

Our Ref: 15773

Your Ref:

Contact: James Rhys-Williams

23rd September 2020

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For the attn. of Mr Darren Rhys Thomas

UPDATED DETAILED GROUND GAS RISK ASSESSMENT: SWANSEA BAY TECHNOLOGY CENTRE

1.0 Introduction

Terra Firma Wales Ltd. Have been retained by Morgan Sindall Construction & Infrastructure Ltd. (the Client) to prepare a detailed ground gas risk assessment for their development site at Swansea Bay Technology Park.

Between December 2019 and January 2020 site investigation works were undertaken at the site by the author to investigate any geotechnical and geoenvironmental liabilities, to facilitate the construction of the proposed commercial development. Three boreholes were drilled as part of the investigation and installed with dual purpose monitoring wells. A programme of ground gas and groundwater monitoring followed site works for a period of three months, with visits approximately every two weeks.

An initial ground gas risk assessment was prepared based on the results of the first two rounds of ground gas monitoring data. It was evident that borehole BH03 was producing high levels of methane gas at elevated flow rates. However, it was noted that the screened section of the well was flooded which is likely to influence the actual gas concentration. Where the screened section of well was not wholly flooded in borehole BH01 and BH02, negligible levels of hazardous gas were recorded. It was also suggested that elevated flow rates may be attributed to tidal changes. Based on the measured results a gas screening value of 2.73l/hr was prepared, classifying the site as 'Gas Characteristic Situation 3' (CS3).

This letter report is to be read in conjunction with Terra Firma Wales Ltd. Geotechnical and Geoenvironmental Report, referenced 15773, dated February 2020.

Due to Local Authority concern with the reliability of initial interpretations, a supplementary investigation was undertaken on the 19th August 2020 and comprised the installation of three shallow gas wells (WS101 to WS103), installed wholly above groundwater for the deployment of continuous gas monitoring equipment. Their purpose, with comparison to initial well gas results, was to identify the affect of groundwater on the periodic measured ground gas results already

undertaken. Detailed borehole logs along with their approximate locations are presented in **Annex A**.

Continuous monitoring works were undertaken by GGS Ltd who specialise in continuous gas monitoring. In addition to gas monitoring GGS Ltd collected groundwater samples from two existing wells (BH01 and BH03) and perched water from the newly installed well WS101, as an additional tool to aid in risk assessment.

2.0 Ground Gas Monitoring Results

Three monitoring wells were installed in boreholes BH01, BH02 and BH03 as part of Terra Firma Wales Ltd initial investigation.

Six rounds of gas monitoring have been carried out to date. The installations were tested for carbon dioxide, methane, oxygen, carbon monoxide and hydrogen sulphide using a Gas Analyser GA2000. On occasion the installations were also monitored for volatile organic compounds (VOC) using a photo-ionisation detector with a 10.6eV lamp.

Ground gas monitoring results are tabulated in **Table 2.1** along with approximate tide heights (tidetimes.co.uk) and barometric pressure at time of visit.

Table 2.1 Ground Gas Monitoring Results									
Date & Time	Borehole	Methane (%)	Oxygen (%)	Carbon Dioxide (%)	Flow (l/hr)	Ground-Water (m)	Tide (m)	VOC (ppm)	Baro-metric Pressure (mb)
24/01/20 16:00	BH01	0	10.6	0	0	1.5	5.1 ^{>}		1021 ^F
04/02/20 11:30	BH01	0.1	2.3	0.1	0	1.63	5.3 ^{>}	0.9	1027 ^R
18/02/20 15:00	BH01	0.1	8.6	0.1	0	1.5	7.2 ^H		1017 ^S
02/03/20 12:00	BH01	0.5	5.5	0	2	1.3	7.2 ^{<}		995 ^S
31/03/20 15:00	BH01	0	14.6	0.1	0	1.7	3 ^{<}		1031 ^F
20/04/20 11:30	BH01	0	18.8	0	0	1.9	1.7 ^L	0	1016 ^S
24/01/20 16:00	BH02	0	2.7	0	0	2.4	5.1 ^{>}		1021 ^F
04/02/20 11:30	BH02	0.6	0.8	0.1	0	2.33	5.3 ^{>}	0.6	1027 ^R
18/02/20 15:00	BH02	0.2	0.8	0	0.2	2.1	7.2 ^H		1017 ^S
02/03/20 12:00	BH02	0.1	0.4	0.1	7.8	2	7.2 ^{<}		995 ^S
31/03/20 15:00	BH02	0	19.9	0.1	0	2.4	3 ^{<}		1031 ^F
20/04/20 11:30	BH02	0	18.3	0.1	0	2.6	1.7 ^L	0	1016 ^S
24/01/20 16:00	BH03	29.8	3.8	0	0	1.6	5.1 ^{>}		1021 ^F
04/02/20 11:30	BH03	35.9	19.1	7.3	7.6	1.5	5.3 ^{>}	1.3	1027 ^R

18/02/20 15:00	BH03	39.8	5.5	0	8	1.45	7.2 ^H		1017 ^S
02/03/20 12:00	BH03	45.8	4.7	0	12.5	1.4	7.2 ^{<}		995 ^S
31/03/20 15:00	BH03	3.1	17.7	0	7.2	1.7	3 ^{<}		1031 ^F
20/04/20 11:30	BH03	9.8	14.1	0	0	1.9	1.7 ^L	0	1016 ^S

Table Notes:

> – Rising Tide

< – Falling Tide

H – High Tide

L – Low Tide

F – Falling

R – Rising

S – Steady

Carbon monoxide and hydrogen sulphide were not detected during monitoring of the borehole installations.

Borehole BH03 installation well, unlike BH01 and BH02, was completed flooded throughout monitoring. Flooded wells in combination with variable groundwater levels will confine pressures within the well top, significantly influencing flow rates. Flow readings taken in this scenario will be directly related to the differential pressure due to this hydrostatic head. Falling pressure within the confined well will in turn allow dissolved methane gas to come out of solution. Monitored gas concentration are therefore only reflective of the trapped gasses in the top of the well as a result of this process. It is contentious how the effect of preferential partitioning of dissolved gasses within groundwater into the well top will influence the result. It is considered that borehole BH03 results are not representative of the actual gas risk and should be used with extreme caution.

Gas wells (WS101 to WS103) were continually monitored for a period of two weeks. No significant gas results were recorded. GGS Ltd full report is appended in **Annex B**.

3.0 Gas Risk Characterisation

3.1 Gas Source

Borehole BH03 installation well is entirely situated below the made ground material therefore ruling out this material as the methane source. Apart from rare timber fragments found within the made ground material, no other potential gas producing, organic rich components were identified.

Soft to firm dark grey peaty clay was encountered between 3.00m and 3.50m in borehole BH03. Oxidation of peat would produce methane at concentrations observed during monitoring. It should be noted that peat deposits of any volume are finite reservoirs of very limited amounts of interstitial gas and moreover do not have the capacity to de-gas at significant rates. Elevated flow rate recorded during monitoring are therefore attributed to other driving forces.

Borehole BH01 and BH02 encountered similar dark grey clay without the significant peat content, which may account for the variation in methane concentrations recorded between wells.

Variation in dissolved gas concentrations between boreholes BH01 and BH03 also signify the variance of organic matter confined within the clay soils between the two locations. It should be noted that elevated results in borehole BH03 will also be attributed to it being flooded and influenced by confining pressures.

3.2 Gas Migration Pathways

Due to the vary nature of peat deposits, the lamination of thin horizontal alluvial clay beds, interbedded with organic rich peat, precludes the vertical movement of gasses or fluids at elevated rates. Typically, peaty clay deposits have a permeability in the order of 1×10^{-07} m/s, whereas permeabilities $< 1 \times 10^{-04}$ m/s are required for adequate gas flow (Technical Paper: Risk and Reliability in Gas Protection Design – 20 Year on. Parts 1 and 2:2019).

Made ground encountered above the peaty clay deposits have a permeability at best of 1×10^{-05} , based on previously undertaken soakage tests at shallow depth.

The fact that shallow soils are completely saturated to a depth of between 1.4-2.6m will also inhibit migration of gasses.

Variation of dissolved gas concentration between borehole BH01 and BH03 also demonstrated that there is negligible connectivity horizontally, and elevated dissolved gas concentrations are likely a bias of the well itself.

Existing borehole are considered the only feasible gas migration pathway to surface. It is recommended that borehole be decommissioned prior to development, utilising a bentonite clay plug.

The underlying ground conditions precludes the use of traditional foundation for the proposed structure therefore a piled foundation solution is to be adopted. Although it is considered unlikely due to the re-sealing effect of saturated clays, the annulus between the pile and in-situ materials is considered a potential gas migration pathway.

It is likely the proposed building will include a lift pit, constructed at depth, possibly within or through the peaty clay deposits. The drainage layer between the structure and soil is a potential gas migration pathway. But given the shallow depth of groundwater any structure below ground of this nature would require Grade 2 or 3 waterproofing conforming to BS 8102:2009. Waterproofing of this nature is also very affective at preventing gas ingress.

3.3 Potential Receptors

Potential receptors included all staff and visitor to the commercial structure, as well as the structure itself. Although methane gas itself is nontoxic, significant displacement of oxygen within a confined space can cause asphyxiation. Methane is also explosive at concentrations between 5-15%.

3.4 Driving Forces

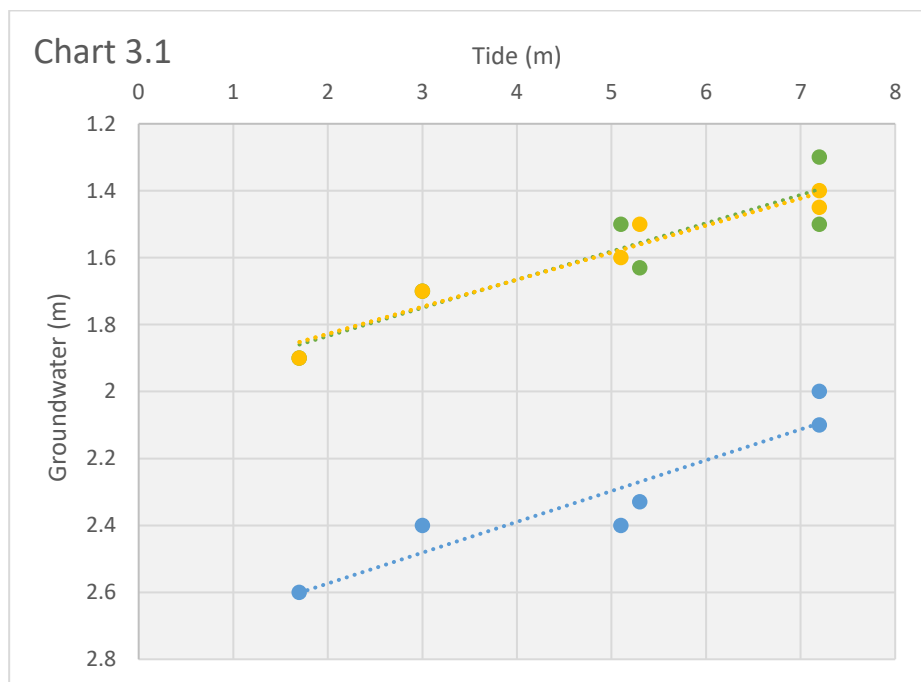
It has been demonstrated that driving forces are accountable for the elevated flow rates recorded in boreholes BH01 to BH03, as the gas source is not favourable to such high degassing conditions.

Continuous ground gas monitoring has also confirmed that gas flow in shallow superficial soils is negligible, therefore demonstrating that there is no effective continuity between potential driving forces explored further in the following subsections and gas concentrations.

The following charts demonstrate that rising groundwater, predominantly attributed to tidal changes with lesser influence from barometric pressure, is the main contributor of differential pressure between the wells and atmosphere, and subsequent flow rate measurements.

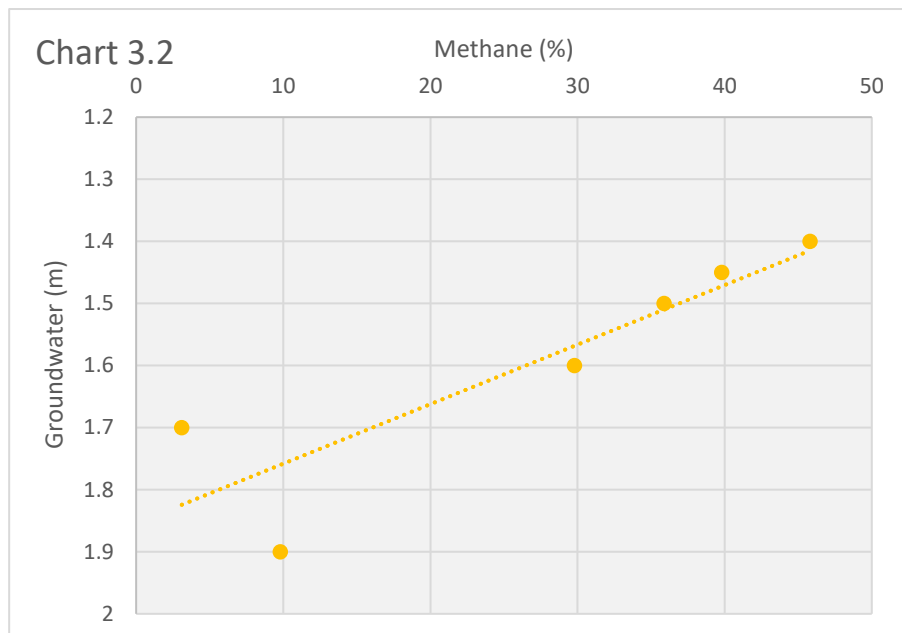
3.4.1 Groundwater

Over the initial investigation and monitoring period groundwater was shown to fluctuate over a range of between 0.5-0.6m. Previous assessments undertaken by the author have alluded to a correlation between tidal patterns and groundwater levels. The following chart **Chart 3.1** illustrates a positive correlation between the two variables for each of the initial boreholes.



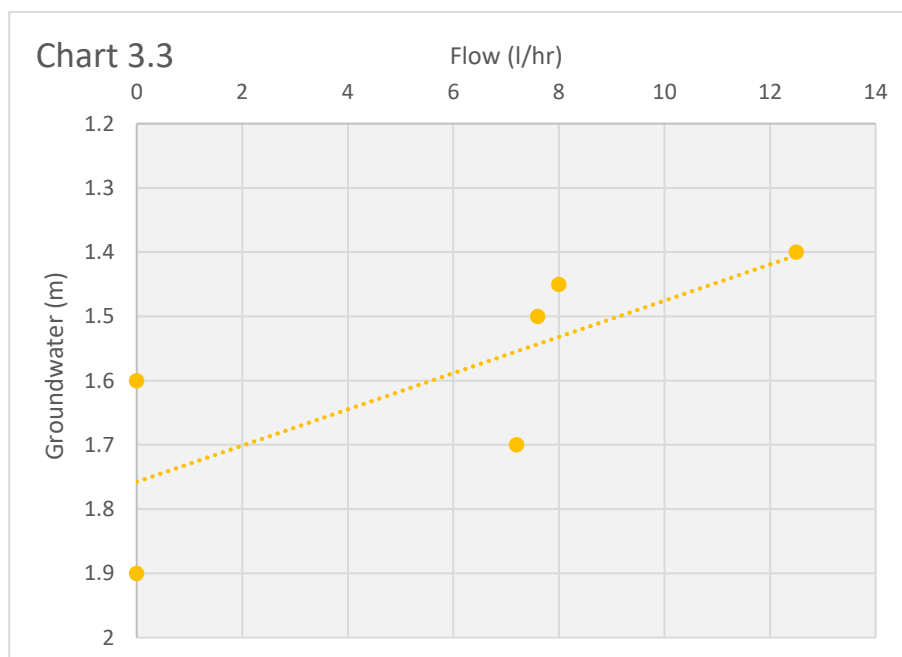
Notes: Green – BH01; Blue – BH02; Yellow – BH03. Trendlines are linear.

Chart 3.2 demonstrates the relationship between methane concentration and groundwater levels for borehole BH03. The chart shows a clear correlation between rising groundwater levels and rising methane levels. Suggesting the increasing confining pressure within the well results in increased degassing of groundwater.



Notes: Yellow – BH03. Trendline is linear.

Similarly, a positive but weak relationship is shown in **Chart 3.3**, which illustrates the correlation between increasing flow rates and rising groundwater level in borehole BH03.

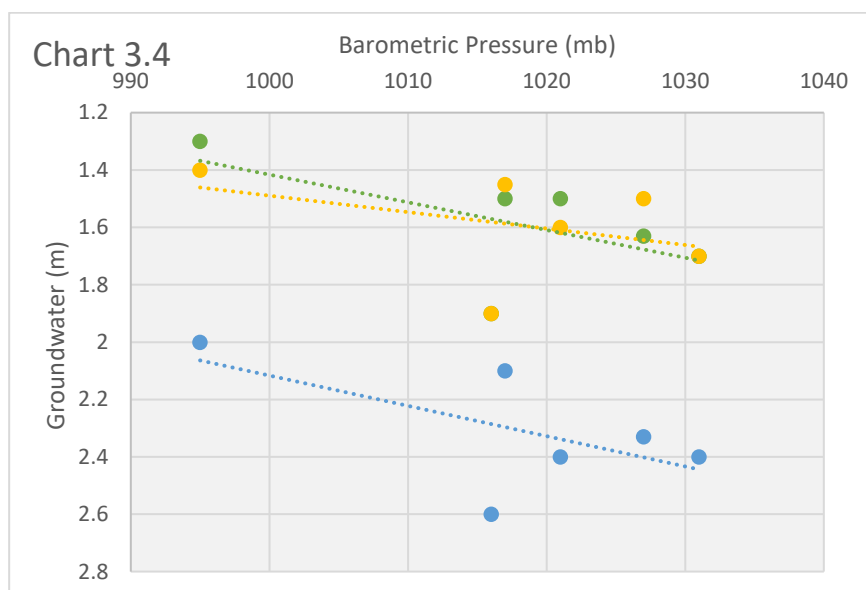


Notes: Yellow – BH03. Trendline is linear.

3.4.2 Barometric Pressure

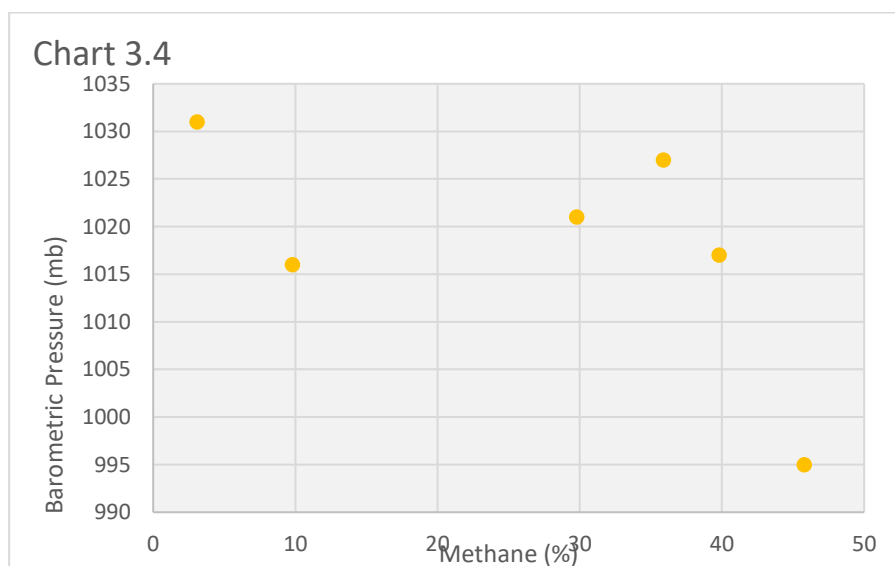
Barometric pressure is also considered another driving force for consideration. Typically, low atmospheric pressure give rise to elevated gas flow rates due to resulting differential pressures between the well and atmosphere. However, analysis of the results shows no discernible relationship between the two variables.

