Simon Harrison
Watson Construction Ltd

Email: s.harrison@watson-homes.co.uk

Date: 21st July 2023
LKC Reference: LKC 23 1327_Gas Risk Assessment

Dear Simon,

RE: Former Manchester College Moston Campus - Ground Gas Risk Assessment

1.0 Introduction

LK Consult Ltd (LKC) has been commissioned by Watson Construction Ltd to provide an updated gas risk assessment for the residential development at the former Manchester College Moston Campus. The proposed development includes houses with roads and car parking. The site location plan, boundary and proposed development plan are included in Appendix A - Drawings.

The remediation strategy was undertaken by Curtins (reference 074971-CUR-00-XX-RP-GE-003, dated 30th March 2022) and has been submitted as part of the planning application and agreed by Manchester City Council.

The remediation strategy was based on previous ground investigations undertaken by Curtins (see Phase II Ground Investigation' (reference 074971-CUR-00-XX-RP-GE-002, dated 17th January 2022). The investigation was undertaken following recommendations in the Phase 1 report undertaken by Curtins ('Phase 1 Preliminary Risk Assessment' (reference 074971-CUR-00-XX-RP-GE-001, dated 13th January 2020).

The Curtins remediation strategy recommended gas protection measures in line with CS2 / Amber 1 based on CO_2 results reported >5%v/v.

The objective of this letter report is to provide an updated ground gas risk assessment based on further consideration of data and recently published NHBC 2023 document[1].

2.0 Regulator Liaison

LKC attended a meeting with Lisa Jones and Laura Miller from Manchester City Council on 6th July 2022 to discuss an alternative to CS2 gas protection measures. During a meeting, it was agreed that a further assessment of existing information was the most pragmatic approach. This was confirmed via email from LK Consult to Lisa Jones and Laura Miller on 5th July 2023 which stated:

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[1] Hazardous ground gas - an essential guide for housebuilders" NHBC Foundation 2023.

''MCC are willing to consider a re-risk assessment of the gas regime and an updated remediation strategy based upon recent NHBC guidance and a "lines of evidence" approach''.

3.0 Gas Risk Assessment

3.1 Source Assessment

3.1.1 Ground Conditions

The main potential source of ground gasses identified in the PRA undertaken by Curtins relate to 12no. areas of historical landfilling within 250m

A historical landfill is recorded on site and the PRA states that it was reported as and household waste. The first input date is recorded in 1947, and no last input is supplied. Mapping indicates the landfill covers the site and extends to the east and south. No indications of historical infilling on site are shown on historical mapping. Mapping shows that in 1947 (first input date of the landfill) the site was in use, with several buildings, yard and garden areas shown. LKC consider it is unlikely that any significant 'landfilling' occurred on site. Refuse heaps associated with a brick works are mapped to the south of the site, and it can be assumed that the landfill area recorded is a 'site boundary' associated with that address rather than an actual area of infilling which encroaching onto site.

The brick works and associated pits / refuse heaps were present from 1909 mapping and are no longer present by 1978 mapping, The infilling is likely to be pre-1978. NHBC 2023 discusses how the age of infilling affects the risk posed from hazardous gasses. It is likely that infilling occurred pre-1960's given that the site was occupied by 1948, in which the NHBC document would argue that pre-1960's landfills typically contained non-degradable materials and are unlikely to pose a significant risk. Moreover, over time the volume of a source reduces and the rate of gas emission and potential for emissions falls. It is likely that any gas generation from the infilling will have initially been low (due to the likely nature of the infilling) and have since significantly declined (due to the age of the infilling).

Intrusive investigation did not identify made ground that was characteristic of landfill material and no putrescible material was recorded. Made Ground was encountered up to a maximum depth of 3.00mbgl in one location, with the average thickness of approximately 1.00m across site. The made ground mostly comprised ash, brick, concrete, metal and timber.

