

PG/C3967/9779

14 December 2020

Domis Construction Ltd
840 Birchwood Blvd
Birchwood
Warrington
WA3 7QZ

For the attention of Mr P Hawkins

Dear Paul

Re: Back Turner Street, Manchester - Ground Gas Risk Assessment

We write to report on the gas monitoring at the above site. The northern portion of the site is occupied by a disused building between four and five storeys in height, and the southern part of the site has no buildings present and was previously used as a rough surfaced car park. It is apparent that the site had a building present previously and that it also very likely contained a basement which has now been backfilled to pavement level..

The proposed development is residential end-use comprising a multi storey building potentially including apartments, townhouses and/or retail space, with the building in the middle of the site to be retained and renovated.

A Desk Study was initially undertaken by BSL (GP/3967/7731) issued in July 2018 which highlighted a high risk from ground gas due to the likely presence of made ground on site.

BSL completed a site investigation between the dates of 10th August and 11th August 2020 to confirm or otherwise the presence and risk of ground gas at the site. A Geo-Environmental Assessment report (Ref: BM/C3967/7815) was issued in September 2020 which identified an preliminary moderate to low gas risk following two gas monitoring visits.

Previous Investigation

Two ground gas monitoring visits were undertaken as part of Geo-Environmental Assessment between the dates of 31st August 2018 and 13th September 2018. The peak carbon dioxide concentrations ranged between 1.7%v/v and 3.0%v/v, whilst the steady state concentrations ranged between 1.4%v/v and 2.7%v/v. Peak oxygen concentrations ranged between 20.3%v/v and 22%v/v, whilst the steady state concentrations ranged between 20.6%v/v and 22.3%v/v. No methane, carbon monoxide or hydrogen sulfide was recorded in any of the standpipes, either under peak and steady state conditions during the monitoring visits in 2018.

Site Investigation

Ground conditions encountered at the site generally comprised made ground to depths between 3.20m bgl and 3.04m bgl underlain by gravelly sandy clay (glacial till) to depths between 11.10m bgl and 11.80m bgl. The glacial till is underlain by weathered sandstone bedrock, recovered as sand with sandstone encountered between 14.05m and 15.60m bgl. The sandstone became more competent with depth.

Gas and water monitoring standpipes were installed in two boreholes and subsequently 12 monitoring visits have been undertaken, 2 visits in 2018 and a further 10 in 2020. Gas monitoring was undertaken using a GA 5000 and a GFM 436 infrared gas meter with integral electronic flow analyser.

Flow measurements on each standpipe (l/hr) were taken. Measurements of the percentage volume in air (%v/v) of oxygen (O₂), carbon dioxide (CO₂) and methane (CH₄) were recorded in addition to the percentage Lower Explosive Limit (%LEL) of methane (Note: 100% LEL equates to 5% by volume), the atmospheric pressure (mb) and average temperature during the visit (°C).

Standpipes were constructed in general accordance with the relevant guidance. A summary of the installation construction is presented in the table below:

Location and Depth	Internal Diameter Pipe	Response Zone (m bgl)	Targeted Strata	Purpose
BH01 16.00m	50mm HDPE	4.00 – 16.00	Gravelly Sandy CLAY, SAND and SANDSTONE	Ground Gas / Groundwater Level Monitoring
BH02 4.30m	50mm HDPE	1.00 – 4.00	Made Ground	Ground Gas

The gas monitoring visits recorded peak and steady state conditions. Peak results are those that occur on opening the valve on the borehole tap. Steady state conditions are those that occur a period of time afterwards when the initial (accumulated) gases have been purged from the borehole.

Ground Gas Results

Ten ground gas monitoring visits have been carried out between the dates of 31st August 2018 and 13th September 2018, and 23rd November 2020 and 11th December 2020. The results are summarised in the table below:

	CH ₄ (%)		CO ₂ (%)		O ₂ (%)		CO (ppm)		H ₂ S (ppm)		Flow (l/h)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Peak	0.1	0.1	0.1	6.3	16.6	22.0	0.0	0.0	0.0	0.0	0.1	0.2
Steady	0.1	0.1	0.1	6.2	15.7	22.3					0.1	0.2

Notes: CH₄ = Methane; CO₂= Carbon dioxide; O₂= Oxygen; CO= Carbon Monoxide; H₂S= Hydrogen Sulphide; TVOC (PID)= Total Volatile Organic Compounds (as measured with Photo Ionisation Detector); ppm= Parts Per Million.