The following chart **Chart 3.4** illustrates a correlation, albeit weak, between barometric pressure and groundwater levels.



Notes: Green – BH01; Blue – BH02; Yellow – BH03. Trendlines are linear.

The relationship between methane concentration and barometric pressure is also analysed in **Chart 3.4** for borehole BH03, it is considered there very little correlation. Similar results were seen for borehole BH02. It is interpreted that point at 995mb, 46% methane is an outlier as it coincides with a higher tide level which is seen to be the dominant force controlling confining pressure and degassing of groundwater within the well.



Notes: Yellow – BH03.

3.5 Volatile Gasses

Boreholes were monitored for volatile organic compounds on two occasions during monitoring, no significant volatiles were recorded. The risk from volatile gasses is considered negligible.

3.6 Continuous Ground Gas Investigation Results

Continuous ground gas monitoring revealed that methane and carbon dioxide concentrations remained below their respective triggering values of 1% and 5% for the duration of monitoring period. It is also confirmed that the most significant atmospheric pressure fall captured during monitoring meets the 'worst case' conditions as outlined in CL:AIRE Technical Bulletin TB18, 2019. Therefore no risk was identified.

This investigation confirms that there is no vertical gas migration pathway present between the peaty clay soils and unsaturated soils, immediately overlying it.

4.0 Ground Gas Risk Assessment

4.1 Conceptual Site Model

Based on the geological data an illustrative conceptual site model has been prepared, **Figure 4.0**, detailing the gas source, potential gas migration pathways and receptors.

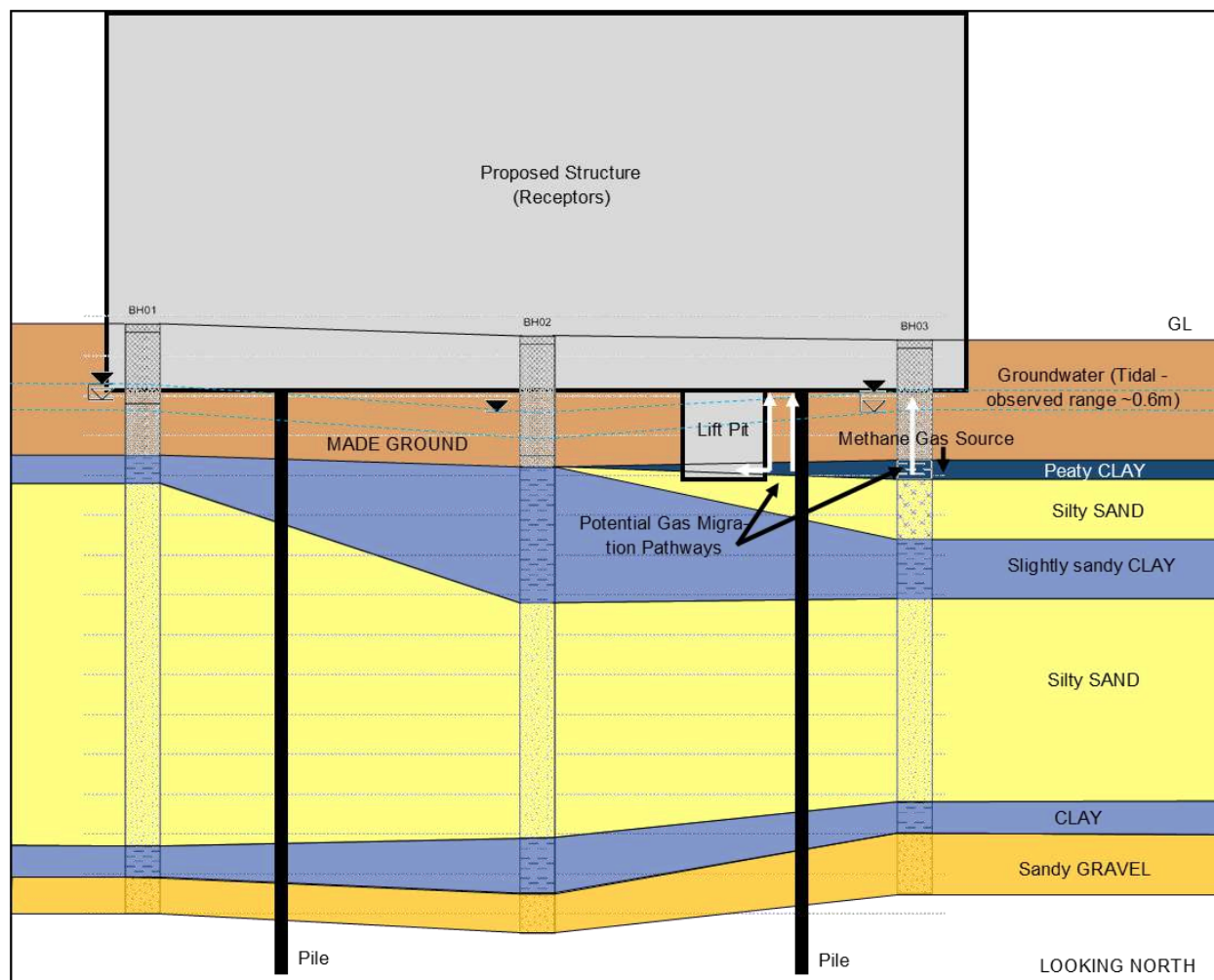


Figure 4.0 – Conceptual Site Model (not to scale).

4.2 Gas Screening Value

Based on the data and analysis of risk a gas screening value of $<0.7\text{l/hr}$ is considered appropriate for the development (CIRIA C665:2007) and remains conservative for peat derived gas. It is considered that borehole BH03 gas concentration and flow results are not representative of the actual gas risk at the site and should be not used in this assessment. Flow rates and gas concentrations in borehole BH03 are a product of a flooded well in combination with tidal derived pressure and to a lesser extent barometric pressure, affecting flow rates. The very presence of the well has created a preferential pathway through the ordinarily impermeable clay, allowing for the concentration of dissolved gasses in groundwater and subsequent gasses in the well top.

When this gas screening value is compared with Table 8.5 of CIRIA report C665, the site is classified as 'Gas Characteristic Situation 2' (CS2).

Utilising worse case ground gas results the resultant gas screening value would be 5.725l/hr which when compared with Table 8.5 of CIRIA report C665 classifies the site as 'Gas Characteristic Situation 4'. This classification would be comparable to a site situated on a modern landfill and not thin laminations of peaty clay. Therefore it is considered this classification is completely misleading and not reflective of the actual site conditions.

5.0 Recommended Protection Measures

It is recommended that all historical boreholes be decommissioned utilising a bentonite plug to eliminate this vertical gas migration pathway.

Consideration should be given to waterproofing drainage routes (if applicable) to reduce potential gas migration pathways to the underside of the structure slab.

Ground gas protection suitable for a CS2 site should be incorporated into the design of the new structure.

The ground gas protection system should be designed, verified, installed and validated in accordance with the British Standard 8485:2015+A1:2019 and CIRIA guidance C735:2014.

It is recommended that a specialist consultant is retained to prepare a risk assessed ground gas protection system Verification Plan for the proposed development. The Verification Plan will detail the required protection measures based on the perceived risk associated with the complexity of design, experience of the installer, scale of the development and gas characteristic situation. The Verification Plan also details the step by step process and requirements to allow for the completion of a Validation Report. Terra Firma (Wales) Ltd offer Verification and Validation services.

Validation of installed ground gas protection systems by an independent third party will be required upon completion of the development. Validation may only be achieved if processes prescribed in the Verification Plan are undertaken.

ANNEX A
Borehole Logs



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Borehole No.

WS101

Sheet 1 of 1

Project Name: Swansea Bay Technology Centre

Project No:
15773

Co-ords:

Hole Type
WLS

Location: Baglan

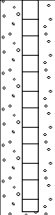
Level:

Scale
1:25

Client: Morgan Sindall Construction & Infrastructure Ltd

Dates: 19/08/2020 - 19/08/2020

Logged By
JRW

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
				0.30				Very soft dark brown slightly sandy slightly gravelly silty CLAY. Gravel is angular fine to coarse sandstone. (MADE GROUND)	
				0.50				Dark greyish brown slightly gravelly fine to coarse SAND with ceramic fragments. Gravel is angular fine to coarse brick. (MADE GROUND)	
				1.20				Dark grey locally dark brown sandy angular fine to coarse concrete, brick and sandstone GRAVEL with rare tarmacadam fragments and a low cobble content. (MADE GROUND)	1
				1.30				Light brown fine to coarse SAND.	
								End of Borehole at 1.300m	
									2
									3
									4
									5

Remarks: Groundwater encountered at 1.20m. On completion, a slotted standpipe (50mm) was installed to 1.20m, granular response zone 1.30-0.50m, bentonite seal 0.50-0.10m, concrete and upstanding cover 0.10-0.00m.



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Borehole No.

WS102

Sheet 1 of 1

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:		Hole Type	WLS
Location:	Baglan	Level:		Scale	1:25	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	19/08/2020 - 19/08/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
				0.30				Very soft dark brown slightly sandy slightly gravelly silty CLAY with rare polystyrene fragments. Gravel is angular fine to coarse sandstone. (MADE GROUND)	1
				1.30				Dark grey locally dark brown slightly clayey sandy angular fine to coarse concrete, brick and sandstone GRAVEL with low cobble content. (MADE GROUND)	2
								End of Borehole at 1.300m	3
									4
									5

Remarks: Groundwater not encountered. On completion, a slotted standpipe (50mm) was installed to 1.30m, granular response zone 1.30-0.50m, bentonite seal 0.50-0.10m, concrete and upstanding cover 0.10-0.00m.



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Borehole No.

WS103

Sheet 1 of 1

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:		Hole Type	WLS
Location:	Baglan	Level:		Scale	1:25	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	19/08/2020 - 19/08/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
				0.20				Very soft dark brown slightly sandy slightly gravelly silty CLAY. Gravel is angular fine to coarse sandstone. (MADE GROUND)	
								Dark grey locally dark brown slightly clayey sandy angular fine to coarse concrete, brick and sandstone GRAVEL with low cobble content. (MADE GROUND)	
				1.30				End of Borehole at 1.300m	
									1
									2
									3
									4
									5

Remarks: Groundwater not encountered. On completion, a slotted standpipe (50mm) was installed to 1.30m, granular response zone 1.30-0.50m, bentonite seal 0.50-0.10m, concrete and upstanding cover 0.10-0.00m.



Job Number:
15773

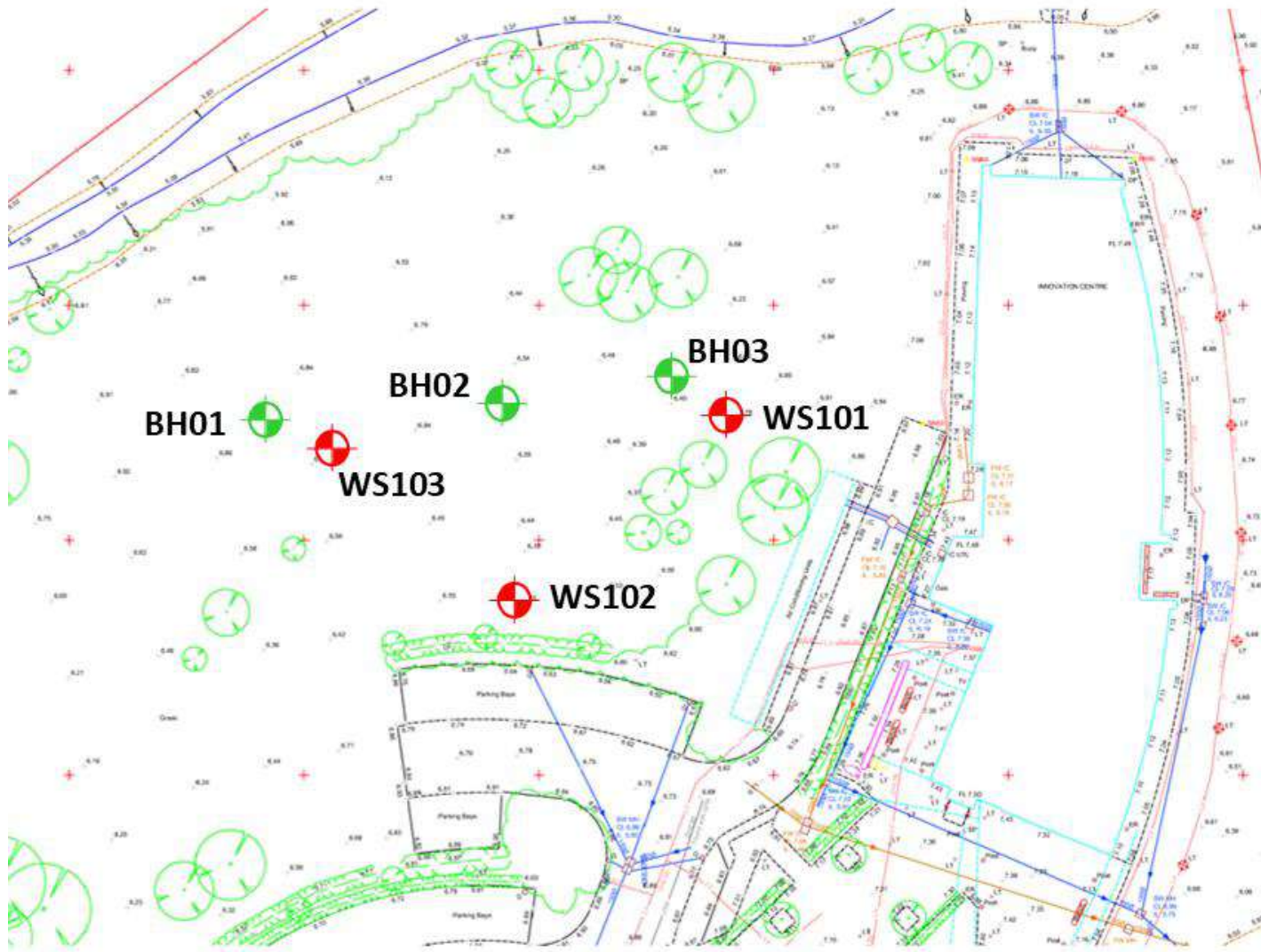
Job Title:
Swansea Bay Technology Centre

Drawing Title:
Site Layout

Drawing Number:
01

Scale:
Not To Scale

North



ANNEX B
GGS Ltd Report

GGs Ltd.

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Web: www.ggs-uk.com



GGs DataPack[®]

GGs2345 Baglan, South Wales



GGs site photograph

Prepared for:

Terra Firma (Wales) Ltd.



GGG DataPack®
GGG2345 Baglan, South Wales

Document Control Page

Client	Terra Firma (Wales) Ltd. 5 Deryn Court, Wharfedale Road, Pentwyn, Cardiff, CF23 7HA
Project Title	GGG DataPack® GGG2345 Baglan, South Wales
Report Ref	GGG2345DP01
Project Revision	-
Revision Detail	-
Issue Status	Final

	Name		Position	Signature	Date
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	Stacey McKenna	BSc (Hons) FGS	Geo- Environmental Consultant		18/09/2020
Checked and Approved By:	John Naylor	BSc (Hons) FGS MIES C.Env	Technical Director		18/09/2020

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FOREWORD

This report has been prepared based on information made available to Ground-Gas Solutions, trading as GGS, at the time of the reporting using all reasonable skill, care and diligence and within the limitations of the scope of works agreed with, and resources provided by, the client.

GGS has relied on information provided by others and has prepared this report on the basis of this information being accurate.

The report and recommendations therein are provided based on information available to GGS at the time of preparing the report and completed to recognised UK guidance and legislation. GGS will not accept any liability for inaccurate or incomplete information provided to GGS or any liability arising from the future change of any such guidance or legislation.

GGS is not obliged and disclaims any obligation to carry out further works or update the report for events occurring after such works have been carried out, and / or report issued in final form. This also applies to transfer of the report to other parties.

This report must be issued as final and be signed by the author and approved by a company director or senior management before the report may be relied upon by the client and subject to full payment for our services being made.

Any third parties using or relying on the information, comments, conclusions and recommendations do so at their own risk. Should any third party wish to use or rely upon the content of the report, written approval must be sought from a GGS Director; a charge may be levied against such approval.

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Appendices

Appendix A

Monitoring Location and Site Plans

Appendix B

Periodic Monitoring Records

Appendix C

Continuous Monitoring Data

Appendix D

Concentration Duration Curves

Appendix E

Groundwater (dissolved gas) results and laboratory certificate

Appendix F

Gas Sentinel® Overview & Deployment Info.

Appendix G

Calibration Certificates

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1 Introduction

GGGS Limited has been commissioned by Terra Firma (Wales) Ltd. to undertake continuous ground gas monitoring at a site in Baglan, South Wales, and prepare a GGS DataPack® report containing the following information:

- Continuous monitoring data and graphs;
- Concentration duration analysis;
- Atmospheric pressure trend analysis;
- Laboratory results and certificates;
- Instrument calibration certificates.

1.1 Scope of works

The scope of works is set out below:

- A site visit by GGS on 26th August 2020 to take groundwater samples from selected monitoring wells and deploy 3 No. continuous monitoring instruments, for the detection of standard ground gases (methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide) and flow;
- A site visit by GGS on 11th September to collect 3 No. instruments and validate the readings by undertaking periodic monitoring;
- Provision of a GGS DataPack® report.

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1.2 Site context

Table 1.2.1 below details the site description. A site plan can be found in Appendix A.

Table 1.2.1 Site description

Description	Details
Address	Baglan Bay Innovation Centre, Central Avenue, Port Talbot
Postcode	SA12 7AX
National Grid Reference (approximate centre of site)	SS 73993 92957
Site area (approximate total)	1.2 hectares
Overview	The site comprises Phase 2 of the Baglan Bay Innovation Centre.
To the North	Railway line.
To the South	An existing structure and associated hardstanding car park.
To the East	Undeveloped land lies immediate east of the site. The M4 resides approximately 200m east.
To the West	Central Avenue. Several industrial units centred on Mardon Park reside beyond Central Avenue.



Figure 1 GGS photographs of the monitoring wells on site

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1.3 Continuous monitoring

1.3.1 Definition

When the frequency of sampling matches, or is greater than, the frequency of a parameter change, the data collected can be termed 'continuous'. A continuous data set will therefore capture the full range of variation in the parameter being recorded.

1.3.2 Benefits of continuous data

The collection of time series data of permanent gases and other environmental parameters provides a wealth of information significantly assisting the assessor to identify the dominant processes of gas generation and migration. This leads to a more detailed understanding of the ground-gas regime and allows for an accurate and truly site-specific risk assessment to be completed.