An extract from the Curtins Phase II report is provided below in Plate 3-1, which summarises the ground conditions:

Strata	Depth to Top of Strata		Depth to Bottom of Strata		Thickness	
	Min (m bgl)	Max (m bgl)	Min (m bgl)	Max (m bgl)	Min (m bgl)	Max (m bgl)
Topsoil/Asphalt/Made Ground	0.00	0.00	0.40	3.00	0.40	3.00
Glacial Till	0.40	3.00	3.00[1]	15.00[1]	2.20[1]	14.40[1]

[1] - Thickness not proved

Plate 3-1: Summary of Ground Conditions.

The NHBC 2023 document discusses how Made Ground soils are not inherently a source of hazardous gas and that substantial portions of putrescible materials such as vegetation, food waste, paper, cardboard and wood would be required to be a source of gas. Occasional timber was recorded in the Curtins logs in a limited number of boreholes, but no significant proportions of putrescible materials were recorded across site

Although ashy made ground was frequently recorded on site. the NHBC 2023document also goes on to state that ashy made ground is not readily degradable and therefore not considered a significant source of gas.

Furthermore, BS8587[2] Figure 6 describes *"made ground with low degradable organic content (e.g. up to 5% organic materials such as pieces of wood, pieces of paper, rags, etc. with a high proportion of ash and no food or other easily degradable waste) and natural soil strata with a low degradable organic content, e.g. alluvium, peat"* as *"very low generation potential"*.

There is no evidence of >5% of such material within the Curtins logs.

LKC consider that there is no significant on site source of gas based on the above, and also no significant off-site source given the age of infilling.

3.1.2 Gas Regime

Gas data from Curtins report is provided in Appendix B, and has been summarised by LKC as follows:

- Peak methane = 0.3%v/v.
- Peak carbon dioxide = 6.2%v/v.
- Peak flow = -7.0/hr
- GSV methane = 0.0018l/hr.
- GSV carbon dioxide = 0.0372l/hr.

[2] BS(2013) "Guidance on the Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs)". BS8576:2013.

The highest peak flow rates were recorded at 2.3l/hr, 5.4 l/hr and 7,0 l/hr. However, Curtins argued that these flow rates were recorded when groundwater levels were above the response zones of the wells causing pressurisation in the well, so were not considered to be representative.

Carbon dioxide was reported above 5%v/v by Curtins on six occasions across all visits. Based on the GSV calculations within the Curtins report, the site was indicate a Characteristic Situation 1 (CS1) is suitable. It is unclear which data used to calculate the GSVs after some of the higher flow rates were dismissed.

LKC have reviewed the data and agree that the high negative flow rates and positive peak flow rates are caused by pressurisation of the well from shallow groundwater and that they are not representative of flow conditions on site.

Discounting high flow rates associated with pressurisation of the well LKC would calculate the GSV as CS1 based on a maximum flow rate of 0.9l/hr (maximum negative flow encountered assumed representative potentially positive flows).

In accordance with CIRIA C665[3], if carbon dioxide and methane are recorded above 5%v/v and 1%v/v respectively, you should consider upgrading the characteristic situation from CS1 to CS2. The Curtins report concluded that CS2 would be suitable based on the CO2 results reported above 5%v/v.

Upgrading from CS1 to CS2 if carbon dioxide concentrations are recorded above 5% v/v is not a mandatory requirement and is only required where there is a high risk gas source (such as a domestic landfill) is present as described in NHBC 2023. The NHBC document also goes on the state that this approach is highly conservative when carbon dioxide is above 5%.

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Wilson *et al*[4] suggests there is no need to increase the classification if the carbon dioxide is caused by biological respiration of small quantities of organic material. Plate 3-1 summarises the gas monitoring data using the methodology described by Wilson *et al* which is also included in the NHBC 2023[5] document.

Plate 3-1 summarises the gas monitoring data from the Curtins report using the methodology described by Wilson *et al* and NHBC 2023.

[3] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

[4] Wilson S, Collins F and Lavery R (2018). Using Ternary Plots for Interpretation of Ground Gas Monitoring Results. Ground Gas Information Sheet No.1. Ambisense and EPG Ltd.

[5] Hazardous ground gas - an essential guide for housebuilders" NHBC Foundation 2023.

