (%)	O2 (%)	Depart valve (%)
NYCW0906	05/11/2019 10:18	59.2	41.4	0	100
NYCR1201	05/11/2019 10:25	56.3	44	0	100
NYCR1202	05/11/2019 10:30	47.7	39.3	0.3	100
NYCW1206	05/11/2019 10:34	55.2	45.4	0	100
NYCW1411	05/11/2019 10:37	54.8	45.8	0	100
NYCW1412	05/11/2019 10:41	39	36.2	0	10
NYCW1410	05/11/2019 10:46	41	35.3	0	10
NYCW1203	05/11/2019 10:48	46.6	35	0	22
NYCW1209	05/11/2019 10:58	58.8	41	0.2	7
NYCW1210	05/11/2019 11:02	60.3	28.5	2.1	5
NYCW1210	05/11/2019 11:05	60.4	28.1	2.1	5
NYCW1402	05/11/2019 11:08	40.6	32.5	0	50
NYCW1403	05/11/2019 11:10	34.4	26.4	0	7
NYCW1403	05/11/2019 11:13	35	26.2	0	7
NYCW1404	05/11/2019 11:16	45.3	36.3	0	7
NYCW1405	05/11/2019 11:18	31.8	30.4	1.1	5
NYCW1405	05/11/2019 11:20	32.1	30.3	1.1	5
NYCW1406	05/11/2019 11:23	35.2	32.7	0.5	7
NYCW1406	05/11/2019 11:25	35.6	33.6	0.1	7
NYCW1407	05/11/2019 11:28	55.8	37.9	1	5
NYCW0909	05/11/2019 11:32	16.3	20.6	4.1	0
NYCW0904	05/11/2019 11:39	42.7	25.3	0	30
NYCW1101	05/11/2019 11:42	38.7	17.2	0.2	0
NYCW1102	05/11/2019 11:46	24.3	22.4	0.9	0
NYCW1103	05/11/2019 11:48	45	33.8	0	100
NYCW1104	05/11/2019 11:51	47.7	33.8	0	37
NYCW0912	05/11/2019 13:03	53.7	34.3	0	10
NYCW0912	05/11/2019 13:05	53.6	35.1	0	10
NYCW0913	05/11/2019 13:11	8.1	6	17.5	100
NYCW0913	05/11/2019 13:16	18.5	10.1	14.4	0
NYCW1010	05/11/2019 13:19	43.9	34.3	0.1	13
NYCW1011	05/11/2019 13:22	42.7	34.6	0.1	28
NYCW1011	05/11/2019 13:24	44.2	35.6	0.1	28
NYCW1012	05/11/2019 13:27	48.7	35.3	0	25

Reference	Reading Taken On	CH4 (%)	CO2 (%)	O2 (%)	Depart valve (%)
NYCW0710	05/11/2019 13:30	30.5	29	0	5
NYCW0710	05/11/2019 13:36	30.6	28.7	0.1	5
NYCW0709	05/11/2019 13:39	49.2	39.7	0	85
NYCW0910	05/11/2019 13:42	53	38.6	0	18
NYCW1009	05/11/2019 13:56	47	34	0.1	50
NYCW0711	05/11/2019 13:58	58.6	41.8	0	100
NYCW0911	05/11/2019 14:01	45.7	35.3	0	100
NYCW1013	05/11/2019 14:07	0.3	6.3	16.9	0
NYCW1014	05/11/2019 14:10	44.3	29.8	0	15
NYCW1015	05/11/2019 14:12	30.1	24.3	0	0
NYCW1016	05/11/2019 14:16	27.7	20.3	0	5
NYCW0913	05/11/2019 14:22	29.9	17.7	10.2	0
NYCW0508	11/11/2019 09:09	67	22.9	0.2	7
NYCW1017	11/11/2019 09:12	49.1	21.1	0.1	12
NYCW0509	11/11/2019 09:17	46.2	22.7	0.1	17
NYCW1018	11/11/2019 09:20	28.4	22.7	0.1	0
NYCW0512	11/11/2019 09:37	45.9	24.8	0.1	10
NYCW0513	11/11/2019 09:43	65.6	35.4	0.1	10
NYCW0513	11/11/2019 09:45	65.7	35.4	0	10
NYCW0704	11/11/2019 10:17	39.5	28.1	0.7	10
NYCW0703	11/11/2019 10:22	44	33.8	0.1	100
NYCW0605	11/11/2019 10:24	36.6	26.9	0	10
NYCW0033	11/11/2019 11:49	47.6	30.9	0.1	20
NYCW0027	11/11/2019 11:54	64	20.5	0.2	20
NYCW0029	11/11/2019 11:56	44.8	27.8	0	20
NYCW0029	11/11/2019 11:58	44.7	27.5	0	20
NYCW0025	11/11/2019 12:01	37.9	24.5	0	5
NYCW0025	11/11/2019 12:04	37.8	24.4	0	5
NYCW0023	11/11/2019 12:06	42.1	26.7	0	25
NYCW0013	11/11/2019 12:09	45.3	27.5	0	10
NYCW0017	11/11/2019 12:11	-	-	-	-
NYCW0018	11/11/2019 12:14	39.1	27.5	0	20
NYCW0018	11/11/2019 12:16	37.2	27.7	0	20
NYCW0019	11/11/2019 12:22	-	-	-	-

Reference	Reading Taken On	CH4 (%)	CO2 (%)	O2 (%)	Depart valve (%)
NYCW0002	11/11/2019 13:58	61.7	34.2	0.1	5
NYCW0002	11/11/2019 14:01	61.7	34.4	0.1	5
NYCW0012	11/11/2019 14:19	49.1	27.7	0	17
NYCW0006	11/11/2019 14:23	50.4	23.6	0	30
NYCW0007	11/11/2019 14:26	51.7	27.2	0	35
NYCW0004	11/11/2019 14:29	51.8	26.6	0	30
NYCW0003	11/11/2019 14:33	51.7	26	2.4	5
NYCW0008	11/11/2019 14:36	65.1	32.1	0	100
NYCW0010	11/11/2019 14:39	62.7	32.7	0	100
NYCW0022	11/11/2019 14:43	42.5	30.3	0	10

APPENDIX D

Gastec Flame Ionisation Detector (FID) Calibration Certificate



Certificate of Test and Calibration

Calibration Date 30th October 2019

Instrument Details Gastec MK 4

Serial Number 6335

Customer SLR Consulting

The above instrument has been serviced in accordance with the manufacturers and British Gas recommended procedures for recalibration and checking of Gastec gas detectors.

The instrument was calibrated using gas standards that are traceable to national standards.

The instrument meets the requirements of British Gas standards, provided it is used and maintained in accordance with the manufacturers instructions

Recalibration is recommended to be carried out at six months from the date on this certificate.

Methane Gas Standard	Range	Readings	Cylinder number
80 ppm	One	80ppm	APE1108548
500 ppm	One	550ppm	618167
800 ppm	One	850ppm	03267292
80 ppm	Two	85ppm	APE1108548
500 ppm	Two	550ppm	618167
800 ppm	Two	850ppm	03267292
8000 ppm	Two	8200ppm	APL 223439

Terry Evans
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