2 Methodology

2.1 Periodic Monitoring

An experienced geo-environmental specialist undertook periodic monitoring of 3 No. monitoring wells on 11th September 2020. The periodic monitoring of the gas well was undertaken using a handheld GA5000 to record flow and gas concentrations. Depth to groundwater and depth to the base of the monitoring well were recorded using a geotechnical dip meter. Gas concentrations and flow were recorded for up to ten minutes, or until steady state was achieved. A summary of the periodic monitoring results is shown in Section 3.1 and the collected data and site visit records are presented in Appendix B.

2.2 Continuous Monitoring

GGG configured high resolution GasSentinel® instrumentation to record at 60-minute intervals for the contracted period of monitoring. The GasSentinel® instrumentation recorded atmospheric pressure, temperature and bulk gas concentrations; methane (CH₄), carbon dioxide (CO₂) oxygen (O₂) and trace gases, including hydrogen sulphide (H₂S) and carbon monoxide (CO). The instrumentation was also configured to record borehole flow rate. A site monitoring location plan is presented in Appendix A.

Table 2.1 below details the schedule of continuous monitoring at the site.

Table 2.1 Continuous monitoring schedule

Monitoring Location	Instrumentation ID	Dates monitored
WS101	03000040	26/08/2020 – 11/09/2020
WS102	03000035	26/08/2020 – 11/09/2020*
WS103	03000039	26/08/2020 – 11/09/2020

*data is intermittent

Continuous monitoring graphs are presented in Section 3.2 and the raw data is presented in Appendix C.

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2.3 Groundwater (dissolved gas) Sampling

GGS obtained groundwater samples from 3 No. monitoring well locations. Samples were dispatched to an appropriate laboratory for dissolved gas (methane and carbon dioxide) analysis. A summary of the dissolved gas results is presented in Section 3.5, whilst the full laboratory certificates are presented in Appendix E

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3 Results

3.1 Periodic Monitoring Results

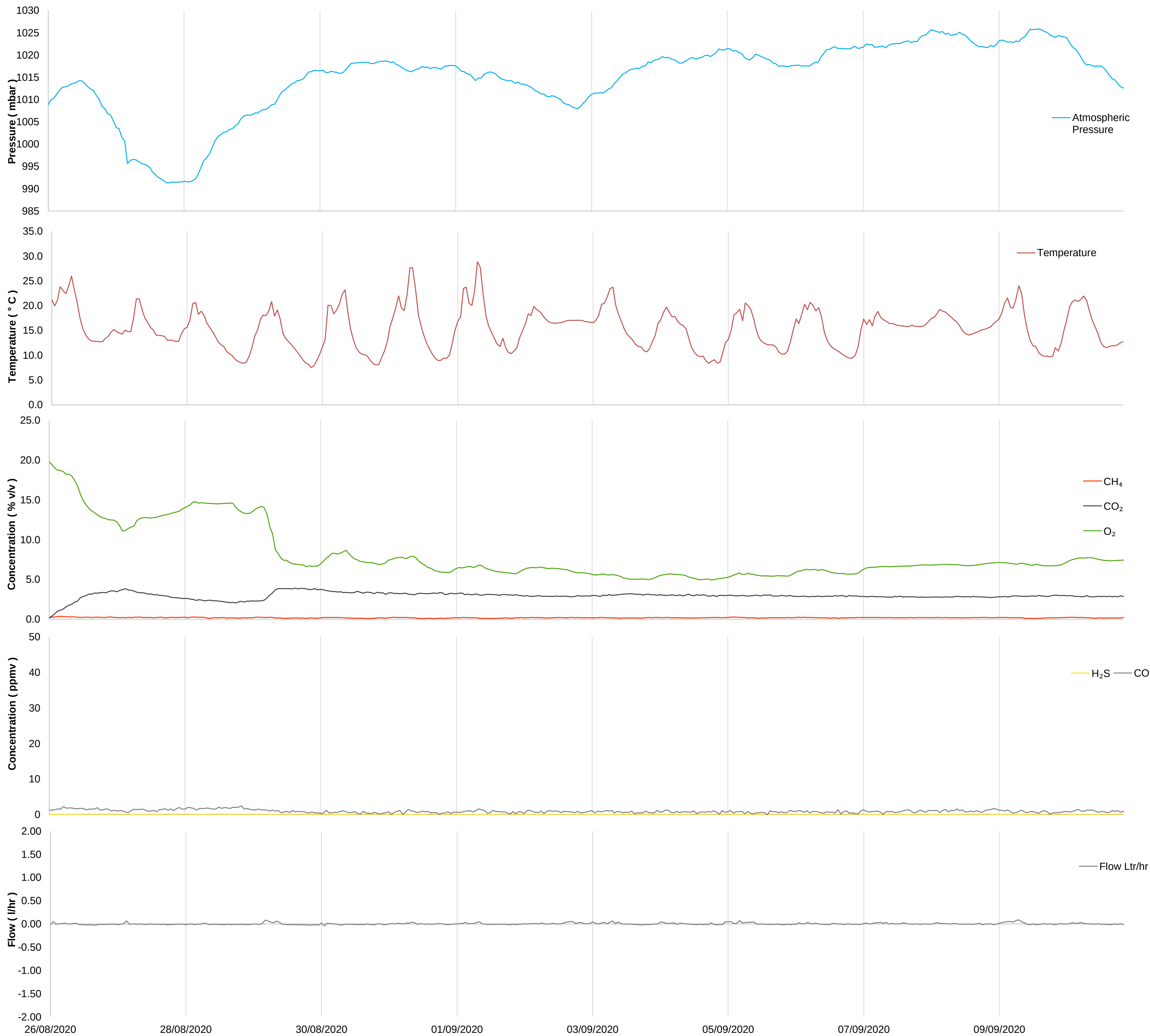
The summary of periodic monitoring results is shown in the table below the full periodic monitoring record can be found in Appendix B.

Table 3.1.1 Periodic monitoring summary

Monitoring Location	Max. Positive Flow Rate (l/hr)	Max. CH ₄ (% v/v)	Max. CO ₂ (% v/v)	Min O ₂ (% v/v)	Max. H ₂ S (ppmv)	Max. CO (ppmv)	Standing water level range (mbgl)
WS101	<0.1	<0.1	2.4	11.5	<1	<1	Dry, base 1.18
WS102	<0.1	<0.1	0.5	18.6	<1	<1	Dry, base 1.11
WS103	<0.1	<0.1	0.1	12.8	<1	<1	Dry, base 1.28
Key: 1/hr – litres per hour; %v/v – Percentage volume by volume; ppmv – parts per million by volume; mbgl – metres below ground level; Max – Maximum; Min. – Minimum; NM – Not Measured							

3.2 Continuous Monitoring Results

GGGS DataPack® analysis involves converting raw data files from instruments into spread sheets. The data is then plotted as time series data graphs, showing ground-gas concentrations, atmospheric pressure, temperature ground-gas flow rate and groundwater levels against time. The continuous monitoring graphs are shown on the following pages; each graph also contains a minimum and maximum values table.



Title:

WS101 Time Series Graphs

Project:

GG2345 Baglan, South Wales

Client:

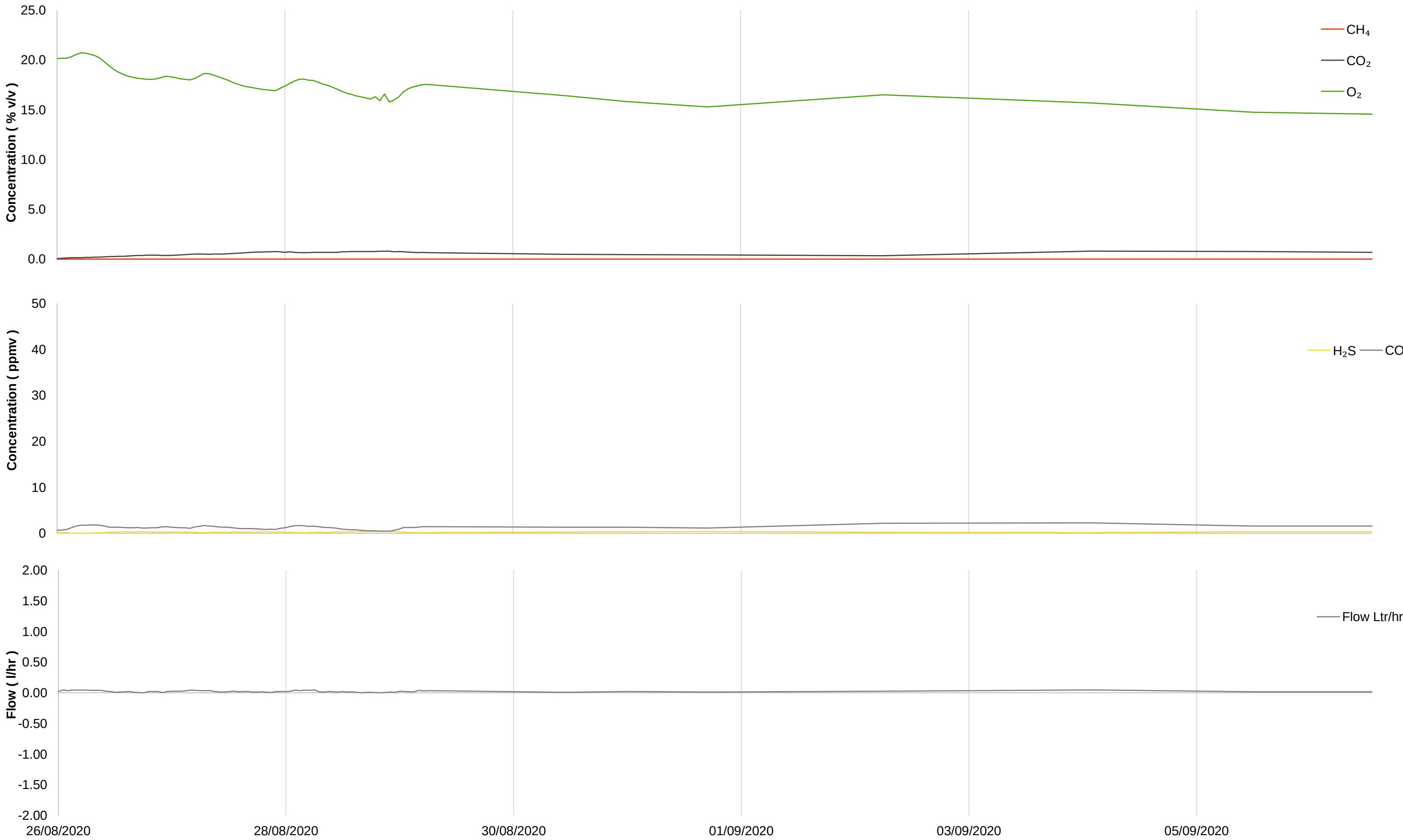
Terra Firma Wales Ltd.

Minimum / Maximum Table		
Parameter	Minimum	Maximum
CH ₄ (% v/v)	0.0	0.0
CO ₂ (% v/v)	0.2	3.9
O ₂ (% v/v)	4.9	19.8
Hydrogen Sulphide (ppmv)	0	0
Carbon Monoxide (ppmv)	0	2
Atmospheric Pressure (mbar)	991	1026
Temperature (° C)	7.5	28.9
Flow (l/hr)	-0.04	0.09

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Title:
WS102 Time Series Graphs

Project:
GGS2345 Baglan, South Wales

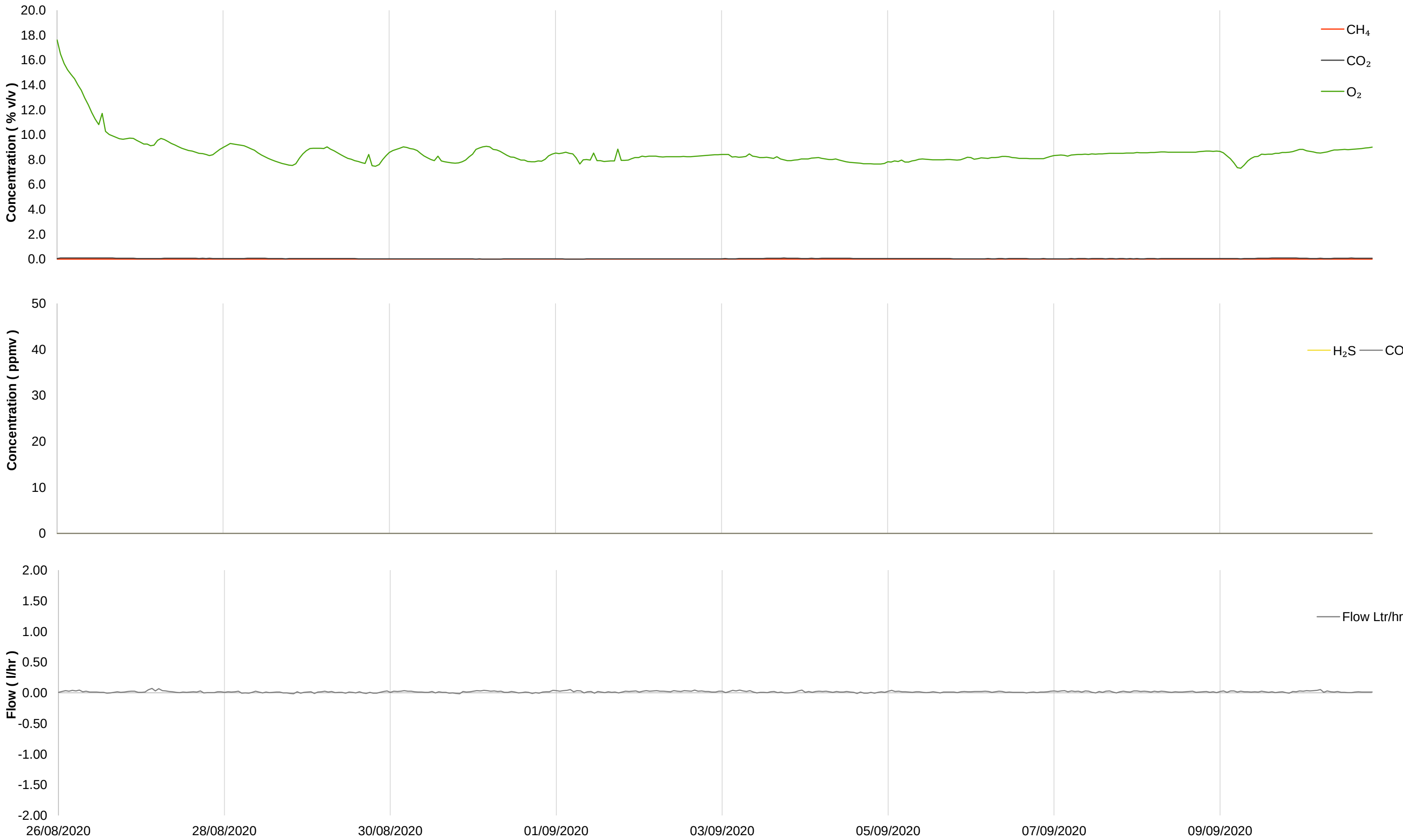
Client:
Terra Firma Wales Ltd.

Minimum / Maximum Table		
Parameter	Minimum	Maximum
CH ₄ (% v/v)	0.0	0.0
CO ₂ (% v/v)	0.1	0.8
O ₂ (% v/v)	14.6	20.7
Hydrogen Sulphide (ppmv)	0	0
Carbon Monoxide (ppmv)	0	2
Flow (l/hr)	-0.01	0.07

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Title:
WS103 Time Series Graphs

Project:
GGS2345 Baglan, South Wales

Client:
Terra Firma Wales Ltd.

Minimum / Maximum Table		
Parameter	Minimum	Maximum
CH ₄ (% v/v)	0.0	0.0
CO ₂ (% v/v)	0.0	0.1
O ₂ (% v/v)	7.3	17.6
Hydrogen Sulphide (ppmv)	0	0
Carbon Monoxide (ppmv)	0	0
Flow (l/hr)	-0.01	0.07

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3.3 Concentration Duration Analysis

Concentration duration analysis involves calculating the percentage of the continuous monitoring period at which ground-gas concentrations were equalled to, or in exceedance of, a particular value. For example, high methane concentrations may be detected, but may only be present for a small percentage of the monitoring period. This is a valuable tool in risk assessment as it can be used to show the percentage time for which high risk gas concentrations are present throughout the monitoring period.

Concentration duration curves are presented in Appendix D. Table 3.3.1 below summarises the percentage time in which methane was at 1% v/v or above, 5% v/v or above and at 20% v/v or above. Table 3.3.2 below summarises the percentage time in which carbon dioxide was at 5% v/v or above, at 10% v/v or above and at 30% v/v or above.

Table 3.3.1 Percentage time at or above 1%, 5% and 20% v/v methane

Borehole Ref	% of monitoring period that CH ₄ equalled or exceeded:		
	1.0% v/v	5.0% v/v	20.0% v/v
WS101	0	0	0
WS102	0	0	0
WS103	0	0	0

Table 3.3.2 Percentage time at or above 5%, 10% and 30% v/v carbon dioxide

Borehole Ref	% of monitoring period that CO ₂ equalled or exceeded:		
	5.0% v/v	10.0% v/v	30.0% v/v
WS101	0	0	0
WS102	0	0	0
WS103	0	0	0

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3.4 Atmospheric Pressure Analysis

Atmospheric pressure is often a dominant ground-gas driver and as such, monitoring should include sampling during falling pressure events. To capture potential 'worst case' conditions monitoring should include both short and longer duration falling pressure events at a rate of 1.15 millibars per hour and above¹. Table 3.4.1 below summarises the most significant atmospheric pressure events during the continuous monitoring period, whilst Figure 2 provides percentage distribution of the atmospheric pressure regime.

Table 3.4.1 Atmospheric pressure regimes over the continuous monitoring period

Monitoring period	26/08/2020 – 11/09/2020
Range in atmospheric pressure (mbar)	991 - 1026
Most significant sustained rate of fall (over 8 hours)	18 millibar drop over 15 hours (1014 27/08/20 00:02 – 996 27/08/20 15:02)
Most significant rate of fall (over 8 hours)	1.2 millibar/hr
Number of samples taken under 1000mb	31 (8.1%)
Number of samples taken below 1000mb and falling	16 (4.2%)

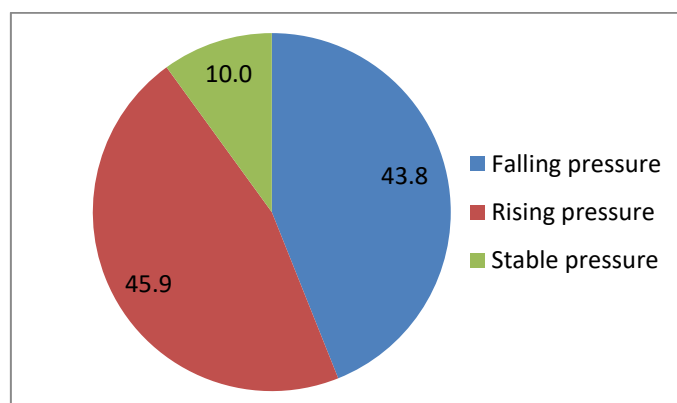


Figure 2 Percentage distribution of the atmospheric pressure regime during the continuous monitoring period

¹ CL:AIRE Technical Bulletin TB18 Continuous Ground Gas Monitoring and the Lines of Evidence Approach to Risk Assessment. January 2019

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Figure 3 below demonstrates the most significant pressure fall captured during the continuous monitoring period (18 millibars over 15 hours) meets 'worst case' conditions, as outlined in TB18².