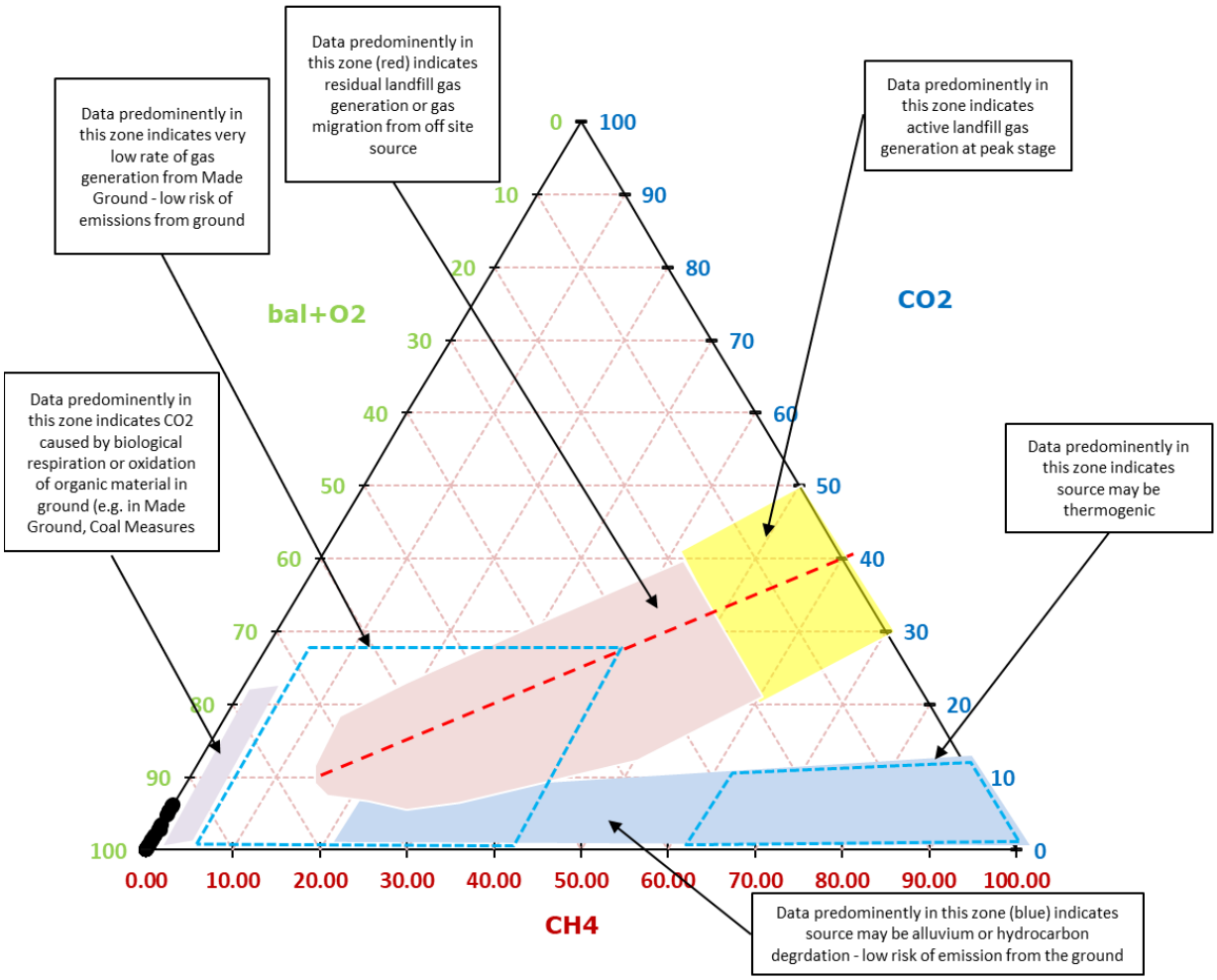


Plate 3-1: Ternary Plot Showing Curtins Gas Monitoring Data.
Note:
Interpretative zones taken from NHBC 2023 and Wilson *et al.*

The Curtins gas data (plotted above) falls within the area of the ternary plot which is indicative of microbial respiration or oxidation of organic material. This indicates the CO_2 is likely to be from microbial degradation of organic material in the soil.