Both peak and steady state methane was encountered 0.1%v/v during the monitoring period.

Peak carbon dioxide concentrations ranged between 0.1%v/v and 6.3%v/v and exceeded 5%v/v once on the seventh visit when there was a period of very low and falling pressure. Steady state concentrations ranged between 0.1%v/v and 6.2%v/v. Carbon dioxide concentrations were consistently highest in BH01.

Peak oxygen concentrations ranged between 16.6%v/v and 22.0%v/v, steady state conditions ranged between 15.7%v/v and 22.3%v/v. Depleted oxygen concentrations were present in BH01 on the tenth visit under a period of falling pressure.

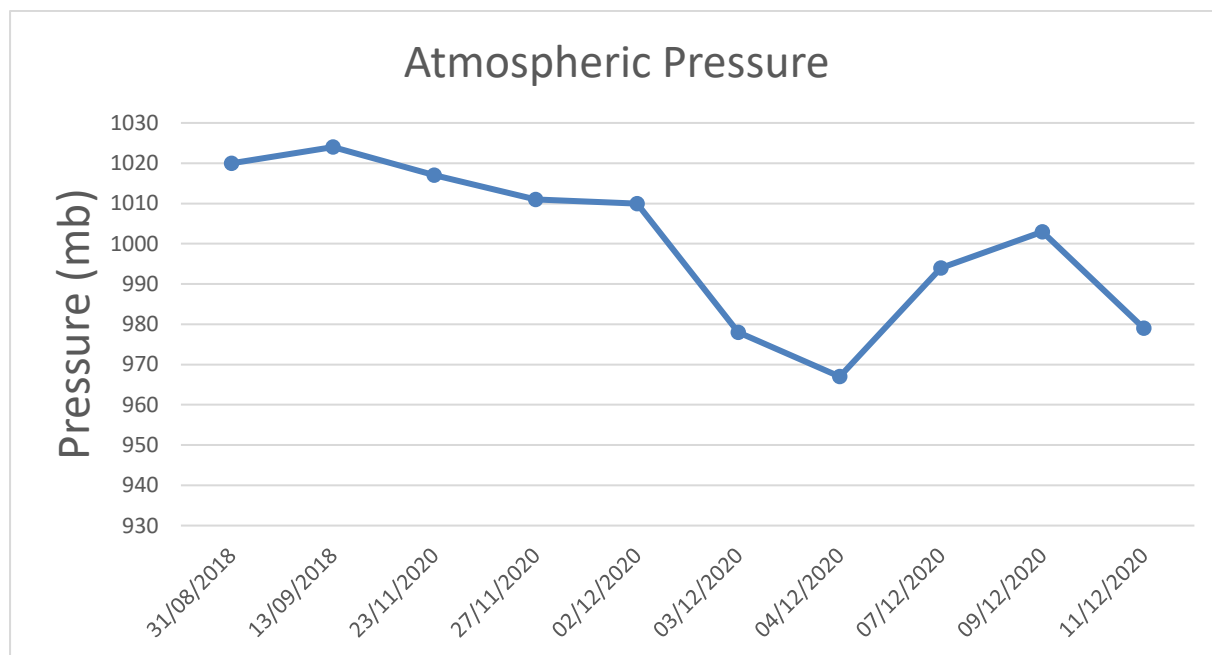
Carbon monoxide and hydrogen sulphide was not detected during any gas monitoring visit.

Positive flow rates between 0.1l/hr and 0.2l/hr were recorded during the monitoring period. The flows were consistently low positive values for both BH01 and BH02 with 0.2 l/h being the highest value recorded.

Driving Mechanisms

The atmospheric pressure ranged between 967mb and 1024mb over the monitoring period. The gas monitoring visits were undertaken through periods of rising, steady and falling atmospheric pressure. The gas monitoring data has been collected in conditions that would be representative of worst case results. A graph of the ambient pressure over the monitoring period is presented below:

Figure 3: Graph of atmospheric pressure during monitoring period 31/08/18 to 11/12/20.



The weather conditions during the monitoring period ranged from precipitation to clear and sunny conditions. No evidence of frost was observed on the ground and none of the areas surrounding the boreholes appeared to be saturated.

The temperatures recorded during the monitoring period ranged between 3° and 15°Celsius.