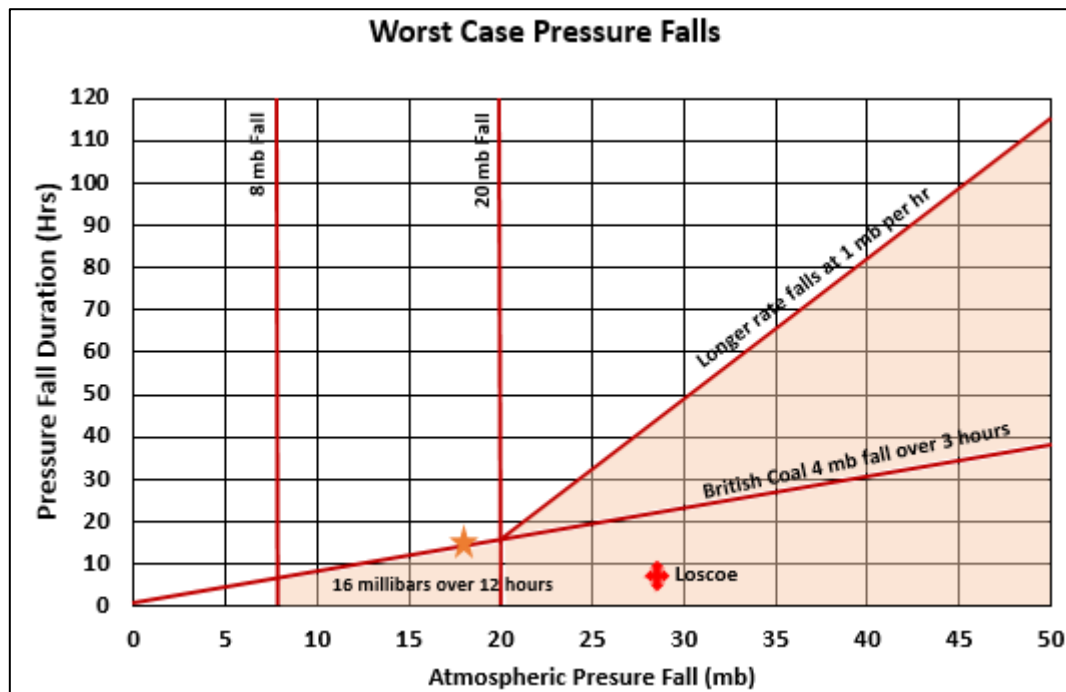


Figure 3 Graph to show the most significant pressure fall captured during the monitoring period plotted.

3.5 Groundwater (Dissolved Gas) Analysis Results

Table 3.5.1 below presents a summary of results from the dissolved gas sampling undertaken on 26th August 2020. The full laboratory certificates are presented in Appendix E.

Table 3.5.1 Groundwater (Dissolved gas) analysis results

Monitoring Well	CH ₄ ug/l	CO ₂ ug/l
WS101	8	>>161736
BH01	84	<1
BH03	>>6033	3299

>>Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.

² CL:AIRE Technical Bulletin TB18 Continuous Ground Gas Monitoring and the Lines of Evidence Approach to Risk Assessment. January 2019

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4 Instrumentation Specifications

All GGS instrumentation is maintained in accordance with the manufacturer recommendations and is serviced and calibrated annually. Note that for some instrumentation cross sensitivity to other gases and significant environmental changes, such as borehole temperature, pressure and humidity, should be taken into consideration when considering all site monitoring data.

An outline of the GasSentinel® instrumentation overview & deployment information is presented in Appendix F. The current calibration certificates for all equipment used on site are presented in Appendix G.

5 Limitations

GGs has prepared this factual report for the use of the Client and those parties whom a warranty agreement has been executed, or with whom an assignment has been agreed.

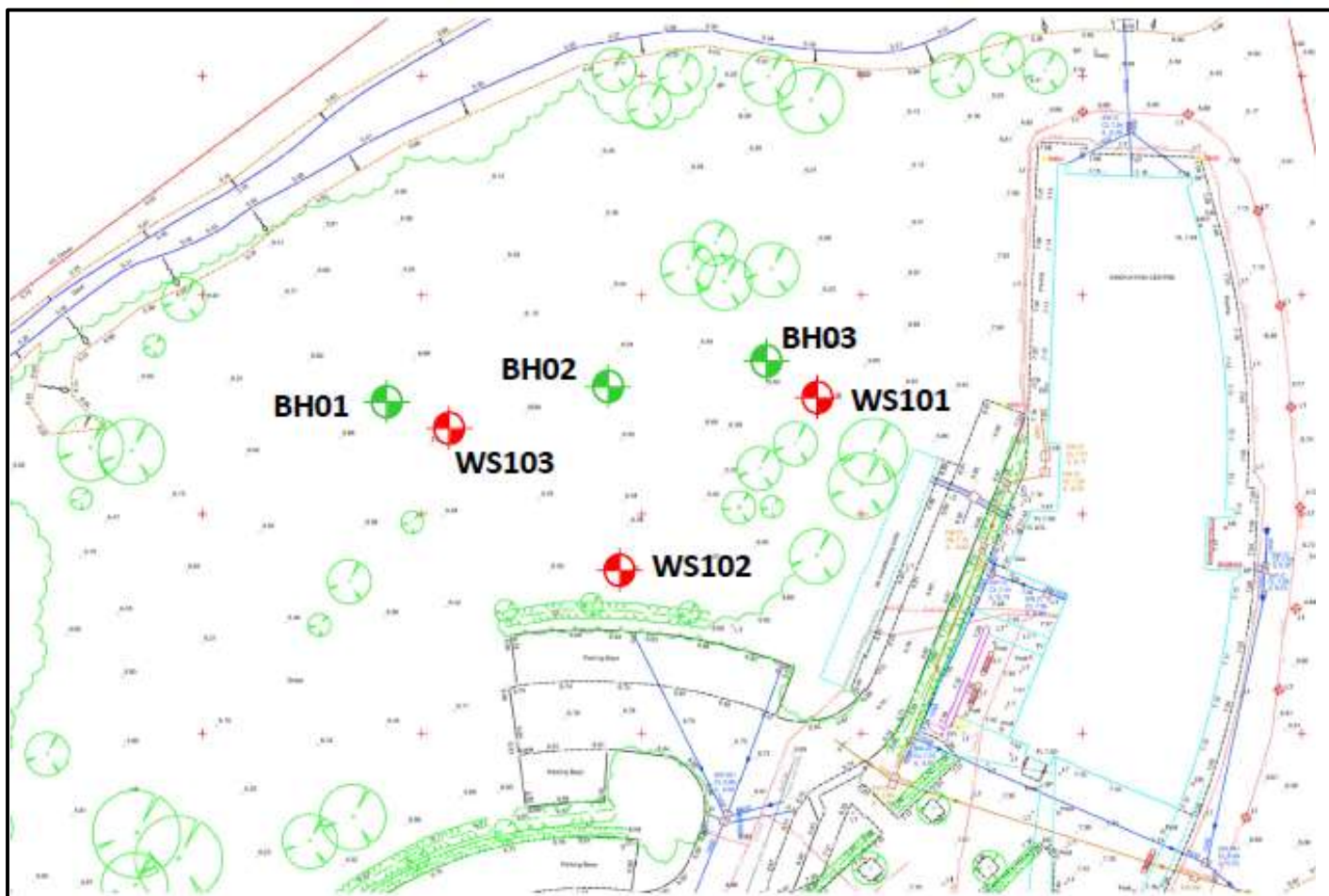
GGs accepts no responsibility for the consequences of this document being used for any purpose or project other than for which it was commissioned or for the consequences arising from this document's use by any third party with whom an agreement has not been executed.

GGs accept no responsibility for the interpretation of this factual data. A reviewer of the data provided must take into account other available information and the context in which this data was collected. For example, site setting, conceptual site model, environmental conditions, gases present (that are not monitored as part of this contract, but may interfere with the sensors used), building design and construction practices during the monitoring period.

GGs accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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Appendix A
Monitoring Location and Site Plans



Rev.	Date	Dwn.	Description	App'd
0	18/09/2020	SM		JN

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TITLE:
Site & Monitoring Location Plan

PROJECT:
GG2345 Baglan, Wales

Drawing No: GGS2345_MLP

ggs
Experts in
Continuous Monitoring

Appendix B

Periodic Monitoring Records



Experts in Continuous Monitoring

IMS Ref: GMPM
Version: 2.2

PROJECT DETAILS			
Project ID	GG52345	Date	11/09/2020
Site	Baglan, South Wales	Time	08:30
Specialist	KL		

EQUIPMENT	
Model	Serial Number
GA5000	G504460

PRESSURE DETAILS	Start:	End:
Atmospheric Pressure (mb)	1016	1016
Borehole Pressure (mb)	NM	NM

BOREHOLE DETAILS	
Borehole ID	WS101
Groundwater Level (mbgl)	Dry
Depth to base (mbgl)	1.18

MONITORING WELL COMMENTS									

TIME	Gas Flow	Gas Readings							
(seconds)	Litres/hour	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	BAL	CO (ppmv)	H ₂ S (ppmv)	TVOC (ppmv)	
Fresh Air	<0.1	<0.1	0.1	21.0	79.0	<1	<1	NM	
Initial	<0.1	<0.1	2.2	18.1	79.7	<1	<1		
30	<0.1	<0.1	2.1	13.0	84.9	<1	<1		
60	<0.1	<0.1	2.2	12.5	85.3	<1	<1		
90		<0.1	2.3	12.0	85.7	<1	<1		
120		<0.1	2.3	11.7	86.0	<1	<1		
150		<0.1	2.4	11.6	86.0	<1	<1		
180		<0.1	2.4	11.5	86.1	<1	<1		
240		<0.1	2.4	11.5	86.1	<1	<1		
300									
360									
420									
600									
Fresh Air	<0.1	<0.1	0.1	20.9	79.1	<1	<1	NM	

		STEADY STATE FINAL RESULTS							
	Flow (l/hr)	CH ₄ (%)	CO ₂ (%)	O ₂ (% v/v)	BAL	CO (ppm)	H ₂ S (ppm)	TVOC (ppm)	
Steady state time (s)	30	30	150	180	180	30	30	NM	
Steady state value	<0.1	<0.1	2.4	11.5	86.1	<1	<1	NM	
Peak Value (O ₂ Low)	<0.1	<0.1	2.4	11.5	86.1	<1	<1	NM	

KEY: <0.1= Below instrument limit of detection, NM = Not Measured, N/A = Not Applicable, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = millibar, ltr/hr = litres per hour, mbgl = metres below ground level, OS = off scale of instrument



Experts in Continuous Monitoring

IMS Ref: GMPM
Version: 2.2

PROJECT DETAILS			
Project ID	GG52345	Date	11/09/2020
Site	Baglan, South Wales	Time	08:55
Specialist	KL		

EQUIPMENT	
Model	Serial Number
GA5000	G504460

PRESSURE DETAILS	Start:	End:
Atmospheric Pressure (mb)	1016	1016
Borehole Pressure (mb)	NM	NM

BOREHOLE DETAILS	
Borehole ID	WS102
Groundwater Level (mbgl)	Dry
Depth to base (mbgl)	1.11

MONITORING WELL COMMENTS									

TIME	Gas Flow	Gas Readings							
(seconds)	Litres/hour	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	BAL	CO (ppmv)	H ₂ S (ppmv)	TVOC (ppmv)	
Fresh Air	<0.1	<0.1	0.1	21.0	79.0	<1	<1	NM	
Initial	<0.1	<0.1	1.0	19.8	79.2	<1	<1		
30	<0.1	<0.1	0.9	16.5	82.6	<1	<1		
60	<0.1	<0.1	0.7	17.5	81.8	<1	<1		
90		<0.1	0.6	18.1	81.3	<1	<1		
120		<0.1	0.5	18.8	80.7	<1	<1		
150		<0.1	0.4	19.0	80.6	<1	<1		
180		<0.1	0.5	18.6	80.9	<1	<1		
240		<0.1	0.5	18.6	80.9	<1	<1		
300		<0.1	0.5	18.6	80.9	<1	<1		
360									
420									
600									
Fresh Air	<0.1	<0.1	0.1	20.9	79.1	<1	<1	NM	

STEADY STATE FINAL RESULTS									
	Flow (l/hr)	CH ₄ (%)	CO ₂ (%)	O ₂ (% v/v)	BAL	CO (ppm)	H ₂ S (ppm)	TVOC (ppm)	
Steady state time (s)	30	30	180	180	180	30	30	NM	
Steady state value	<0.1	<0.1	0.5	18.6	80.9	<1	<1	NM	
Peak Value (O ₂ Low)	<0.1	<0.1	1.0	16.5	80.9	<1	<1	NM	

KEY: <0.1= Below instrument limit of detection, NM = Not Measured, N/A = Not Applicable, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = millibar, ltr/hr = litres per hour, mbgl = metres below ground level, OS = off scale of instrument



Experts in Continuous Monitoring

IMS Ref: GMPM
Version: 2.2

MONITORING WELL COMMENTS

PROJECT DETAILS			
Project ID	GG52345	Date	11/09/2020
Site	Baglan, South Wales	Time	09:20
Specialist	KL		

EQUIPMENT	
Model	Serial Number
GA5000	G504460

PRESSURE DETAILS	Start:	End:
Atmospheric Pressure (mb)	1016	1016
Borehole Pressure (mb)	NM	NM

BOREHOLE DETAILS	
Borehole ID	WS103
Groundwater Level (mbgl)	Dry
Depth to base (mbgl)	1.28

TIME	Gas Flow	Gas Readings							
(seconds)	Litres/hour	CH ₄ (% v/v)	CO ₂ (% v/v)	O ₂ (% v/v)	BAL	CO (ppmv)	H ₂ S (ppmv)	TVOC (ppmv)	
Fresh Air	<0.1	<0.1	0.1	21.0	79.0	<1	<1	NM	
Initial	<0.1	<0.1	0.1	18.9	81.0	<1	<1		
30	<0.1	<0.1	0.1	16.3	83.6	<1	<1		
60	<0.1	<0.1	0.1	16.0	83.9	<1	<1		
90		<0.1	0.1	15.7	84.2	<1	<1		
120		<0.1	0.1	15.4	84.5	<1	<1		
150		<0.1	0.1	15.0	84.9	<1	<1		
180		<0.1	0.1	14.6	85.3	<1	<1		
240		<0.1	0.1	14.3	85.6	<1	<1		
300		<0.1	0.1	14.0	85.9	<1	<1		
360		<0.1	0.1	13.6	86.3	<1	<1		
420		<0.1	0.1	13.4	86.5	<1	<1		
600		<0.1	0.1	12.8	87.1	<1	<1		
Fresh Air	<0.1	<0.1	0.1	20.9	79.1	<1	<1	NM	

		STEADY STATE FINAL RESULTS							
	Flow (l/hr)	CH ₄ (%)	CO ₂ (%)	O ₂ (% v/v)	BAL	CO (ppm)	H ₂ S (ppm)	TVOC (ppm)	
Steady state time (s)	30	30	30	NA	NM	30	30	NM	
Steady state value	<0.1	<0.1	0.1	NA	NM	<1	<1	NM	
Peak Value (O ₂ Low)	<0.1	<0.1	0.1	12.8	87.1	<1	<1	NM	

KEY: <0.1= Below instrument limit of detection, NM = Not Measured, N/A = Not Applicable, %v/v = Percentage volume by volume, ppmv = parts per million by volume, mb = millibar, ltr/hr = litres per hour, mbgl = metres below ground level, OS = off scale of instrument

Appendix C

Continuous Monitoring Data

GGs Time Series Data



Project Ref:	GGs2345		
Location:	Baglan, South Wales		
Borehole ref:	WS101		
Sentinel ID:	GS40	Days of monitoring:	15
Start Date:	26/08/2020 11:02	Monitoring Frequency (mins):	60
End Date:	11/09/2020 07:02	Total samples taken:	381

Minimum, Maximum and Range Table

	CH ₄	CO ₂	O ₂	H ₂ S	CO	Atmospheric Pressure	Flow	Temperature
Minimum	0.0	0.2	4.9	0	0	991	-0.04	7.5
Maximum	0.0	3.9	19.8	0	2	1026	0.09	28.9
Range	0.0	3.7	14.9	0	2	35	0.13	21.4

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Atmospheric Pressure mbar	Flow Ltr/hr	Temperature °C
26/08/2020 11:02	0.0	0.2	19.8	0	1	1009	-0.02	21.2
26/08/2020 12:02	0.0	0.4	19.4	0	1	1010	0.05	20.0
26/08/2020 13:02	0.0	0.7	19.0	0	1	1010	-0.01	21.1
26/08/2020 14:02	0.0	1.0	18.7	0	2	1011	0.01	23.8
26/08/2020 15:02	0.0	1.1	18.7	0	2	1012	0.01	23.0
26/08/2020 16:02	0.0	1.3	18.5	0	2	1013	0.02	22.5
26/08/2020 17:02	0.0	1.6	18.2	0	2	1013	0.00	23.9
26/08/2020 18:02	0.0	1.8	18.2	0	2	1013	0.00	26.0
26/08/2020 19:02	0.0	1.9	18.0	0	2	1014	0.01	23.2
26/08/2020 20:02	0.0	2.1	17.5	0	2	1014	0.01	20.5
26/08/2020 21:02	0.0	2.3	16.8	0	2	1014	-0.01	17.6
26/08/2020 22:02	0.0	2.7	15.7	0	2	1014	-0.01	15.4
26/08/2020 23:02	0.0	2.9	14.9	0	2	1014	-0.01	14.1
27/08/2020 00:02	0.0	3.0	14.4	0	1	1014	-0.02	13.3
27/08/2020 01:02	0.0	3.2	14.0	0	2	1013	-0.02	12.9
27/08/2020 02:02	0.0	3.2	13.6	0	2	1012	-0.02	12.9
27/08/2020 03:02	0.0	3.3	13.4	0	2	1012	-0.03	12.8
27/08/2020 04:02	0.0	3.3	13.1	0	2	1011	-0.01	12.8
27/08/2020 05:02	0.0	3.3	12.9	0	1	1010	-0.01	12.8
27/08/2020 06:02	0.0	3.4	12.7	0	1	1009	-0.01	13.4
27/08/2020 07:02	0.0	3.3	12.6	0	2	1008	-0.01	13.8
27/08/2020 08:02	0.0	3.5	12.5	0	2	1007	0.00	14.6
27/08/2020 09:02	0.0	3.6	12.5	0	1	1007	-0.01	15.2
27/08/2020 10:02	0.0	3.6	12.4	0	1	1005	-0.01	14.8
27/08/2020 11:02	0.0	3.5	12.2	0	1	1004	-0.02	14.5
27/08/2020 12:02	0.0	3.6	11.7	0	1	1004	0.00	14.3
27/08/2020 13:02	0.0	3.7	11.1	0	1	1002	0.01	15.1
27/08/2020 14:02	0.0	3.8	11.2	0	1	1001	0.07	14.8
27/08/2020 15:02	0.0	3.7	11.4	0	1	996	-0.01	14.8
27/08/2020 16:02	0.0	3.6	11.6	0	1	996	0.00	17.4
27/08/2020 17:02	0.0	3.6	11.7	0	1	997	0.00	21.4
27/08/2020 18:02	0.0	3.4	12.4	0	1	997	0.00	21.4
27/08/2020 19:02	0.0	3.3	12.7	0	1	996	0.00	19.2
27/08/2020 20:02	0.0	3.3	12.7	0	2	996	-0.01	17.6
27/08/2020 21:02	0.0	3.3	12.8	0	1	996	-0.01	16.6
27/08/2020 22:02	0.0	3.2	12.7	0	1	995	0.00	15.6
27/08/2020 23:02	0.0	3.2	12.7	0	1	995	0.00	15.2
28/08/2020 00:02	0.0	3.1	12.8	0	1	994	-0.01	14.1
28/08/2020 01:02	0.0	3.1	12.8	0	1	993	-0.01	14.0
28/08/2020 02:02	0.0	3.0	12.9	0	1	993	-0.01	14.0
28/08/2020 03:02	0.0	3.0	13.0	0	2	992	0.00	13.8
28/08/2020 04:02	0.0	2.9	13.1	0	2	992	-0.01	13.0
28/08/2020 05:02	0.0	2.9	13.2	0	1	991	-0.02	13.1
28/08/2020 06:02	0.0	2.8	13.3	0	2	991	-0.01	13.0
28/08/2020 07:02	0.0	2.7	13.4	0	1	992	-0.01	12.8
28/08/2020 08:02	0.0	2.7	13.5	0	2	991	-0.01	12.9
28/08/2020 09:02	0.0	2.7	13.6	0	2	992	0.00	14.4
28/08/2020 10:02	0.0	2.6	13.8	0	2	992	-0.01	15.4
28/08/2020 11:02	0.0	2.6	14.0	0	2	992	-0.02	15.7
28/08/2020 12:02	0.0	2.6	14.2	0	2	992	-0.01	17.1
28/08/2020 13:02	0.0	2.5	14.4	0	2	992	0.00	20.5
28/08/2020 14:02	0.0	2.5	14.8	0	2	992	-0.02	20.6
28/08/2020 15:02	0.0	2.4	14.7	0	1	992	-0.01	18.3