Wilson et al goes on to say *"where gas monitoring results plot within the zone shown…for microbial respiration there is no requirement to increase the Characteristic Situation simply because CO_2 concentrations exceed 5%"*

All the monitoring wells were installed above partially backfilled boreholes. It is not clear what materials were used to backfill the boreholes but, most likely it was a combination of

to made ground or bentonite. Microbial action chemical oxidation processes may have both contributed to the observed CO_2 concentrations.

Furthermore, CL:AIRE Research Bulletin 17 states *"Carbon dioxide in natural soils such as Glacial Deposits and Chalk can often be recorded at up to 15% in monitoring wells, but that this does not pose a risk to development.".* The maximum concentration of CO_2 observed on site by Curtins is 6.2%v/v.

Limited amounts of natural silt was recorded on site up to 1,70m thick (2 out of 44 locations). The NHBC 2023 guidance indicates that organic silts are low risk sources of bulk gases and may have contributed to the marginally elevated concentrations of carbon dioxide encountered. The strata is not considered to pose a significant risk.

3.1.3 Pathway

There are no significant pathways anticipated for the preferential flow of ground gases in the subsurface as described in NHBC 2023. No shallow fractured / fissured bedrock was encountered across site which could act a preferential pathway . Below ground services will be present on site (which may act a preferential pathway for gas), however given that no significant source of gas is present on site as discussed in Section 3.1, the potential pathway does not link a source to the receptor (i.e buildings on site) and the risk is considered to be low.

Furthermore, it is understood that the buildings incorporate a ventilated sub-floor void (Photographic evidence in Appendix C) CL:AIRE Research Bulletin 17[6] states:

"The void provides good protection against ground gas ingress and when designed and constructed correctly it dilutes any gas being emitted from the ground to acceptable levels. The minimum level of ventilation required to deal with condensation is capable of dealing with quite onerous ground gas regimes. For a typical residential property up to 8m wide the minimum ventilation to the void of 1500mm /metre of wall will provide adequate dilution of gas (equilibrium concentration of 0.25% v/v) up to a Gas Screening Value of 3.5l/h (Wilson and Card - Characteristic Situation 3 or NHBC - Amber 2). This has been demonstrated by monitoring of voids below completed buildings for many years (Wilson and Card 1999; Pecksen, 1986). Good construction also requires the cavity wall below ground level to be filled with concrete, again limiting the potential for gas ingress. Thus many buildings will already have an inherent level of gas protection provided in their construction and this can be taken into account when determining whether gas monitoring is likely to be required during a site investigation."

Based on the ground conditions encountered during the site investigation and recorded on local geological mapping, there does not appear to be any significant pathway to the migration of gas. The construction of the plots, incorporating a ventilated sub-floor void also acts as more than sufficient mechanism to mitigate gas migration into a building.

[6] CL:AIRE Research Bulletin (RB17) "A Pragmatic Approach to Ground Gas Risk Assessment" November 2012.

3.2 Summary & Conclusions

The objective of this letter report is to further assess ground gas risk at the Former Manchester College Moston Campus site and confirm the Characteristic Situation for the development.

The site history and environmental setting has identified a possible area of landfill on site, and infilled ground within 250m of site. The features are not considered to be significant sources given age of infilling and ground conditions (absence of any significant putrescible material which may generate gas) encountered during the site investigation.

No evidence of landfilling (such as vegetation, food waste, paper, etc) and made ground across site is analogous to that of 'low degradable content' comprising mostly ash, brick, concrete, metal and some timber.

In summary, the source is considered to represent a 'low risk' gas generation potential.

Only low concentrations of gas have been recorded very- limited methane, marginally elevated carbon dioxide and no significant flow rates. Analysis of the likely source of the small amounts of gas recorded indicates it to be due to microbial activity rather than landfill gas generation.

Although a maximum carbon dioxide concentration of 6.2% v/v was recorded by Curtins, NHBC 2023[7] considers it overly conservative to upgrade CS1 to CCS2 based on concentrations above 5%v/v and is only required where there is a high risk gas source (such as a domestic landfill) is present. No evidence of such a gas source has been identified on site.