No groundwater was encountered in BH01 on the first three visits. On the following visits groundwater was encountered between 15.49m and 15.66m bgl. Groundwater was encountered in BH02 on all visits between 2.75m and 3.63m bgl. Groundwater levels during site works ranged from 16.30m bgl and 17.10m bgl and were therefore recorded below the response zones both BH01 and BH02. Groundwater was recorded within the response zones in BH01 and BH02 in the majority of monitoring visits. The depths and locations are shown in the table below:

Location and Response Zone	During Site Works	31/08/18	13/09/18	23/11/20	27/11/20	02/12/20	03/12/20	04/12/20	07/12/20	09/12/20	11/12/20
BH01 4.00-16.00	16.30	NGW	NGW	NGW	NGW	15.54	15.49	15.52	15.56	15.66	15.66
BH02 1.00-4.30	17.10	3.40	2.87	3.55	3.63	2.75	2.77	2.76	2.77	2.76	2.75

Cells highlighted red indicate groundwater levels recorded above the response zone

Radon

Having assessed the site from information available to date, the site is not in an area requiring radon precaution measures.

Assessment

In order to assess the ground gas situation and the requirement for ground gas precautionary measures at the site, guidance was taken from CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings' and BS8485:2015+A1:2019 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

As the proposed end-use a high rise development potentially including apartments, townhouses and/or retail space CIRIA C665 dictates that the gas monitoring results should be assessed in accordance with Situation A, the Wilson and Card methodology.

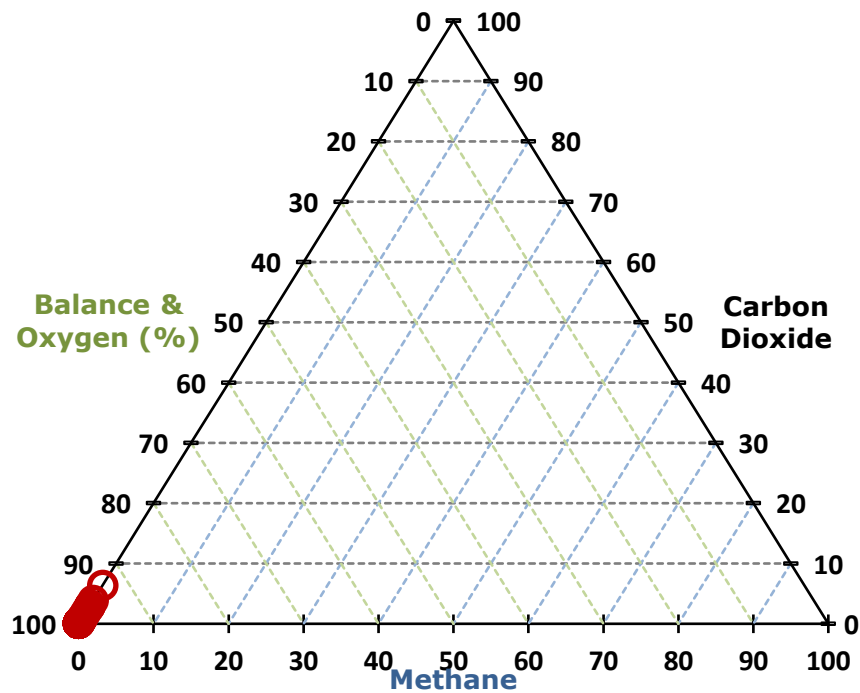
In accordance with CIRIA C665, the Wilson and Card methodology uses the concept of a Gas Screening Value (GSV) which is based on measured data using the following equation: (max gas concentration / 100) x maximum flow.

A maximum positive flow of 0.2l/hr has been used to derive the GSVs. The GSV's for the site are presented below.