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Atmospheric Pressure mbar	Flow Ltr/hr	Temperature °C
28/08/2020 16:02	0.0	2.5	14.6	0	2	993	-0.01	18.9
28/08/2020 17:02	0.0	2.4	14.6	0	2	995	0.01	18.0
28/08/2020 18:02	0.0	2.3	14.6	0	2	996	0.02	16.5
28/08/2020 19:02	0.0	2.4	14.6	0	2	997	-0.01	15.7
28/08/2020 20:02	0.0	2.4	14.6	0	2	998	-0.01	14.8
28/08/2020 21:02	0.0	2.3	14.5	0	2	999	0.00	13.8
28/08/2020 22:02	0.0	2.3	14.5	0	2	1001	-0.01	12.7
28/08/2020 23:02	0.0	2.3	14.5	0	2	1002	-0.01	12.2
29/08/2020 00:02	0.0	2.2	14.5	0	2	1002	-0.01	11.8
29/08/2020 01:02	0.0	2.2	14.6	0	2	1003	-0.02	10.8
29/08/2020 02:02	0.0	2.1	14.6	0	2	1003	-0.01	10.3
29/08/2020 03:02	0.0	2.1	14.6	0	2	1003	-0.02	9.9
29/08/2020 04:02	0.0	2.1	14.6	0	2	1004	-0.01	9.2
29/08/2020 05:02	0.0	2.0	14.0	0	2	1004	-0.01	8.8
29/08/2020 06:02	0.0	2.2	13.7	0	2	1005	-0.01	8.5
29/08/2020 07:02	0.0	2.2	13.5	0	2	1006	-0.01	8.4
29/08/2020 08:02	0.0	2.2	13.3	0	2	1006	-0.01	8.6
29/08/2020 09:02	0.0	2.3	13.3	0	2	1007	-0.01	9.9
29/08/2020 10:02	0.0	2.3	13.3	0	1	1007	-0.01	11.5
29/08/2020 11:02	0.0	2.3	13.6	0	1	1007	0.00	13.9
29/08/2020 12:02	0.0	2.3	13.8	0	1	1007	0.00	15.1
29/08/2020 13:02	0.0	2.3	14.0	0	2	1007	-0.01	17.3
29/08/2020 14:02	0.0	2.3	14.2	0	1	1008	0.01	18.1
29/08/2020 15:02	0.0	2.4	14.0	0	1	1008	0.08	18.0
29/08/2020 16:02	0.0	2.7	13.2	0	1	1008	0.06	19.0
29/08/2020 17:02	0.0	3.0	11.7	0	1	1008	0.04	20.9
29/08/2020 18:02	0.0	3.3	10.7	0	1	1009	0.02	17.9
29/08/2020 19:02	0.0	3.7	8.7	0	1	1009	0.06	19.1
29/08/2020 20:02	0.0	3.8	8.2	0	1	1010	0.04	17.3
29/08/2020 21:02	0.0	3.8	7.7	0	1	1011	0.00	14.4
29/08/2020 22:02	0.0	3.8	7.4	0	1	1012	-0.01	13.4
29/08/2020 23:02	0.0	3.9	7.4	0	1	1012	-0.01	12.8
30/08/2020 00:02	0.0	3.8	7.1	0	1	1013	-0.01	12.1
30/08/2020 01:02	0.0	3.8	7.0	0	1	1014	-0.01	11.5
30/08/2020 02:02	0.0	3.9	6.9	0	1	1014	-0.02	10.7
30/08/2020 03:02	0.0	3.8	6.9	0	1	1014	-0.02	10.0
30/08/2020 04:02	0.0	3.9	6.8	0	1	1014	-0.02	9.1
30/08/2020 05:02	0.0	3.9	6.8	0	1	1015	-0.02	8.5
30/08/2020 06:02	0.0	3.8	6.6	0	1	1015	-0.02	8.2
30/08/2020 07:02	0.0	3.7	6.7	0	1	1016	-0.03	7.5
30/08/2020 08:02	0.0	3.8	6.7	0	1	1016	-0.02	8.0
30/08/2020 09:02	0.0	3.8	6.7	0	0	1017	-0.02	8.9
30/08/2020 10:02	0.0	3.7	6.7	0	1	1017	-0.03	10.2
30/08/2020 11:02	0.0	3.7	7.0	0	0	1017	0.02	11.7
30/08/2020 12:02	0.0	3.7	7.3	0	0	1017	-0.04	13.2
30/08/2020 13:02	0.0	3.6	7.7	0	1	1016	0.01	20.1
30/08/2020 14:02	0.0	3.5	8.0	0	0	1016	0.01	20.1
30/08/2020 15:02	0.0	3.5	8.3	0	1	1016	0.00	18.4
30/08/2020 16:02	0.0	3.5	8.3	0	1	1016	0.00	19.1
30/08/2020 17:02	0.0	3.4	8.2	0	1	1016	-0.01	20.3
30/08/2020 18:02	0.0	3.4	8.3	0	1	1016	-0.03	22.3
30/08/2020 19:02	0.0	3.4	8.5	0	1	1016	-0.01	23.2
30/08/2020 20:02	0.0	3.4	8.7	0	1	1017	0.00	18.9
30/08/2020 21:02	0.0	3.3	8.3	0	1	1017	0.00	15.2
30/08/2020 22:02	0.0	3.3	7.9	0	1	1018	-0.01	13.1
30/08/2020 23:02	0.0	3.4	7.6	0	1	1018	-0.01	11.4
31/08/2020 00:02	0.0	3.5	7.5	0	0	1018	-0.02	10.7
31/08/2020 01:02	0.0	3.4	7.3	0	0	1018	-0.01	10.2
31/08/2020 02:02	0.0	3.3	7.2	0	1	1018	-0.01	10.1
31/08/2020 03:02	0.0	3.4	7.2	0	0	1018	0.00	9.8
31/08/2020 04:02	0.0	3.4	7.1	0	0	1018	-0.01	9.0
31/08/2020 05:02	0.0	3.3	7.1	0	0	1018	-0.02	8.3
31/08/2020 06:02	0.0	3.2	7.0	0	1	1018	-0.02	8.1
31/08/2020 07:02	0.0	3.4	6.9	0	0	1018	0.00	8.1
31/08/2020 08:02	0.0	3.3	6.9	0	0	1019	0.00	9.5
31/08/2020 09:02	0.0	3.3	7.0	0	0	1019	-0.01	10.8
31/08/2020 10:02	0.0	3.1	7.1	0	1	1019	-0.02	12.8
31/08/2020 11:02	0.0	3.3	7.4	0	1	1019	0.00	15.8
31/08/2020 12:02	0.0	3.3	7.5	0	0	1018	0.01	17.6
31/08/2020 13:02	0.0	3.3	7.6	0	1	1019	0.00	19.6
31/08/2020 14:02	0.0	3.2	7.7	0	1	1018	0.01	22.0
31/08/2020 15:02	0.0	3.2	7.8	0	1	1018	0.01	19.6

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Atmospheric Pressure mbar	Flow Ltr/hr	Temperature °C
31/08/2020 16:02	0.0	3.2	7.8	0	0	1017	0.00	19.0
31/08/2020 17:02	0.0	3.3	7.6	0	1	1017	0.02	22.1
31/08/2020 18:02	0.0	3.2	7.7	0	1	1017	0.02	27.7
31/08/2020 19:02	0.0	3.1	7.9	0	1	1016	0.04	27.7
31/08/2020 20:02	0.0	3.1	7.9	0	1	1017	0.03	23.4
31/08/2020 21:02	0.0	3.2	7.6	0	1	1017	-0.01	18.3
31/08/2020 22:02	0.0	3.3	7.2	0	1	1017	0.01	15.8
31/08/2020 23:02	0.0	3.2	7.0	0	1	1017	0.00	14.0
01/09/2020 00:02	0.0	3.2	6.7	0	1	1017	0.00	12.4
01/09/2020 01:02	0.0	3.2	6.5	0	1	1017	0.00	11.2
01/09/2020 02:02	0.0	3.3	6.4	0	0	1017	-0.01	10.2
01/09/2020 03:02	0.0	3.3	6.2	0	1	1017	0.00	9.4
01/09/2020 04:02	0.0	3.2	6.1	0	1	1017	0.00	9.0
01/09/2020 05:02	0.0	3.3	6.0	0	0	1017	0.00	9.0
01/09/2020 06:02	0.0	3.3	5.9	0	0	1017	0.00	9.4
01/09/2020 07:02	0.0	3.1	5.9	0	0	1018	-0.01	9.4
01/09/2020 08:02	0.0	3.1	5.9	0	1	1018	-0.01	10.0
01/09/2020 09:02	0.0	3.3	5.9	0	0	1018	0.00	12.3
01/09/2020 10:02	0.0	3.2	6.2	0	1	1018	-0.01	15.0
01/09/2020 11:02	0.0	3.2	6.4	0	1	1018	0.00	16.8
01/09/2020 12:02	0.0	3.3	6.5	0	1	1017	0.01	17.8
01/09/2020 13:02	0.0	3.3	6.4	0	1	1016	0.01	23.5
01/09/2020 14:02	0.0	3.1	6.5	0	1	1016	0.03	23.7
01/09/2020 15:02	0.0	3.2	6.6	0	1	1016	0.01	20.5
01/09/2020 16:02	0.0	3.1	6.6	0	1	1016	0.01	20.1
01/09/2020 17:02	0.0	3.1	6.5	0	1	1015	0.01	23.3
01/09/2020 18:02	0.0	3.2	6.6	0	1	1014	0.03	28.9
01/09/2020 19:02	0.0	3.1	6.8	0	2	1015	0.05	27.7
01/09/2020 20:02	0.0	3.0	6.7	0	1	1015	0.00	22.1
01/09/2020 21:02	0.0	3.1	6.5	0	1	1016	0.00	17.8
01/09/2020 22:02	0.0	3.1	6.3	0	0	1016	-0.01	15.9
01/09/2020 23:02	0.0	3.1	6.2	0	1	1016	-0.01	14.6
02/09/2020 00:02	0.0	3.1	6.1	0	1	1016	-0.01	13.4
02/09/2020 01:02	0.0	3.1	6.0	0	1	1016	-0.01	12.3
02/09/2020 02:02	0.0	3.0	6.0	0	1	1015	-0.01	11.8
02/09/2020 03:02	0.0	3.1	5.9	0	1	1015	-0.01	13.4
02/09/2020 04:02	0.0	3.1	5.9	0	1	1015	0.00	11.5
02/09/2020 05:02	0.0	3.1	5.8	0	1	1014	-0.01	10.6
02/09/2020 06:02	0.0	3.1	5.8	0	0	1014	-0.02	10.4
02/09/2020 07:02	0.0	3.0	5.8	0	1	1014	-0.01	10.9
02/09/2020 08:02	0.0	3.1	5.7	0	0	1014	-0.01	11.6
02/09/2020 09:02	0.0	3.0	5.9	0	1	1014	0.00	13.6
02/09/2020 10:02	0.0	3.0	6.1	0	1	1014	-0.01	15.0
02/09/2020 11:02	0.0	2.9	6.3	0	0	1014	0.01	16.4
02/09/2020 12:02	0.0	3.0	6.4	0	1	1013	-0.01	18.4
02/09/2020 13:02	0.0	2.9	6.5	0	1	1013	0.01	18.0
02/09/2020 14:02	0.0	2.9	6.5	0	1	1013	0.00	19.9
02/09/2020 15:02	0.0	2.9	6.5	0	1	1012	0.01	19.2
02/09/2020 16:02	0.0	3.0	6.5	0	1	1012	0.00	18.8
02/09/2020 17:02	0.0	2.9	6.6	0	1	1011	0.02	18.2
02/09/2020 18:02	0.0	2.9	6.5	0	0	1011	0.00	17.4
02/09/2020 19:02	0.0	2.9	6.4	0	1	1011	0.00	16.9
02/09/2020 20:02	0.0	2.9	6.4	0	1	1011	0.00	16.6
02/09/2020 21:02	0.0	2.8	6.4	0	1	1011	0.01	16.5
02/09/2020 22:02	0.0	2.9	6.4	0	1	1011	0.00	16.5
02/09/2020 23:02	0.0	2.9	6.3	0	1	1010	0.00	16.6
03/09/2020 00:02	0.0	2.9	6.3	0	1	1010	0.00	16.6
03/09/2020 01:02	0.0	2.9	6.3	0	1	1009	0.03	16.9
03/09/2020 02:02	0.0	2.9	6.2	0	1	1009	0.04	17.0
03/09/2020 03:02	0.0	2.8	6.1	0	1	1009	0.05	17.1
03/09/2020 04:02	0.0	2.8	6.0	0	1	1008	0.05	17.0
03/09/2020 05:02	0.0	2.9	5.9	0	1	1008	0.01	17.0
03/09/2020 06:02	0.0	3.0	5.8	0	1	1008	0.03	17.0
03/09/2020 07:02	0.0	2.9	5.8	0	0	1008	0.03	17.0
03/09/2020 08:02	0.0	2.9	5.8	0	1	1009	0.01	16.8
03/09/2020 09:02	0.0	2.9	5.8	0	1	1010	0.01	16.7
03/09/2020 10:02	0.0	2.9	5.8	0	1	1011	0.01	16.6
03/09/2020 11:02	0.0	3.0	5.6	0	1	1011	0.04	16.6
03/09/2020 12:02	0.0	3.0	5.6	0	0	1012	0.02	17.0
03/09/2020 13:02	0.0	2.9	5.6	0	1	1012	0.00	18.1
03/09/2020 14:02	0.0	2.9	5.6	0	1	1012	0.01	20.3
03/09/2020 15:02	0.0	3.0	5.7	0	1	1012	0.04	20.4