The build phase of the development incorporates a ventilated sub-floor void which is likely to provide more than sufficient gas protection for the site setting. Evidence of this is provided in Appendix C.

Based on the ground gas monitoring provided and the assessment above, further gas risk assessment is not considered necessary as there is no significant on site source of gas, no significant off-site source given the age of infilling, and no significant concentrations of gas identified. Data indicates that a Characteristic Situation 1 is suitable for the development and no additional gas protection measures are required.

I trust the contents of this letter meet with your requirements.

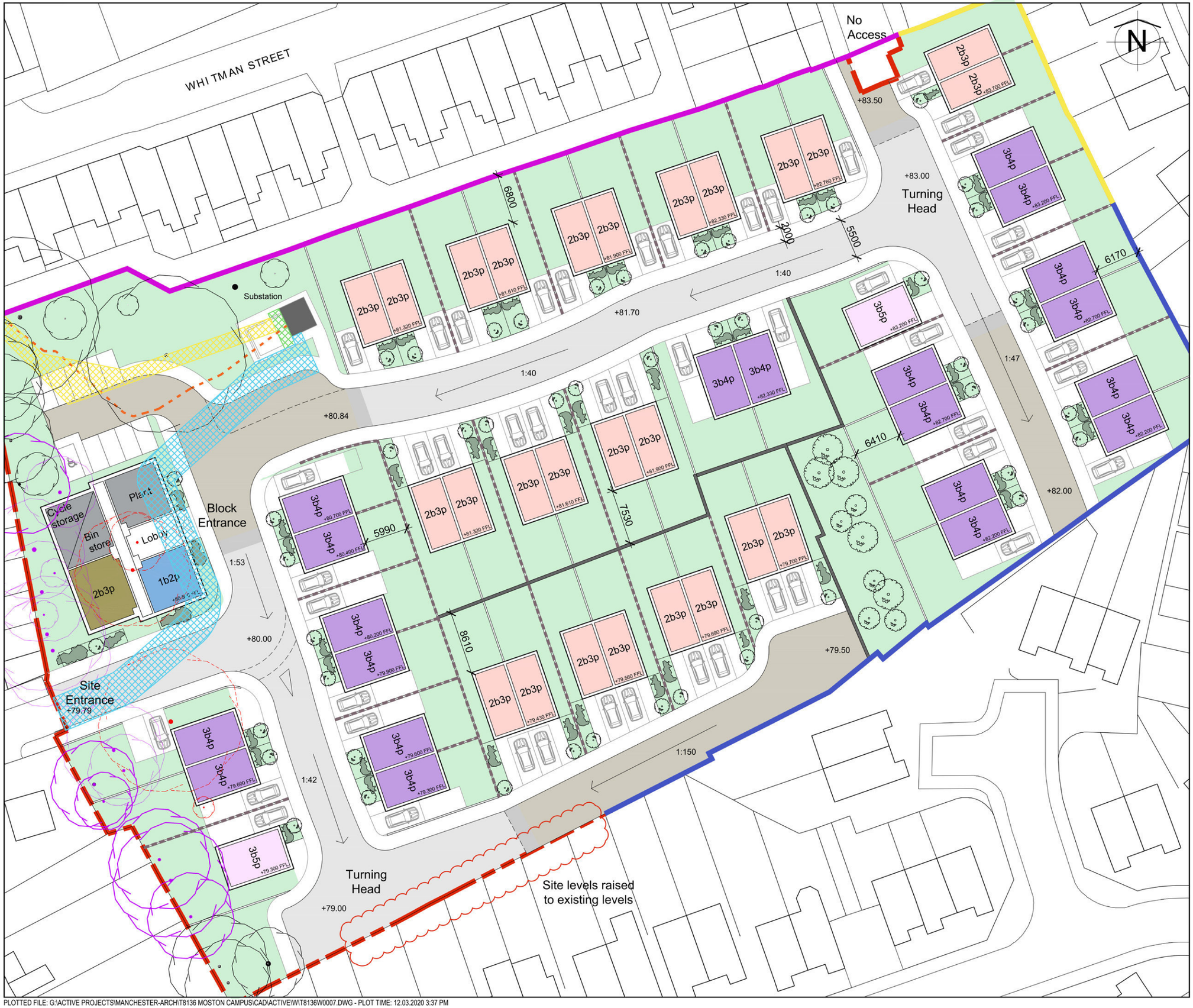
HANNAH MOSS
SENIOR GEO-ENVIRONMENTAL CONSULTANT

Enclosed:

[7] Hazardous ground gas - an essential guide for housebuilders" NHBC Foundation 2023.