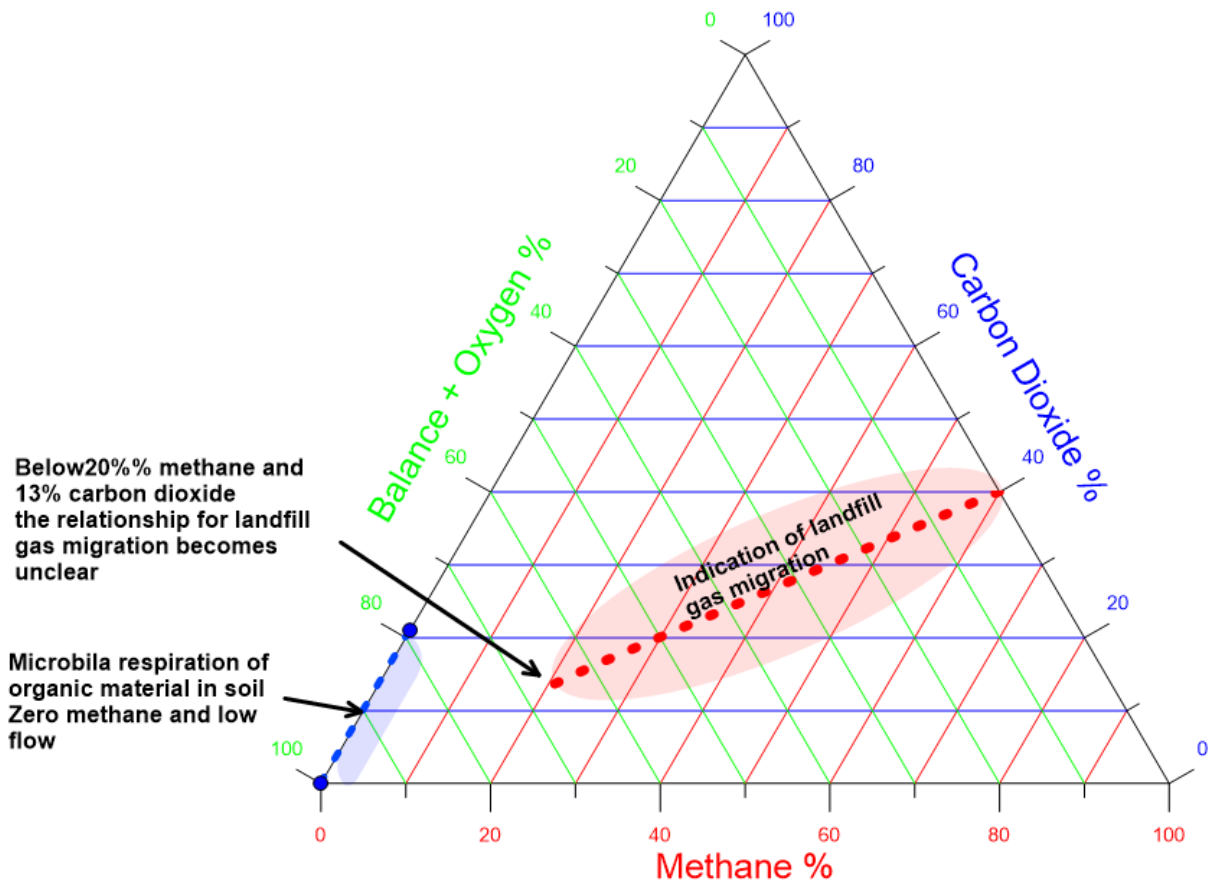
Gas	Calculated GSV (l/h)	Typical Max Threshold Concentration Exceeded	Classification
Methane	0.0002	No	CS-1
Carbon Dioxide	0.0126	Yes	CS-1

The GSV for carbon dioxide place the site the site into Characteristic Situation 1 (CS1), however the typical threshold concentrations for carbon dioxide in BH01 was exceeded on just one occasion.

Guidance states that where results plot in the zone typical for microbial respiration there is no need to increase the characteristic situation. In order to increase confidence in this assessment and adopting a lines of evidence approach, reference has been made to the recent 2018 paper by Wilson et al (Ambisence and EPG Ltd) "Using ternary plots for interpretation of ground gas monitoring results". The data has been presented on the ternary plot displayed below, which aims to determine the likely source of the ground gas.



The dataset falls within the zone attributed to microbial respiration of organic material in soils, and the hypothesis is supported by the low gas flow rates and very low methane concentrations which characterise the gas monitoring data as shown below (extract from Wilson et al 2018).



The rates of gas generation via microbial respiration are typically very low and subsequently high flow rates would not be expected from this source.

Based on this rationale, in this instance the classification of CS2 is not considered to be applicable and the site is considered to be characteristic of a CS1 site.

Proposed Development

The proposed foundation solution at the site is likely to be deep piles and the installation may create a preferential pathway from ground gas. The recommendations made within this assessment are based on the information available at this stage. The risk should be addressed in a Piling Risk Assessment.

Mitigation Measures

Based on the ground gas monitoring results to date, no mitigation measures are required in the new development at the site in relation to carbon dioxide or methane gas from anthropogenic or natural strata.

Conclusions and Recommendations

On the basis of the monitoring undertaken, the assessment and guidance, no ground gas precautions are required.

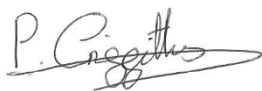
Boreholes installed with standpipes should be correctly decommissioned in line with EA guidance prior to construction at the site.