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Atmospheric Pressure mbar	Flow Ltr/hr	Temperature °C
03/09/2020 16:02	0.0	3.0	5.6	0	1	1012	0.01	21.7
03/09/2020 17:02	0.0	3.1	5.6	0	1	1012	0.03	23.5
03/09/2020 18:02	0.0	3.0	5.6	0	1	1013	0.07	23.7
03/09/2020 19:02	0.0	3.0	5.6	0	0	1014	0.01	20.3
03/09/2020 20:02	0.0	3.1	5.5	0	1	1014	0.04	18.3
03/09/2020 21:02	0.0	3.1	5.4	0	1	1015	0.01	16.9
03/09/2020 22:02	0.0	3.2	5.2	0	1	1016	-0.01	15.3
03/09/2020 23:02	0.0	3.2	5.1	0	1	1016	-0.01	14.3
04/09/2020 00:02	0.0	3.2	5.1	0	1	1017	0.00	13.7
04/09/2020 01:02	0.0	3.2	5.0	0	1	1017	0.00	13.1
04/09/2020 02:02	0.0	3.2	5.0	0	0	1017	-0.01	12.2
04/09/2020 03:02	0.0	3.1	5.0	0	1	1017	-0.02	11.8
04/09/2020 04:02	0.0	3.1	5.0	0	0	1017	-0.01	11.7
04/09/2020 05:02	0.0	3.0	5.1	0	1	1018	-0.02	10.9
04/09/2020 06:02	0.0	3.1	5.0	0	1	1018	-0.01	10.7
04/09/2020 07:02	0.0	3.2	5.0	0	1	1019	-0.02	11.3
04/09/2020 08:02	0.0	3.1	5.1	0	1	1018	-0.01	12.7
04/09/2020 09:02	0.0	3.1	5.2	0	0	1019	-0.01	14.0
04/09/2020 10:02	0.0	3.0	5.4	0	1	1019	0.00	16.5
04/09/2020 11:02	0.0	3.1	5.5	0	1	1019	0.04	17.2
04/09/2020 12:02	0.0	3.0	5.6	0	1	1020	0.04	18.7
04/09/2020 13:02	0.0	3.0	5.6	0	1	1019	0.02	19.7
04/09/2020 14:02	0.0	3.0	5.7	0	1	1020	0.01	18.8
04/09/2020 15:02	0.0	3.1	5.7	0	1	1019	0.02	17.8
04/09/2020 16:02	0.0	3.0	5.6	0	1	1019	0.02	17.8
04/09/2020 17:02	0.0	3.0	5.7	0	1	1019	-0.01	16.9
04/09/2020 18:02	0.0	3.1	5.6	0	1	1018	0.02	16.3
04/09/2020 19:02	0.0	3.0	5.6	0	1	1018	0.00	16.0
04/09/2020 20:02	0.0	3.0	5.5	0	1	1019	0.01	15.3
04/09/2020 21:02	0.0	3.2	5.3	0	1	1019	-0.01	13.2
04/09/2020 22:02	0.0	3.0	5.2	0	1	1019	0.00	11.5
04/09/2020 23:02	0.0	3.0	5.1	0	1	1019	-0.01	10.5
05/09/2020 00:02	0.0	3.1	5.0	0	0	1019	-0.02	9.9
05/09/2020 01:02	0.0	3.0	5.0	0	1	1019	0.00	9.7
05/09/2020 02:02	0.0	3.1	5.0	0	1	1020	-0.02	9.9
05/09/2020 03:02	0.0	3.0	5.0	0	1	1020	-0.01	8.9
05/09/2020 04:02	0.0	2.9	5.0	0	1	1020	-0.01	8.4
05/09/2020 05:02	0.0	2.9	4.9	0	1	1020	0.03	8.8
05/09/2020 06:02	0.0	3.0	5.0	0	1	1020	-0.01	9.1
05/09/2020 07:02	0.0	2.9	5.1	0	1	1021	-0.02	8.4
05/09/2020 08:02	0.0	3.0	5.1	0	0	1021	-0.01	8.6
05/09/2020 09:02	0.0	3.0	5.2	0	1	1021	-0.01	10.5
05/09/2020 10:02	0.0	3.0	5.2	0	1	1021	0.05	12.6
05/09/2020 11:02	0.0	3.0	5.3	0	1	1022	0.05	13.2
05/09/2020 12:02	0.0	3.0	5.4	0	1	1021	0.05	15.1
05/09/2020 13:02	0.0	3.0	5.5	0	0	1021	0.01	18.1
05/09/2020 14:02	0.0	3.0	5.7	0	1	1021	0.01	18.6
05/09/2020 15:02	0.0	2.9	5.8	0	1	1021	0.07	19.3
05/09/2020 16:02	0.0	3.0	5.7	0	1	1020	0.02	17.0
05/09/2020 17:02	0.0	3.0	5.6	0	0	1020	0.03	20.6
05/09/2020 18:02	0.0	2.9	5.8	0	1	1019	0.03	20.1
05/09/2020 19:02	0.0	3.0	5.7	0	0	1019	0.04	19.1
05/09/2020 20:02	0.0	3.0	5.7	0	0	1020	0.04	17.2
05/09/2020 21:02	0.0	3.0	5.5	0	0	1020	0.00	14.9
05/09/2020 22:02	0.0	3.0	5.5	0	1	1020	0.00	13.4
05/09/2020 23:02	0.0	2.9	5.5	0	1	1020	0.00	12.7
06/09/2020 00:02	0.0	3.1	5.5	0	1	1019	0.00	12.3
06/09/2020 01:02	0.0	3.0	5.4	0	0	1019	-0.01	12.1
06/09/2020 02:02	0.0	3.1	5.4	0	1	1019	-0.01	12.1
06/09/2020 03:02	0.0	2.9	5.4	0	1	1018	-0.01	12.1
06/09/2020 04:02	0.0	2.9	5.5	0	1	1018	-0.01	11.6
06/09/2020 05:02	0.0	2.9	5.5	0	1	1018	-0.01	10.6
06/09/2020 06:02	0.0	3.0	5.4	0	1	1018	-0.02	10.2
06/09/2020 07:02	0.0	2.9	5.4	0	1	1018	-0.01	10.3
06/09/2020 08:02	0.0	2.9	5.4	0	1	1017	0.00	10.8
06/09/2020 09:02	0.0	3.0	5.5	0	1	1018	-0.01	12.7
06/09/2020 10:02	0.0	2.9	5.7	0	1	1018	-0.01	15.2
06/09/2020 11:02	0.0	2.9	5.9	0	1	1018	-0.01	17.3
06/09/2020 12:02	0.0	2.9	6.1	0	1	1018	0.03	16.4
06/09/2020 13:02	0.0	2.9	6.1	0	1	1018	0.00	18.3
06/09/2020 14:02	0.0	2.9	6.2	0	1	1018	0.00	20.3
06/09/2020 15:02	0.0	2.8	6.3	0	1	1018	0.03	19.2

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Atmospheric Pressure mbar	Flow Ltr/hr	Temperature °C
06/09/2020 16:02	0.0	2.8	6.2	0	0	1018	0.02	20.7
06/09/2020 17:02	0.0	2.9	6.3	0	1	1018	0.00	20.1
06/09/2020 18:02	0.0	2.9	6.2	0	1	1018	0.02	18.9
06/09/2020 19:02	0.0	2.9	6.2	0	1	1018	0.00	19.6
06/09/2020 20:02	0.0	2.9	6.2	0	1	1020	0.00	17.8
06/09/2020 21:02	0.0	2.9	6.2	0	0	1020	-0.01	14.7
06/09/2020 22:02	0.0	2.9	6.1	0	1	1021	-0.01	13.0
06/09/2020 23:02	0.0	2.9	6.0	0	1	1021	-0.02	12.1
07/09/2020 00:02	0.0	2.9	5.9	0	1	1022	0.02	11.5
07/09/2020 01:02	0.0	3.0	5.8	0	0	1022	0.01	11.1
07/09/2020 02:02	0.0	2.9	5.8	0	1	1022	0.00	10.8
07/09/2020 03:02	0.0	3.0	5.8	0	0	1022	0.00	10.4
07/09/2020 04:02	0.0	2.9	5.7	0	1	1022	-0.02	10.0
07/09/2020 05:02	0.0	2.8	5.7	0	1	1021	0.00	9.6
07/09/2020 06:02	0.0	3.0	5.7	0	0	1021	0.00	9.4
07/09/2020 07:02	0.0	2.9	5.7	0	1	1022	-0.01	9.4
07/09/2020 08:02	0.0	2.9	5.7	0	0	1022	-0.01	10.0
07/09/2020 09:02	0.0	2.9	5.8	0	0	1022	-0.01	11.8
07/09/2020 10:02	0.0	2.8	6.0	0	1	1022	-0.01	15.2
07/09/2020 11:02	0.0	2.9	6.3	0	1	1022	0.01	17.4
07/09/2020 12:02	0.0	2.8	6.4	0	1	1023	0.01	16.3
07/09/2020 13:02	0.0	2.9	6.5	0	1	1022	0.00	17.2
07/09/2020 14:02	0.0	2.9	6.5	0	1	1022	0.01	16.0
07/09/2020 15:02	0.0	2.8	6.5	0	1	1022	0.03	17.9
07/09/2020 16:02	0.0	2.8	6.6	0	1	1022	0.03	18.8
07/09/2020 17:02	0.0	2.8	6.6	0	1	1022	0.04	17.6
07/09/2020 18:02	0.0	2.8	6.6	0	0	1022	0.01	17.2
07/09/2020 19:02	0.0	2.8	6.6	0	1	1022	0.03	16.9
07/09/2020 20:02	0.0	2.8	6.6	0	1	1022	-0.01	16.4
07/09/2020 21:02	0.0	2.8	6.6	0	1	1023	0.02	16.4
07/09/2020 22:02	0.0	2.9	6.6	0	1	1023	0.00	16.2
07/09/2020 23:02	0.0	2.8	6.7	0	1	1023	0.00	16.0
08/09/2020 00:02	0.0	2.9	6.7	0	1	1023	0.00	16.0
08/09/2020 01:02	0.0	2.8	6.7	0	1	1023	0.02	15.9
08/09/2020 02:02	0.0	2.8	6.7	0	1	1023	0.01	15.8
08/09/2020 03:02	0.0	2.8	6.7	0	1	1023	0.00	15.8
08/09/2020 04:02	0.0	2.8	6.7	0	1	1023	-0.01	16.1
08/09/2020 05:02	0.0	2.8	6.7	0	0	1023	0.00	15.8
08/09/2020 06:02	0.0	2.8	6.8	0	1	1023	0.00	15.8

GGs Time Series Data



Project Ref:	GGs2345	
Location:	Baglan, South Wales	
Borehole ref:	WS102	
Sentinel ID:	GS35	Days of monitoring: 11
Start Date:	26/08/2020 11:02	Monitoring Frequency (mins): 60
End Date:	07/09/2020 00:02	Total samples taken: 86

Minimum, Maximum and Range Table

	CH ₄	CO ₂	O ₂	H ₂ S	CO	Flow
Minimum	0.0	0.1	14.6	0	0	0.00
Maximum	0.0	0.8	20.7	0	2	0.05
Range	0.0	0.8	6.2	0	2	0.05

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
26/08/2020 11:02	0.0	0.1	20.2	0	1	0.02
26/08/2020 12:02	0.0	0.1	20.2	0	1	0.05
26/08/2020 13:02	0.0	0.1	20.2	0	1	0.04
26/08/2020 14:02	0.0	0.1	20.3	0	1	0.05
26/08/2020 15:02	0.0	0.1	20.6	0	2	0.05
26/08/2020 16:02	0.0	0.2	20.7	0	2	0.05
26/08/2020 17:02	0.0	0.2	20.7	0	2	0.04
26/08/2020 18:02	0.0	0.2	20.6	0	2	0.04
26/08/2020 19:02	0.0	0.2	20.4	0	2	0.04
26/08/2020 20:02	0.0	0.2	20.2	0	2	0.04
26/08/2020 21:02	0.0	0.2	19.8	0	2	0.03
26/08/2020 22:02	0.0	0.2	19.4	0	1	0.02
26/08/2020 23:02	0.0	0.3	19.0	0	1	0.01
27/08/2020 00:02	0.0	0.3	18.8	0	1	0.01
27/08/2020 01:02	0.0	0.3	18.6	0	1	0.02
27/08/2020 02:02	0.0	0.3	18.4	0	1	0.02
27/08/2020 03:02	0.0	0.3	18.3	0	1	0.01
27/08/2020 04:02	0.0	0.4	18.2	0	1	0.00
27/08/2020 05:02	0.0	0.4	18.1	0	1	0.00
27/08/2020 06:02	0.0	0.4	18.1	0	1	0.02
27/08/2020 07:02	0.0	0.4	18.1	0	1	0.02
27/08/2020 08:02	0.0	0.4	18.1	0	1	0.02
27/08/2020 09:02	0.0	0.4	18.3	0	1	0.00
27/08/2020 10:02	0.0	0.4	18.4	0	1	0.02
27/08/2020 11:02	0.0	0.4	18.3	0	1	0.03
27/08/2020 12:02	0.0	0.4	18.2	0	1	0.02
27/08/2020 13:02	0.0	0.4	18.1	0	1	0.03
27/08/2020 14:02	0.0	0.5	18.1	0	1	0.03
27/08/2020 15:02	0.0	0.5	18.0	0	1	0.04
27/08/2020 16:02	0.0	0.5	18.1	0	1	0.04
27/08/2020 17:02	0.0	0.5	18.4	0	2	0.03
27/08/2020 18:02	0.0	0.5	18.6	0	2	0.04
27/08/2020 19:02	0.0	0.5	18.6	0	2	0.03
27/08/2020 20:02	0.0	0.5	18.5	0	1	0.02
27/08/2020 21:02	0.0	0.5	18.3	0	1	0.01
27/08/2020 22:02	0.0	0.5	18.1	0	1	0.01
27/08/2020 23:02	0.0	0.5	18.0	0	1	0.02
28/08/2020 00:02	0.0	0.6	17.8	0	1	0.03
28/08/2020 01:02	0.0	0.6	17.6	0	1	0.02

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
28/08/2020 02:02	0.0	0.6	17.4	0	1	0.02
28/08/2020 03:02	0.0	0.7	17.3	0	1	0.02
28/08/2020 04:02	0.0	0.7	17.2	0	1	0.01
28/08/2020 05:02	0.0	0.7	17.1	0	1	0.01
28/08/2020 06:02	0.0	0.7	17.1	0	1	0.02
28/08/2020 07:02	0.0	0.7	17.0	0	1	0.01
28/08/2020 08:02	0.0	0.7	17.0	0	1	0.01
28/08/2020 09:02	0.0	0.8	16.9	0	1	0.02
28/08/2020 10:02	0.0	0.7	17.2	0	1	0.02
28/08/2020 11:02	0.0	0.7	17.4	0	1	0.02
28/08/2020 12:02	0.0	0.7	17.6	0	1	0.02
28/08/2020 13:02	0.0	0.7	17.9	0	2	0.04
28/08/2020 14:02	0.0	0.7	18.1	0	2	0.04
28/08/2020 15:02	0.0	0.7	18.1	0	2	0.04
28/08/2020 16:02	0.0	0.7	18.0	0	2	0.04
28/08/2020 17:02	0.0	0.7	17.9	0	2	0.05
28/08/2020 18:02	0.0	0.7	17.8	0	1	0.01
28/08/2020 19:02	0.0	0.7	17.6	0	1	0.01
28/08/2020 20:02	0.0	0.7	17.5	0	1	0.02
28/08/2020 21:02	0.0	0.7	17.3	0	1	0.02
28/08/2020 22:02	0.0	0.7	17.1	0	1	0.01
28/08/2020 23:02	0.0	0.7	16.8	0	1	0.02
29/08/2020 00:02	0.0	0.7	16.7	0	1	0.01
29/08/2020 01:02	0.0	0.8	16.6	0	1	0.02
29/08/2020 02:02	0.0	0.8	16.4	0	1	0.01
29/08/2020 03:02	0.0	0.8	16.3	0	1	0.00
29/08/2020 04:02	0.0	0.8	16.2	0	1	0.01
29/08/2020 05:02	0.0	0.8	16.1	0	1	0.01
29/08/2020 06:02	0.0	0.8	16.3	0	1	0.00
29/08/2020 07:02	0.0	0.8	15.9	0	1	0.00
29/08/2020 08:02	0.0	0.8	16.6	0	0	0.01
29/08/2020 09:02	0.0	0.8	15.8	0	0	0.01
29/08/2020 10:02	0.0	0.7	16.0	0	1	0.01
29/08/2020 11:02	0.0	0.8	16.3	0	1	0.02
29/08/2020 12:02	0.0	0.7	16.8	0	1	0.02
29/08/2020 13:02	0.0	0.7	17.1	0	1	0.02
29/08/2020 14:02	0.0	0.7	17.3	0	1	0.02
29/08/2020 15:02	0.0	0.7	17.4	0	1	0.04
29/08/2020 16:02	0.0	0.7	17.5	0	1	0.03
29/08/2020 17:02	0.0	0.6	17.6	0	1	0.03
30/08/2020 22:02	0.0	0.5	16.4	0	1	0.01
31/08/2020 11:02	0.0	0.5	15.8	0	1	0.02
01/09/2020 04:02	0.0	0.4	15.3	0	1	0.01
02/09/2020 17:02	0.0	0.4	16.5	0	2	0.03
04/09/2020 13:02	0.0	0.8	15.7	0	2	0.05
05/09/2020 23:02	0.0	0.8	14.7	0	2	0.02
07/09/2020 00:02	0.0	0.7	14.6	0	2	0.02

GGs Time Series Data



Project Ref:	GGs2345	
Location:	Baglan, South Wales	
Borehole ref:	WS103	
Sentinel ID:	GS39	Days of monitoring: 15
Start Date:	26/08/2020 12:02	Monitoring Frequency (mins): 60
End Date:	11/09/2020 08:02	Total samples taken: 381

Minimum, Maximum and Range Table

	CH ₄	CO ₂	O ₂	H ₂ S	CO	Flow
Minimum	0.0	0.0	7.3	0	0	-0.01
Maximum	0.0	0.1	17.6	0	0	0.07
Range	0.0	0.1	10.3	0	0	0.08

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
26/08/2020 12:02	0.0	0.1	17.6	0	0	0.01
26/08/2020 13:02	0.0	0.1	16.5	0	0	0.02
26/08/2020 14:02	0.0	0.1	15.7	0	0	0.03
26/08/2020 15:02	0.0	0.1	15.2	0	0	0.03
26/08/2020 16:02	0.0	0.1	14.9	0	0	0.04
26/08/2020 17:02	0.0	0.1	14.5	0	0	0.03
26/08/2020 18:02	0.0	0.1	14.0	0	0	0.04
26/08/2020 19:02	0.0	0.1	13.6	0	0	0.01
26/08/2020 20:02	0.0	0.1	13.0	0	0	0.02
26/08/2020 21:02	0.0	0.1	12.4	0	0	0.01
26/08/2020 22:02	0.0	0.1	11.8	0	0	0.01
26/08/2020 23:02	0.0	0.1	11.3	0	0	0.01
27/08/2020 00:02	0.0	0.1	10.8	0	0	0.01
27/08/2020 01:02	0.0	0.1	11.7	0	0	0.01
27/08/2020 02:02	0.0	0.1	10.3	0	0	-0.01
27/08/2020 03:02	0.0	0.1	10.0	0	0	0.00
27/08/2020 04:02	0.0	0.1	9.9	0	0	0.01
27/08/2020 05:02	0.0	0.1	9.8	0	0	0.02
27/08/2020 06:02	0.0	0.1	9.7	0	0	0.01
27/08/2020 07:02	0.0	0.1	9.6	0	0	0.01
27/08/2020 08:02	0.0	0.1	9.7	0	0	0.02
27/08/2020 09:02	0.0	0.1	9.7	0	0	0.03
27/08/2020 10:02	0.0	0.1	9.7	0	0	0.03
27/08/2020 11:02	0.0	0.1	9.5	0	0	0.01
27/08/2020 12:02	0.0	0.1	9.4	0	0	0.01
27/08/2020 13:02	0.0	0.1	9.2	0	0	0.01
27/08/2020 14:02	0.0	0.0	9.3	0	0	0.05
27/08/2020 15:02	0.0	0.1	9.1	0	0	0.07
27/08/2020 16:02	0.0	0.1	9.2	0	0	0.03
27/08/2020 17:02	0.0	0.1	9.5	0	0	0.07
27/08/2020 18:02	0.0	0.1	9.7	0	0	0.04
27/08/2020 19:02	0.0	0.1	9.6	0	0	0.03
27/08/2020 20:02	0.0	0.1	9.4	0	0	0.02
27/08/2020 21:02	0.0	0.1	9.3	0	0	0.02
27/08/2020 22:02	0.0	0.1	9.2	0	0	0.01
27/08/2020 23:02	0.0	0.1	9.1	0	0	0.00
28/08/2020 00:02	0.0	0.1	8.9	0	0	0.01
28/08/2020 01:02	0.0	0.1	8.8	0	0	0.01
28/08/2020 02:02	0.0	0.1	8.7	0	0	0.01