Appendix A – Drawings
Appendix B – Gas Monitoring Data from Curtins report
Appendix C – Photographic Evidence

Appendix A – Drawings



NOTES:

DO NOT SCALE. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING. CHECK DIMENSIONS ON SITE AND REPORT DISCREPANCIES TO THE ARCHITECT.

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TOTAL ACCOMMODATION: 58 NO. HOMES

	Housing types			
	Type A 2 Bed(3P) @70.6 sqm 760 sqft	Type B 3 Bed (4P) @84 sqm 904 sqft	Type C 3 Bed (5P) @93 sqm 1001 sqft	Total
Total	26 (54%)	20 (41%)	2 (5%)	48

Type A 2 Bedroom (3 Person) 70.6 sqm

Type B 3 Bedroom (4 Person) 84 sqm

Type C 3 Bedroom (5 person) 93 sqm

Floor	BLOCK 1 (3 Storey)			
	1bed (2P) @50 sqm 538 sqft	2bed (3P) @61 sqm 657 sqft	Total	GIA sqft
G	1	1	2	1,195
1	2	2	4	2,390
2	2	2	4	2,390
Total	5 (50%)	5 (50%)	10	5,975

CAR PARKING: 10 SPACES (100%)

1 Bedroom (For 2 Person) 50 sqm

2 Bedroom (For 3 Person) 61 sqm

Ancillary

Retaining wall

Cable easement

Cable easement & right of way for substation

Right of way for substation

Allow for retaining wall at boundary

Footing of existing retaining wall to be checked, new wall may be required

Existing wall to be investigated, allow for replace

House to step in line with slope - low brick retaining wall

Existing trees to be removed

Existing trees to be retained, but cut back

No.	Date	Comment	Drawn	Chk'd
P3	12.03.20	KERBS MODIFIED AS PER CURTINS INFO	SP	AJL
P2	09.03.20	ISSUED FOR COMMENTS	SP	AJL
P1	03.03.20	ISSUED FOR COMMENTS	SP	AJL

Revisions

Issue Status

PRELIMINARY

tp bennett
architecture
interiors
planning

Royal Mills Unit 2B 17 Redhill Street Manchester M4 5BA UK (0) 161 694 7700 www.tpbennett.com

Project

MOSTON CAMPUS
RESIDENTIAL

Drawing Title

PROPOSED SITE PLAN (OPTION 3)

Drawn	Date	Scale @ A3	Alt. Ref.
SP	06.03.2020	1:500	

tp bennett Project No.	Drawing Number	Rev
T8136	W0007	P3

©

PLOTTED FILE: G:\ACTIVE PROJECTS\MANCHESTER-ARCH\T8136 MOSTON CAMPUS\CAD\ACTIVE\W\T8136W0007.DWG - PLOT TIME: 12.03.2020 3:37 PM

Appendix B –

Curtins Gas Monitoring Data

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Moston Campus	**Date:**	23/01/2020
Job Number:	74971	**Visit:**	1
Client:	One Manchester	**Weather:**	Overcast
Barometric State:	Falling	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS01	1020	-7.0	-0.4	0.0	0.0	5.9	5.9	16.0	0	0	1.24	3.21	**2**
WS03	1018	1.5	0.0	0.0	0.0	3.3	3.3	13.7	0	0	0.36	2.16	3
WS05	1017	-0.1	0.0	0.0	0.0	1.7	0.5	19.5	0	0	4.99	5.10	
WS07	1018	-0.4	-0.3	0.0	0.0	0.4	0.0	20.4	0	0	1.15	1.16	
WS08	1017	-0.7	0.0	0.0	0.0	0.8	0.8	18.5	0	0	Dry	1.85	
WS09A	1016	-1.9	0.0	0.0	0.0	0.3	0.3	19.9	0	0	-	-	4
WS10	1016	-2.6	0.0	0.0	0.0	3.0	3.0	9.7	0	0	1.15	2.14	
WS12	1017	0.0	0.0	0.0	0.0	2.0	2.0	15.8	0	0	2.05	2.63	