Recommendations made within this assessment should be confirmed with the Local Authority prior to any irrevocable action at the site.

We trust the above meets your requirements. If you have any queries then please do not hesitate to contact the undersigned.

Yours sincerely

For Brownfield Solutions Ltd



P Griffiths
Graduate Project Engineer
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Checked and approved by



N Swallow
Senior Project Engineer
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Enc Exploratory Hole Location Plan
 Borehole Logs
 Ground Gas Monitoring Results
 Ground Gas Monitor Calibration Certificates



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**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

DOMIS

**Back Turner Street,
Manchester
Exploratory Hole
Location Plan**

Drawing Number C3967/03

Scale: NTS

Drawn By: JM

Checked By: AJS



William Smith House,
173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP

Rotary Core Log

Borehole No.

BH1

Sheet 1 of 3

Project Name: BACK TURNER STREET

Project No.
C3967

Co-ords:

Hole Type
CP+RC

Location: MANCHESTER

Level:

Scale
1:50

Client: DOMIS CONSTRUCTION LTD

Dates: 06/08/2018 - 08/08/2018

Logged By
JM

Well	Water Strikes	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		0.20								MADE GROUND: Grey subangular fine to coarse gravel of limestone and sandstone.	
		0.50	ES							MADE GROUND: Reddish brown slightly sandy gravel with high, angular brick cobble content. Sand is fine to medium of ash. Gravel is subangular to subrounded fine to coarse of brick, quartzite, mudstone and sandstone. Rare fragments of plastic, timber and glass.	1
		N=5 (1,2/2,1,1,1) 1.50	ES								
		N=3 (4,2/2,1,0,0)									2
		2.40									
		2.50								MADE GROUND: Vinyl coated floor covering (Suspected basement structure)	
		3.00								MADE GROUND: Brownish grey ashy angular gravel predominantly of brick with rare rotten timber fragments. (Suspected basement structure)	3
		3.40								MADE GROUND: Reddish brown sandy gravel. High, angular brick cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of brick and sandstone.	
		4.00	D							Stiff brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is subangular to subrounded, fine to medium of mudstone.	4
		N=25 (4,4/5,6,7,7)	D								
		5.00	D								5
		N=22 (2,3/5,5,6,6)									
		5.50 - 6.00	U								
		6.00	D								6
		N=19 (4,4/4,5,5,5)								Becoming firm below 6.2m bgl.	
		7.00	D								7
		N=22 (3,4/4,6,6,6)								Becoming stiff and more gravelly below 7.0m bgl.	
		8.00 - 8.50	U								8
		8.00								Stiff brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to medium of mudstone and sandstone.	
		8.70								Stiff brown slightly gravelly very sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of mudstone.	9
		9.30	D							Sand lens at 9.50-9.55m bgl.	
		N=43 (5,7/8,8,12,15)									10

Remarks

1. Hand excavated inspection pit to 1.20m bgl.
2. Groundwater strike at 16.3m bgl rising to 15.1m bgl after 20 minutes.
3. Installation to 16.0m bgl; G.L. to 4.0m plain pipe, 4.0m - 16.0m slotted pipe.





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CW9 5LP

Rotary Core Log

Borehole No.

BH1

Sheet 2 of 3

Project Name: BACK TURNER STREET

Project No.
C3967

Co-ords:

Hole Type
CP+RC

Location: MANCHESTER

Level:

Scale
1:50

Client: DOMIS CONSTRUCTION LTD

Dates: 06/08/2018 - 08/08/2018

Logged By
JM

Well	Water Strikes	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		50 (25 for 75mm/50 for 75mm)					11.80			Stiff brown slightly gravelly very sandy CLAY. Sand is fine to coarse. Gravel is subangular fine to medium of mudstone.	11
		50 (25 for 75mm/50 for 75mm)					13.60			Dense to very dense reddish brown gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to medium of sandstone.	12
											13
										Very dense red coarse grained SAND. (COMPLETELY WEATHERED CHESTER PEBBLE BEDS FORMATION)	14
											15
		15.00 - 16.50	10	67	60	24	15.60			Weak thinly bedded red coarse grained SANDSTONE. Joint set 1: joints are horizontal to sub-horizontal (typically <5 degrees), medium spaced, planar and tight. (CHESTER PEBBLE BEDS FORMATION).	16
		16.50 - 18.00	19	100	100	15					17
		18.00 - 19.50	14	60	60	0					18
											19
											20

Remarks

- Hand excavated inspection pit to 1.20m bgl.
- Groundwater strike at 16.3m bgl rising to 15.1m bgl after 20 minutes.
- Installation to 16.0m bgl; G.L. to 4.0m plain pipe, 4.0 m- 16.0m slotted pipe.