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
28/08/2020 03:02	0.0	0.1	8.7	0	0	0.02
28/08/2020 04:02	0.0	0.1	8.6	0	0	0.01
28/08/2020 05:02	0.0	0.1	8.5	0	0	0.03
28/08/2020 06:02	0.0	0.1	8.5	0	0	0.00
28/08/2020 07:02	0.0	0.1	8.4	0	0	0.00
28/08/2020 08:02	0.0	0.1	8.3	0	0	0.00
28/08/2020 09:02	0.0	0.1	8.4	0	0	0.00
28/08/2020 10:02	0.0	0.1	8.6	0	0	0.02
28/08/2020 11:02	0.0	0.1	8.8	0	0	0.02
28/08/2020 12:02	0.0	0.0	9.0	0	0	0.01
28/08/2020 13:02	0.0	0.1	9.1	0	0	0.02
28/08/2020 14:02	0.0	0.0	9.3	0	0	0.01
28/08/2020 15:02	0.0	0.0	9.2	0	0	0.02
28/08/2020 16:02	0.0	0.1	9.2	0	0	0.03
28/08/2020 17:02	0.0	0.1	9.2	0	0	-0.01
28/08/2020 18:02	0.0	0.1	9.1	0	0	0.00
28/08/2020 19:02	0.0	0.1	9.0	0	0	-0.01
28/08/2020 20:02	0.0	0.1	8.9	0	0	0.01
28/08/2020 21:02	0.0	0.1	8.7	0	0	0.03
28/08/2020 22:02	0.0	0.1	8.6	0	0	0.01
28/08/2020 23:02	0.0	0.1	8.4	0	0	0.00
29/08/2020 00:02	0.0	0.1	8.2	0	0	0.01
29/08/2020 01:02	0.0	0.1	8.1	0	0	0.00
29/08/2020 02:02	0.0	0.1	8.0	0	0	0.01
29/08/2020 03:02	0.0	0.0	7.9	0	0	0.01
29/08/2020 04:02	0.0	0.0	7.8	0	0	0.01
29/08/2020 05:02	0.0	0.0	7.7	0	0	0.00
29/08/2020 06:02	0.0	0.0	7.6	0	0	0.00
29/08/2020 07:02	0.0	0.0	7.6	0	0	-0.01
29/08/2020 08:02	0.0	0.0	7.5	0	0	-0.01
29/08/2020 09:02	0.0	0.0	7.7	0	0	0.02
29/08/2020 10:02	0.0	0.0	8.1	0	0	-0.01
29/08/2020 11:02	0.0	0.0	8.5	0	0	0.01
29/08/2020 12:02	0.0	0.1	8.7	0	0	0.01
29/08/2020 13:02	0.0	0.1	8.9	0	0	0.01
29/08/2020 14:02	0.0	0.0	8.9	0	0	-0.01
29/08/2020 15:02	0.0	0.0	8.9	0	0	0.01
29/08/2020 16:02	0.0	0.0	8.9	0	0	0.01
29/08/2020 17:02	0.0	0.0	8.9	0	0	0.02
29/08/2020 18:02	0.0	0.0	9.0	0	0	0.01
29/08/2020 19:02	0.0	0.0	8.8	0	0	0.02
29/08/2020 20:02	0.0	0.1	8.7	0	0	0.00
29/08/2020 21:02	0.0	0.1	8.6	0	0	0.01
29/08/2020 22:02	0.0	0.1	8.4	0	0	0.01
29/08/2020 23:02	0.0	0.1	8.2	0	0	-0.01
30/08/2020 00:02	0.0	0.1	8.1	0	0	0.01
30/08/2020 01:02	0.0	0.0	8.0	0	0	0.01
30/08/2020 02:02	0.0	0.0	7.9	0	0	0.00
30/08/2020 03:02	0.0	0.0	7.8	0	0	0.02
30/08/2020 04:02	0.0	0.0	7.8	0	0	0.00
30/08/2020 05:02	0.0	0.0	7.7	0	0	-0.01
30/08/2020 06:02	0.0	0.0	8.4	0	0	0.01
30/08/2020 07:02	0.0	0.0	7.5	0	0	-0.01
30/08/2020 08:02	0.0	0.0	7.5	0	0	-0.01
30/08/2020 09:02	0.0	0.0	7.6	0	0	0.01
30/08/2020 10:02	0.0	0.0	8.0	0	0	0.02
30/08/2020 11:02	0.0	0.0	8.3	0	0	0.03
30/08/2020 12:02	0.0	0.0	8.6	0	0	0.01

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
30/08/2020 13:02	0.0	0.0	8.7	0	0	0.02
30/08/2020 14:02	0.0	0.0	8.8	0	0	0.02
30/08/2020 15:02	0.0	0.0	8.9	0	0	0.02
30/08/2020 16:02	0.0	0.0	9.0	0	0	0.03
30/08/2020 17:02	0.0	0.0	9.0	0	0	0.03
30/08/2020 18:02	0.0	0.0	8.9	0	0	0.03
30/08/2020 19:02	0.0	0.0	8.8	0	0	0.02
30/08/2020 20:02	0.0	0.0	8.7	0	0	0.01
30/08/2020 21:02	0.0	0.0	8.5	0	0	0.01
30/08/2020 22:02	0.0	0.0	8.3	0	0	0.01
30/08/2020 23:02	0.0	0.0	8.1	0	0	0.01
31/08/2020 00:02	0.0	0.0	8.0	0	0	0.02
31/08/2020 01:02	0.0	0.0	7.9	0	0	0.00
31/08/2020 02:02	0.0	0.0	8.3	0	0	0.02
31/08/2020 03:02	0.0	0.0	7.9	0	0	0.01
31/08/2020 04:02	0.0	0.0	7.8	0	0	0.01
31/08/2020 05:02	0.0	0.0	7.8	0	0	-0.01
31/08/2020 06:02	0.0	0.0	7.7	0	0	0.00
31/08/2020 07:02	0.0	0.0	7.7	0	0	-0.01
31/08/2020 08:02	0.0	0.0	7.7	0	0	-0.01
31/08/2020 09:02	0.0	0.0	7.8	0	0	0.02
31/08/2020 10:02	0.0	0.0	8.0	0	0	0.01
31/08/2020 11:02	0.0	0.0	8.2	0	0	0.02
31/08/2020 12:02	0.0	0.0	8.4	0	0	0.03
31/08/2020 13:02	0.0	0.0	8.8	0	0	0.03
31/08/2020 14:02	0.0	0.0	8.9	0	0	0.03
31/08/2020 15:02	0.0	0.0	9.0	0	0	0.04
31/08/2020 16:02	0.0	0.0	9.1	0	0	0.03
31/08/2020 17:02	0.0	0.0	9.0	0	0	0.03
31/08/2020 18:02	0.0	0.0	8.8	0	0	0.03
31/08/2020 19:02	0.0	0.0	8.8	0	0	0.02
31/08/2020 20:02	0.0	0.0	8.7	0	0	0.03
31/08/2020 21:02	0.0	0.0	8.5	0	0	0.01
31/08/2020 22:02	0.0	0.0	8.3	0	0	0.01
31/08/2020 23:02	0.0	0.0	8.2	0	0	0.02
01/09/2020 00:02	0.0	0.0	8.2	0	0	0.01
01/09/2020 01:02	0.0	0.0	8.1	0	0	0.00
01/09/2020 02:02	0.0	0.0	8.0	0	0	0.00
01/09/2020 03:02	0.0	0.0	8.0	0	0	0.01
01/09/2020 04:02	0.0	0.0	7.8	0	0	0.01
01/09/2020 05:02	0.0	0.0	7.8	0	0	-0.01
01/09/2020 06:02	0.0	0.0	7.8	0	0	0.00
01/09/2020 07:02	0.0	0.0	7.9	0	0	-0.01
01/09/2020 08:02	0.0	0.0	7.9	0	0	0.01
01/09/2020 09:02	0.0	0.0	8.0	0	0	0.02
01/09/2020 10:02	0.0	0.0	8.3	0	0	0.02
01/09/2020 11:02	0.0	0.0	8.4	0	0	0.04
01/09/2020 12:02	0.0	0.0	8.5	0	0	0.03
01/09/2020 13:02	0.0	0.0	8.5	0	0	0.03
01/09/2020 14:02	0.0	0.0	8.5	0	0	0.03
01/09/2020 15:02	0.0	0.0	8.6	0	0	0.04
01/09/2020 16:02	0.0	0.0	8.5	0	0	0.05
01/09/2020 17:02	0.0	0.0	8.5	0	0	0.02
01/09/2020 18:02	0.0	0.0	8.1	0	0	0.03
01/09/2020 19:02	0.0	0.0	7.7	0	0	0.03
01/09/2020 20:02	0.0	0.0	8.0	0	0	0.00
01/09/2020 21:02	0.0	0.0	8.0	0	0	0.02
01/09/2020 22:02	0.0	0.0	8.0	0	0	0.02

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
01/09/2020 23:02	0.0	0.0	8.5	0	0	-0.01
02/09/2020 00:02	0.0	0.0	7.9	0	0	0.02
02/09/2020 01:02	0.0	0.0	7.9	0	0	0.01
02/09/2020 02:02	0.0	0.0	7.8	0	0	0.00
02/09/2020 03:02	0.0	0.0	7.9	0	0	0.02
02/09/2020 04:02	0.0	0.0	7.9	0	0	0.01
02/09/2020 05:02	0.0	0.0	7.9	0	0	0.01
02/09/2020 06:02	0.0	0.0	8.8	0	0	0.00
02/09/2020 07:02	0.0	0.0	7.9	0	0	0.01
02/09/2020 08:02	0.0	0.0	7.9	0	0	0.03
02/09/2020 09:02	0.0	0.0	8.0	0	0	0.02
02/09/2020 10:02	0.0	0.0	8.1	0	0	0.02
02/09/2020 11:02	0.0	0.0	8.2	0	0	0.03
02/09/2020 12:02	0.0	0.0	8.2	0	0	0.01
02/09/2020 13:02	0.0	0.0	8.3	0	0	0.03
02/09/2020 14:02	0.0	0.0	8.2	0	0	0.03
02/09/2020 15:02	0.0	0.0	8.3	0	0	0.02
02/09/2020 16:02	0.0	0.0	8.3	0	0	0.03
02/09/2020 17:02	0.0	0.0	8.3	0	0	0.03
02/09/2020 18:02	0.0	0.0	8.2	0	0	0.03
02/09/2020 19:02	0.0	0.0	8.2	0	0	0.03
02/09/2020 20:02	0.0	0.0	8.2	0	0	0.02
02/09/2020 21:02	0.0	0.0	8.2	0	0	0.02
02/09/2020 22:02	0.0	0.0	8.2	0	0	0.03
02/09/2020 23:02	0.0	0.0	8.2	0	0	0.03
03/09/2020 00:02	0.0	0.0	8.2	0	0	0.02
03/09/2020 01:02	0.0	0.0	8.2	0	0	0.03
03/09/2020 02:02	0.0	0.0	8.2	0	0	0.03
03/09/2020 03:02	0.0	0.0	8.2	0	0	0.03
03/09/2020 04:02	0.0	0.0	8.3	0	0	0.04
03/09/2020 05:02	0.0	0.0	8.3	0	0	0.03
03/09/2020 06:02	0.0	0.0	8.3	0	0	0.03
03/09/2020 07:02	0.0	0.0	8.3	0	0	0.02
03/09/2020 08:02	0.0	0.0	8.3	0	0	0.02
03/09/2020 09:02	0.0	0.0	8.4	0	0	0.01
03/09/2020 10:02	0.0	0.0	8.4	0	0	0.01
03/09/2020 11:02	0.0	0.0	8.4	0	0	0.03
03/09/2020 12:02	0.0	0.0	8.4	0	0	0.03
03/09/2020 13:02	0.0	0.0	8.4	0	0	0.00
03/09/2020 14:02	0.0	0.0	8.4	0	0	0.02
03/09/2020 15:02	0.0	0.0	8.2	0	0	0.04
03/09/2020 16:02	0.0	0.0	8.2	0	0	0.03
03/09/2020 17:02	0.0	0.0	8.2	0	0	0.04
03/09/2020 18:02	0.0	0.0	8.2	0	0	0.03
03/09/2020 19:02	0.0	0.0	8.3	0	0	0.02
03/09/2020 20:02	0.0	0.0	8.5	0	0	0.03
03/09/2020 21:02	0.0	0.0	8.3	0	0	0.01
03/09/2020 22:02	0.0	0.0	8.2	0	0	0.00
03/09/2020 23:02	0.0	0.1	8.2	0	0	0.01
04/09/2020 00:02	0.0	0.1	8.2	0	0	0.01
04/09/2020 01:02	0.0	0.1	8.2	0	0	0.00
04/09/2020 02:02	0.0	0.1	8.1	0	0	0.02
04/09/2020 03:02	0.0	0.1	8.1	0	0	0.02
04/09/2020 04:02	0.0	0.1	8.2	0	0	0.00
04/09/2020 05:02	0.0	0.1	8.0	0	0	0.01
04/09/2020 06:02	0.0	0.1	8.0	0	0	0.00
04/09/2020 07:02	0.0	0.1	7.9	0	0	0.00
04/09/2020 08:02	0.0	0.1	7.9	0	0	0.00

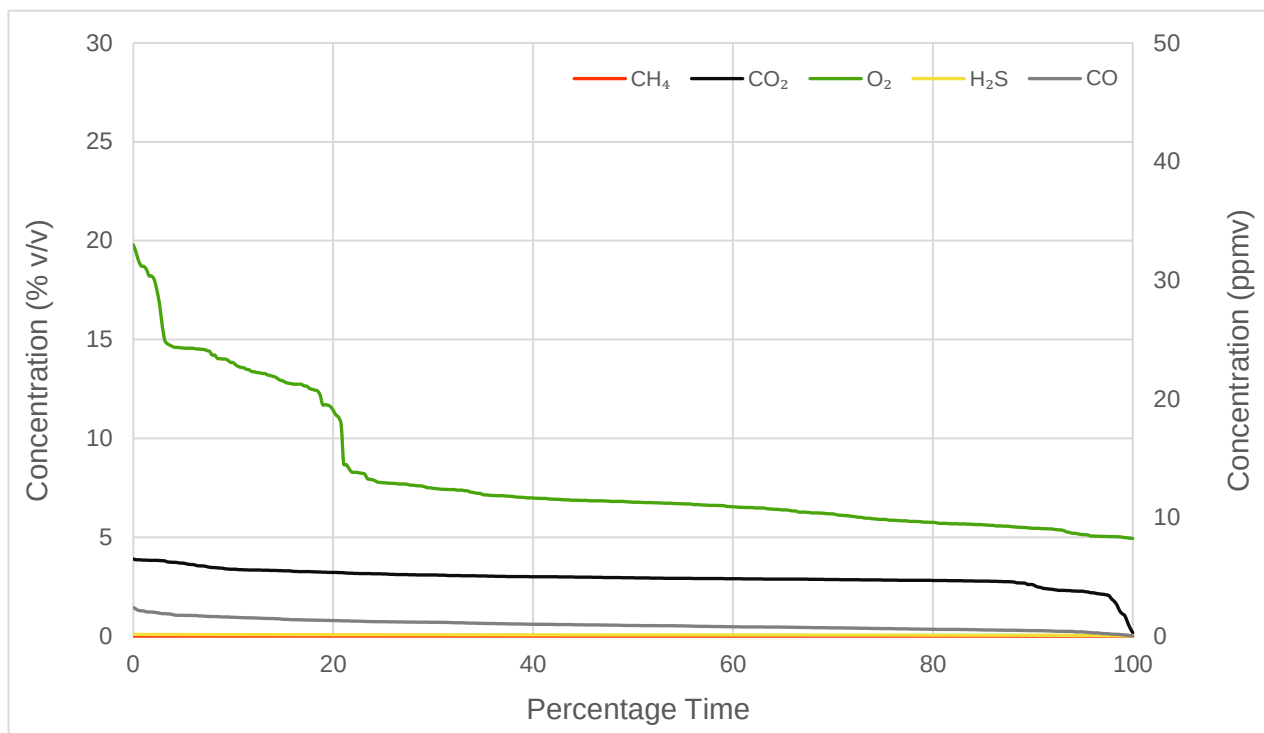
Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
04/09/2020 09:02	0.0	0.1	8.0	0	0	0.01
04/09/2020 10:02	0.0	0.1	8.0	0	0	0.03
04/09/2020 11:02	0.0	0.1	8.1	0	0	0.04
04/09/2020 12:02	0.0	0.1	8.1	0	0	0.01
04/09/2020 13:02	0.0	0.1	8.1	0	0	0.02
04/09/2020 14:02	0.0	0.1	8.1	0	0	0.01
04/09/2020 15:02	0.0	0.1	8.1	0	0	0.02
04/09/2020 16:02	0.0	0.1	8.2	0	0	0.03
04/09/2020 17:02	0.0	0.1	8.1	0	0	0.02
04/09/2020 18:02	0.0	0.1	8.0	0	0	0.02
04/09/2020 19:02	0.0	0.1	8.0	0	0	0.02
04/09/2020 20:02	0.0	0.1	8.0	0	0	0.01
04/09/2020 21:02	0.0	0.1	8.0	0	0	0.02
04/09/2020 22:02	0.0	0.1	8.0	0	0	0.01
04/09/2020 23:02	0.0	0.1	7.9	0	0	0.01
05/09/2020 00:02	0.0	0.1	7.8	0	0	0.02
05/09/2020 01:02	0.0	0.1	7.8	0	0	0.01
05/09/2020 02:02	0.0	0.1	7.8	0	0	0.01
05/09/2020 03:02	0.0	0.1	7.7	0	0	-0.01
05/09/2020 04:02	0.0	0.1	7.7	0	0	0.01
05/09/2020 05:02	0.0	0.0	7.7	0	0	0.00
05/09/2020 06:02	0.0	0.0	7.7	0	0	0.00
05/09/2020 07:02	0.0	0.0	7.7	0	0	0.01
05/09/2020 08:02	0.0	0.0	7.7	0	0	0.00
05/09/2020 09:02	0.0	0.0	7.6	0	0	0.01
05/09/2020 10:02	0.0	0.0	7.7	0	0	0.02
05/09/2020 11:02	0.0	0.0	7.7	0	0	0.01
05/09/2020 12:02	0.0	0.0	7.8	0	0	0.02
05/09/2020 13:02	0.0	0.0	7.8	0	0	0.04
05/09/2020 14:02	0.0	0.1	7.9	0	0	0.02
05/09/2020 15:02	0.0	0.0	7.8	0	0	0.03
05/09/2020 16:02	0.0	0.1	8.0	0	0	0.01
05/09/2020 17:02	0.0	0.1	7.8	0	0	0.02
05/09/2020 18:02	0.0	0.1	7.8	0	0	0.01
05/09/2020 19:02	0.0	0.1	7.9	0	0	0.01
05/09/2020 20:02	0.0	0.1	7.9	0	0	0.02
05/09/2020 21:02	0.0	0.1	8.0	0	0	0.02
05/09/2020 22:02	0.0	0.1	8.0	0	0	0.01
05/09/2020 23:02	0.0	0.0	8.0	0	0	0.00
06/09/2020 00:02	0.0	0.1	8.0	0	0	0.01
06/09/2020 01:02	0.0	0.1	8.0	0	0	0.02
06/09/2020 02:02	0.0	0.0	8.0	0	0	0.01
06/09/2020 03:02	0.0	0.0	8.0	0	0	0.00
06/09/2020 04:02	0.0	0.0	8.0	0	0	0.01
06/09/2020 05:02	0.0	0.0	8.0	0	0	0.01
06/09/2020 06:02	0.0	0.0	8.0	0	0	0.01
06/09/2020 07:02	0.0	0.0	8.0	0	0	0.01
06/09/2020 08:02	0.0	0.0	8.0	0	0	0.00
06/09/2020 09:02	0.0	0.0	8.0	0	0	0.02
06/09/2020 10:02	0.0	0.0	8.1	0	0	0.02
06/09/2020 11:02	0.0	0.0	8.2	0	0	0.02
06/09/2020 12:02	0.0	0.0	8.2	0	0	0.02
06/09/2020 13:02	0.0	0.0	8.0	0	0	0.02
06/09/2020 14:02	0.0	0.0	8.1	0	0	0.02
06/09/2020 15:02	0.0	0.0	8.1	0	0	0.02
06/09/2020 16:02	0.0	0.0	8.1	0	0	0.03
06/09/2020 17:02	0.0	0.0	8.1	0	0	0.02
06/09/2020 18:02	0.0	0.0	8.2	0	0	0.01