Notes

1	WS01, WS03, WS10 and WS12 bailed
2	Steady flow rate reached after 5 minutes
3	Unable to monitor water levels due to bung being stuck in install

Logged by

EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
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GAS MONITORING LOG SHEET

Project:	Moston Campus	**Date:**	07/02/2020
Job Number:	74971	**Visit:**	2
Client:	One Manchester	**Weather:**	Overcast
Barometric State:	Falling	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS01	1009	0.0	0.0	0.0	0.0	1.8	1.5	18.40	0	0	0.78	3.17	
WS03	1007	-0.6	-0.6	0.0	0.0	6.2	6.2	2.40	0	0	1.13	2.14	1
WS05	1008	-0.6	-0.6	0.0	0.0	0.5	0.5	19.00	0	0	4.99	5.07	2
WS07	1007	-0.9	-0.9	0.0	0.0	0.0	0.0	19.60	0	0	Dry	1.16	3
WS08	1006	-0.9	-0.7	0.0	0.0	0.7	0.7	17.70	0	0	Dry	1.74	
WS09A													4
WS10	1005	-0.6	-0.6	0.0	0.0	1.9	1.9	15.8	0	0	1.09	2.11	1
WS12	1008	-0.6	-0.6	0.3	0.0	3.0	3.0	15.3	0	0	1.94	2.59	1

Notes

1 Flow steady after 5 minutes
2 Flow fluctuated between -0.4 and -0.6 for 5 minutes
3 Flow fluctuated between -0.7 and -0.9 for 5 minutes
4 Unable to monitor due to bung being open and stuck in install

Logged by

EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
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GAS MONITORING LOG SHEET

Project:	Moston Campus	**Date:**	19/02/2020
Job Number:	74971	**Visit:**	3
Client:	One Manchester	**Weather:**	Light Rain
Barometric State:	Falling	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS01	1007	0.0	0.0	0.0	0.0	2.3	1.4	19.4	0	0	0.58	3.21	1
WS03	1004	5.4	0.0	0.0	0.0	4.8	4.8	9.7	0	0	0.35	2.16	2
WS05	1004	-0.3	-0.3	0.0	0.0	0.7	0.7	18.4	0	0	-	-	3
WS07	1005	-0.4	-0.3	0.0	0.0	0.0	0.0	20.0	0	0	1.15	1.16	
WS08	1004	-0.6	-0.4	0.0	0.0	0.3	0.3	19.5	0	0	Dry	1.62	
WS09A	1006	-0.6	-0.6	0.0	0.0	0.2	0.2	19.7	0	0	-	-	3
WS10	1006	-0.6	-0.4	0.0	0.0	0.3	0.0	20.0	0	0	0.79	2.14	
WS12	1006	-0.7	-0.7	0.0	0.0	3.0	3.0	16.6	0	0	1.55	2.62	

Notes

1	Monitoring stopped after 2 minutes 30 seconds due to water ingress into pipe
2	Steady flow state reached after 1 minute 30 seconds
3	Unable to monitor water level due to bung being stuck in install

Logged by

EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
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Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Moston Campus	**Date:**	13/03/2020
Job Number:	74971	**Visit:**	4
Client:	One Manchester	**Weather:**	Sunny
Barometric State:	Steady	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS01	1010	-1.3	-0.6	0.0	0.0	2.8	2.8	19.5	0	0	0.60	3.18	1
WS03	1008	0.0	0.0	0.0	0.0	5.3	5.3	13.3	0	0	0.37	2.14	2
WS05	1008	0.0	0.0	0.0	0.0	0.2	0.0	21.4	0	0			3
WS07	1007	0.0	0.0	0.0	0.0	0.0	0.0	21.3	0	0	Dry	1.13	
WS08	1007	0.0	0.0	0.0	0.0	0.2	0.2	21.0	0	0	Dry	1.59	
WS09A	1007	0.0	0.0	0.0	0.0	0.2	0.1	20.9	0	0			3
WS10	1007	0.0	0.0	0.0	0.0	0.2	0.0	21.3	0	0	0.76	2.12	
WS12	1006	0.2	0.0	0.0	0.0	3.5	3.5	17.2	0	0	1.79	2.60	

Notes

1	Stopped monitoring after 2:30 due to water ingress into pipe
2	Stopped monitoring after 1:00 due to water ingress into pipe
3	Unable to monitor water levels due to bung being stuck in pipe

Logged by

EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Moston Campus	**Date:**	28/05/2020
Job Number:	74971	**Visit:**	5
Client:	One Manchester	**Weather:**	Sunny
Barometric State:	Steady	**Ground Conditions:**	Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS01	1028	-1.3	-0.6	0.0	0.0	2.8	2.8	19.5	0	0	0.60	3.18	1
WS03	1028	0.0	0.0	0.0	0.0	5.3	5.3	13.3	0	0	0.37	2.14	2
WS05	1028	0.0	0.0	0.0	0.0	0.2	0.0	21.4	0	0			3
WS07	1028	0.1	0.0	0.0	0.0	0.1	0.1	20.4	0	0	Dry	1.13	
WS08	1028	0.0	0.0	0.0	0.0	1.3	1.3	18.0	0	0	Dry	1.60	
WS09A													4
WS10	1028	0.0	0.0	0.0	0.0	2.1	2.1	15.3	0	0	1.45	2.12	
WS12	1028	0.0	0.0	0.0	0.0	6.1	6.1	14.0	0	0	2.22	2.59	

Notes

1 Unable to access
2 Flow not measured due to well being flooded at the bung
3 Unable to monitor due to well being filled with ants
4 Unable to open

Logged by

PN

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

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GAS MONITORING LOG SHEET

Project:	Moston Campus	**Date:**	13/03/2020
Job Number:	74971	**Visit:**	4
Client:	One Manchester	**Weather:**	Sunny
Barometric State:	Steady	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS01	1012	0.3	0.0	0.0	0.0	5.0	5.0	16.2	0	0	-	-	1
WS03	1012	0.0	0.0	0.0	0.0	1.7	1.7	19.6	0	0	DRY	2.14	
WS05													2
WS07	1013	2.4	0.0	0.0	0.0	0.0	0.0	20.7	0	0	Dry	1.13	
WS08	1013	0.3	0.0	0.0	0.0	0.8	0.8	20.1	0	0	Dry	1.62	
WS09A													3
WS10	1013	0.0	0.0	0.0	0.0	0.9	0.9	19.4	0	0	1.13	2.11	
WS12	1013	0.0	0.0	0.0	0.0	6.1	6.1	11.8	0	0	2.20	2.60	

Notes

1	Unable to remove bung
2	Unable to monitor due to well being filled with ants
3	Unable to open

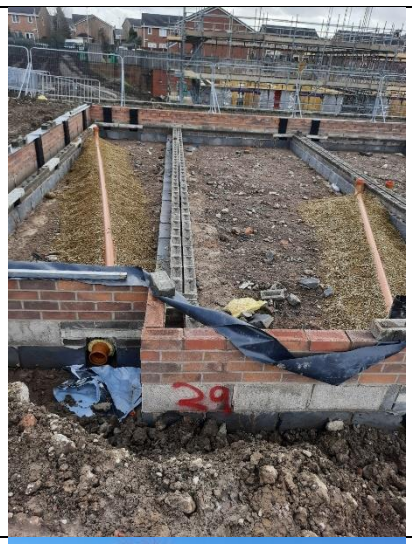
Logged by

PN

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Appendix C –

Photographic Evidence of Sub-Floor Void

		Evidence of subfloor void
		Evidence of subfloor void

	Evidence of airbricks.

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