Date and Time	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	H ₂ S ppm/v	CO ppm/v	Flow Ltr/hr
06/09/2020 19:02	0.0	0.0	8.2	0	0	0.02
06/09/2020 20:02	0.0	0.0	8.2	0	0	0.03
06/09/2020 21:02	0.0	0.0	8.3	0	0	0.02
06/09/2020 22:02	0.0	0.0	8.2	0	0	0.01
06/09/2020 23:02	0.0	0.0	8.2	0	0	0.01
07/09/2020 00:02	0.0	0.0	8.2	0	0	0.01
07/09/2020 01:02	0.0	0.0	8.1	0	0	0.01
07/09/2020 02:02	0.0	0.0	8.1	0	0	0.01
07/09/2020 03:02	0.0	0.0	8.1	0	0	0.01
07/09/2020 04:02	0.0	0.0	8.1	0	0	0.00
07/09/2020 05:02	0.0	0.0	8.1	0	0	0.01
07/09/2020 06:02	0.0	0.0	8.1	0	0	0.01
07/09/2020 07:02	0.0	0.0	8.1	0	0	0.00
07/09/2020 08:02	0.0	0.0	8.1	0	0	0.01
07/09/2020 09:02	0.0	0.0	8.1	0	0	0.01
07/09/2020 10:02	0.0	0.0	8.2	0	0	0.02
07/09/2020 11:02	0.0	0.0	8.2	0	0	0.02
07/09/2020 12:02	0.0	0.0	8.3	0	0	0.03
07/09/2020 13:02	0.0	0.0	8.3	0	0	0.02
07/09/2020 14:02	0.0	0.0	8.4	0	0	0.03
07/09/2020 15:02	0.0	0.0	8.3	0	0	0.03
07/09/2020 16:02	0.0	0.0	8.3	0	0	0.01
07/09/2020 17:02	0.0	0.0	8.4	0	0	0.03
07/09/2020 18:02	0.0	0.0	8.4	0	0	0.02
07/09/2020 19:02	0.0	0.0	8.4	0	0	0.03
07/09/2020 20:02	0.0	0.0	8.4	0	0	0.01
07/09/2020 21:02	0.0	0.0	8.4	0	0	0.03
07/09/2020 22:02	0.0	0.0	8.4	0	0	0.03
07/09/2020 23:02	0.0	0.0	8.5	0	0	0.01
08/09/2020 00:02	0.0	0.0	8.4	0	0	0.00
08/09/2020 01:02	0.0	0.0	8.5	0	0	0.02
08/09/2020 02:02	0.0	0.0	8.5	0	0	0.01
08/09/2020 03:02	0.0	0.0	8.5	0	0	0.03
08/09/2020 04:02	0.0	0.0	8.5	0	0	0.03
08/09/2020 05:02	0.0	0.0	8.5	0	0	0.01
08/09/2020 06:02	0.0	0.0	8.5	0	0	0.00
08/09/2020 07:02	0.0	0.0	8.5	0	0	0.02

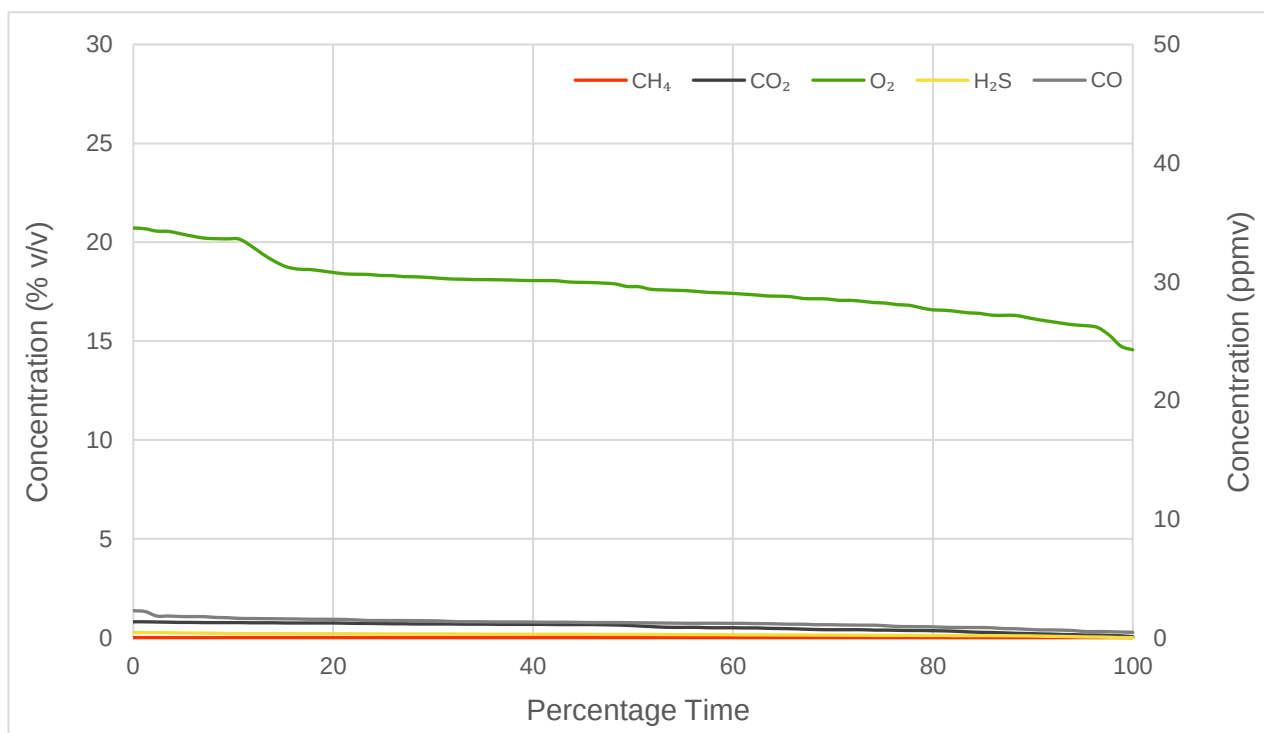
Appendix D

Concentration Duration Curves

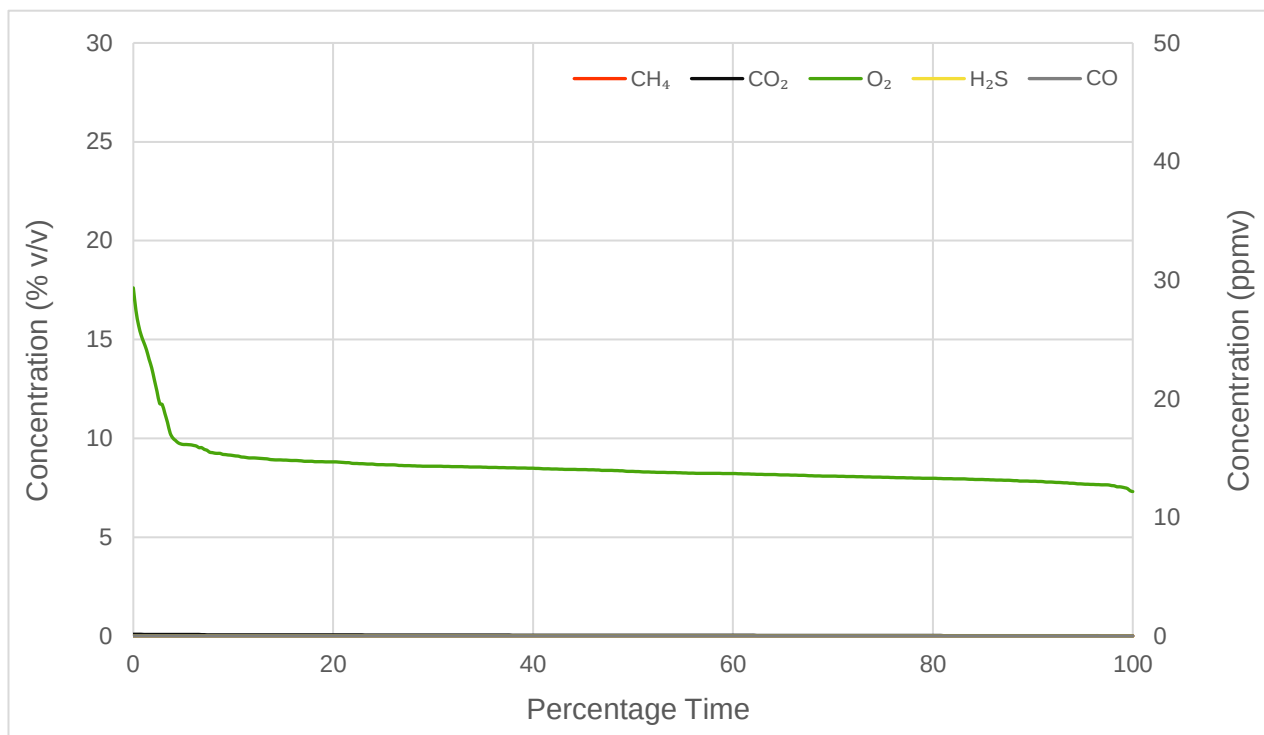
Concentration Duration Graph, WS101



Concentration Duration Graph, WS102



Concentration Duration Graph, WS103



Appendix E

Groundwater (dissolved gas) results and laboratory certificate

Ground Gas Solutions
Pythia House (Unit 10) □
Bamford Business Park □
Hibbert Street □
Stockpot □
SK4 1PL



Attention :	Andrew Brunton
Date :	7th September, 2020
Your reference :	GGs 2345
Our reference :	Test Report 20/11710 Batch 1
Location :	Baglan
Date samples received :	28th August, 2020
Status :	Final report
Issue :	1

Three samples were received for analysis on 28th August, 2020 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. □
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Ground Gas Solutions
Reference: GGS 2345
Location: Baglan
Contact: Andrew Brunton
EMT Job No: 20/11710

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HN0₃

[illegible]

Client Name: Ground Gas Solutions

Reference: GGS 2345

Location: Baglan

Contact: Andrew Brunton

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11710

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Please include all sections of this report if it is reproduced

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/11710

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.				
TM25	Determinaion of Dissolved Methane, Ethane and Ethene by Headspace GC-FID	PM0	No preparation is required.	Yes			

Appendix F

Gas Sentinel® Overview & Deployment Info.

GGG Gas Sentinel® Instrumentation Overview & Deployment Information



Introduction

GGG Gas Sentinel® is a transportable, continuous, multi-gas analyser; with 2-way telemetry capability. It is easy to use for both short term and long term monitoring of landfill, contaminated land and existing buildings. Versatile remote data acquisition through an intuitive dashboard provides cost effective regulatory compliance. The equipment is designed to be ATEX* and IP68* rated and can operate safely in explosive atmospheres and survive flooding environments (*awaiting certification).

GGG Gas Sentinel® devices can be configured to carry an extended range of gas sensors but is normally available to monitor methane, carbon dioxide, oxygen, TVOC, hydrogen sulphide and carbon monoxide. Sensors for both full range and high resolution 0-5% methane and 0-2,000ppm carbon dioxide are available. The device also records atmospheric pressure, borehole pressure and temperature and borehole gas flow as standard.

GGG can also provide high frequency water level logging in conjunction with Gas Sentinel deployments

Gas Sentinel® Sensor Specifications, Service and Maintenance

The GGS instruments are serviced and calibrated annually. Routine maintenance including the replacement of filters and operational checks are carried out at regular intervals and prior to deployment at a site. Copies of the calibration certificates for the instruments used on site are included as standard within reporting. Details of the sensor specification are provided below:

Sensor	Method / Type	Range	Resolution & Tolerance
Methane (0-100%)	Infrared	0 - 100%v/v	0.1% v/v 2%FSD or $\pm 10\%$ of reading whichever is the greatest
Methane (0-5%) High Resolution	Infrared	0-5%v/v	0.01% v/v or 2%FSD or $\pm 10\%$ of reading whichever is the greatest
Carbon Dioxide (0-100%)	Infrared	0 - 100%v/v	0.1% v/v or 2%FSD or $\pm 10\%$ of reading whichever is the greatest
Carbon Dioxide (0-2,000ppm) High Resolution	Infrared	0-2,000ppmv	10ppm or 2%FSD or $\pm 10\%$ of reading whichever is the greatest
Oxygen	Electrochemical	0 - 25%v/v	0.1% v/v or $\pm 10\%$ of reading whichever is the greatest
Hydrogen Sulphide	Electrochemical	0 - 100ppmv	1ppm ± 4 ppm or $\pm 10\%$ of reading whichever is the greatest
Carbon Monoxide	Electrochemical	0 – 1,000ppmv	1ppm ± 6 ppm or $\pm 10\%$ of reading whichever is the greatest
Total Volatile Organic Compounds	PID	0 – 4,000ppmv	1ppm ± 10 ppm or $\pm 10\%$ of reading whichever is the greatest
Atmospheric Pressure	Piezoelectric	800 – 1,200mb	± 1 mbar
Borehole Pressure	Piezoelectric	800 – 1,200mb	± 1 mbar
Temperature	Internal chip	-5°C to +50°C	0.1°C ± 0.5 °C of reading
Humidity	Capacitive Internal chip	0-100%RH	1%RH ± 1.8 %RH
Gas Flow	Thermal sensor	0–60 Ltr/hr	0.1ltr/hr ± 0.1 ltr/hr or 10% of reading whichever is the greatest

The GGS Gas Sentinel® is powered by re-chargeable batteries that can provide 4 weeks to several months depending on how many sensors are switched on and the frequency of monitoring. Please discuss your requirements with GGS for the optimum configuration for your site.

Deployment Requirements (IMPORTANT)

The GGS Gas Sentinel® is designed for deployment with standard 50mm installation standpipes but can be used with both larger and smaller diameter standpipes. Secure headworks with sufficient clearance are required for the Gas Sentinel®. GGS recommends a 10 inch diameter flush fit. A minimum 250 mm clearance is required from the top of the 50mm standpipe to the underside of the cover. GGS recommends a minimum distance of 0.25m between the top of the standpipe and standing water level to allow gas sampling. The device is also easily fitted to either inside or to the outside of buildings. Other bespoke deployment options are available. Please contact GGS to discuss options.

Gas Sentinel® Insurance

GGG can provide insurance to cover instruments against theft from site or acts of vandalism.

GGs DataPack®
GGs2345 Baglan, South Wales

Appendix G
Calibration Certificates

CALIBRATION CERTIFICATE:



Certificate ref.	GSCAL00236
Issued By:	DN
Date:	25/08/2020
Staff No.	1
Instrument:	3000035

Calibration Results			
Sensor	Lot No.	Ref. value	Indicated value
Carbon monoxide	C24438	41	42
Hydrogen sulphide	C22238	118	118
Methane	C322626	59.73	62.30
Carbon dioxide High	C322626	40.27	39.68
Carbon dioxide Low	C322726	1.99	2.06
Carbon dioxide Low ppm	C24338	504	512
Isobutylene	N/A	N/A	N/A
Oxygen	C24438	0.0	0.0

Comments:

Prior to calibration the sensors were allowed to stabilise in ambient air for 1 hour.

The Instrument was calibrated by exposing the sensors to known values of gas concentrations.

The reference values are those generated by the certified source and indicated values are those measured by the Gas Sentinel.

Uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$

This provides a level of confidence of uncertainty of approximately 95%

Ambient conditions	
Temperature	20.6
Relative Humidity	62.6

CALIBRATION CERTIFICATE:



Certificate ref.	GSCAL00237
Issued By:	DN
Date:	25/08/2020
Staff No.	1
Instrument:	3000039

Calibration Results			
Sensor	Lot No.	Ref. value	Indicated value
Carbon monoxide	C24438	41	41
Hydrogen sulphide	C22238	118	115
Methane	C322626	59.73	57.16
Carbon dioxide High	C322626	40.27	39.98
Carbon dioxide Low	C322726	1.99	1.96
Carbon dioxide Low ppm	C24338	504	504
Isobutylene	N/A	N/A	N/A
Oxygen	C24438	0.0	0.0

Comments:

Prior to calibration the sensors were allowed to stabilise in ambient air for 1 hour.

The Instrument was calibrated by exposing the sensors to known values of gas concentrations.

The reference values are those generated by the certified source and indicated values are those measured by the Gas Sentinel.

Uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$

This provides a level of confidence of uncertainty of approximately 95%

Ambient conditions	
Temperature	20.2
Relative Humidity	62.3

CALIBRATION CERTIFICATE:



Certificate ref.	GSCAL00238
Issued By:	DN
Date:	25/08/2020
Staff No.	1
Instrument:	3000040

Calibration Results			
Sensor	Lot No.	Ref. value	Indicated value
Carbon monoxide	C24438	41	42
Hydrogen sulphide	C22238	118	112
Methane	C322626	59.73	59.77
Carbon dioxide High	C322626	40.27	38.89
Carbon dioxide Low	C322726	1.99	1.97
Carbon dioxide Low ppm	C24338	504	508
Isobutylene	N/A	N/A	N/A
Oxygen	C24438	0.0	0.0

Comments:

Prior to calibration the sensors were allowed to stabilise in ambient air for 1 hour.

The Instrument was calibrated by exposing the sensors to known values of gas concentrations.

The reference values are those generated by the certified source and indicated values are those measured by the Gas Sentinel.

Uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$

This provides a level of confidence of uncertainty of approximately 95%

Ambient conditions	
Temperature	20.5
Relative Humidity	62.7

CERTIFICATION OF CALIBRATION



Date Of Calibration: 07-Aug-2020

Certificate Number: G504460_1/26199

Issued by: QED Environmental Systems Ltd.

Customer: Ground Gas Solutions

Unit 10 Pythia House Hibbert Street, Bamford Buss Park Stockport
Greater Manchester SK4 1PL UNITED KINGDOM

Description: Gas Analyser

Model: GA5000

Serial Number: G504460

UKAS Accredited results:

Results after adjustment :

Methane (CH ₄)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	5.0	0.41
15.0	15.1	0.64
60.0	59.7	0.94

Carbon Dioxide (CO ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	4.9	0.43
15.0	14.9	0.70
39.9	40.0	1.1

Oxygen (O ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
21.1	21.2	0.31

The inwards assessment was carried out 30-Jul-2020.

The maximum adjustment is larger than the inwards assessment uncertainty.

Inwards assessment data is available if requested.

All concentrations are molar.

CH₄, CO₂ readings recorded at : 32.9 °C ± 2.5 °C

O₂ readings recorded at : 22.8 °C ± 2.5 °C

Barometric Pressure : 1007 mbar ± 4 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance:110 IGC Instance:110

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www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

CERTIFICATION OF CALIBRATION



Date Of Calibration: 07-Aug-2020

Certificate Number: G504460_1/26199

Issued by: QED Environmental Systems Ltd.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS accredited results after adjustment:

Barometer (mbar)	
Reference	Instrument Reading
1007	1008

Additional Gas Cells		
Gas	Certified Gas (ppm)	Instrument Reading (ppm)
CO	508	512
H ₂ S	261	261

Internal Flow	
Applied (l/hr)	Instrument Reading (l/hr)
5	5.2
10	10.1

Date of Issue : 10-Aug-2020

Approved by Signatory

Dawn Hemings

Laboratory Inspection

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance:110 IGC Instance:110

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