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Rotary Core Log

Borehole No.

BH1

Sheet 3 of 3

Project Name: BACK TURNER STREET

Project No.
C3967

Co-ords:

Hole Type
CP+RC

Location: MANCHESTER

Level:

Scale
1:50

Client: DOMIS CONSTRUCTION LTD

Dates: 06/08/2018 - 08/08/2018

Logged By
JM

Well	Water Strikes	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		19.50 - 21.00	19	100	100	35	24.00				21
		21.00 - 22.50	13	100	100	68					22
		22.50 - 24.00	10	100	100	75					23
										Partially unweathered sandstone from 22.50m bgl.	24
										End of Borehole at 24.000m	25
											26
											27
											28
											29
											30

Remarks

1. Hand excavated inspection pit to 1.20m bgl.
2. Groundwater strike at 16.3m bgl rising to 15.1m bgl after 20 minutes.
3. Installation to 16.0m bgl; G.L. to 4.0m plain pipe, 4.0 m- 16.0m slotted pipe.





William Smith House,
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CW9 5LP

Rotary Core Log

Borehole No.

BH2

Sheet 1 of 3

Project Name: BACK TURNER STREET

Project No.
C3967

Co-ords:

Hole Type
CP+RC

Location: MANCHESTER

Level:

Scale
1:50

Client: DOMIS CONSTRUCTION LTD

Dates: 08/08/2018 - 10/08/2018

Logged By
JM

Well	Water Strikes	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		0.30	ES				0.25			MADE GROUND: Grey subangular fine to coarse gravel of limestone and sandstone.	
		1.00	ES							MADE GROUND: Reddish brown slightly sandy gravel with high, angular brick cobble content. Sand is fine to medium of ash. Gravel is subangular to subrounded, fine to coarse of brick, quartzite, mudstone, limestone and sandstone. Rare fragments of timber, plastic, glass and cloth.	1
		(3,4/4,4,5,3)									
		1.50	ES							Scrap metal bar at 0.4m bgl.	
		N=16									2
		(1,2/4,4,5,3)									
							2.60				
							2.70			MADE GROUND: Vinyl coated floor covering (Suspected basement structure)	
		N=22								MADE GROUND: Brownish grey ashy angular gravel predominantly of brick with rare rotten timber fragments. (Suspected basement structure)	3
		(2,6/8,4,5,5)					3.20				
		3.50	D							Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to medium of mudstone and sandstone.	4
		4.00 - 4.50	U								
		4.50 - 5.00	U								
		5.00	D								5
		N=24								Becoming firm below 5.5m bgl.	
		(4,4/5,7,6,6)									
		6.00	D								6
		N=34									
		(6,7/7,7,10,10)									
		7.00	D							Returning to stiff below 7.2m bgl.	7
		N=30								Becoming gravelly below 7.5m bgl.	
		(5,5/6,7,8,9)									
		8.00	D								8
		N=28									
		(3,4/4,6,8,10)									
		9.00	D								9
		50 (7,7/50 for 295mm)									
							9.60			Stiff reddish brown gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to	10

Remarks

1. Hand excavated inspection pit to 1.20m bgl.
2. Groundwater strike at 17.1m bgl, rising to 15.9m bgl after 20 minutes.
3. Installation to 4.0m bgl: G.L. to 1.0m plain pipe, 1.0m - 4.0m slotted pipe.





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CW9 5LP

Rotary Core Log

Borehole No.

BH2

Sheet 2 of 3

Project Name: BACK TURNER STREET

Project No.
C3967

Co-ords:

Hole Type
CP+RC

Location: MANCHESTER

Level:

Scale
1:50

Client: DOMIS CONSTRUCTION LTD

Dates: 08/08/2018 - 10/08/2018

Logged By
JM

Well	Water Strikes	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		50 (7.8/50 for 210mm)					11.10			medium of sandstone. <i>Sand lens encountered between 10.0m and 10.08m bgl.</i>	11
										Very dense red coarse grained SAND. (COMPLETELY WEATHERED CHESTER PEBBLE BEDS FORMATION)	12
											13
							14.05				14
											15
		15.00 - 16.50	14	57	43	10					16
		16.50 - 18.00	18	87	87	23					17
		18.00 - 19.50	17	100	100	25					18
											19
											20

Remarks

1. Hand excavated inspection pit to 1.20m bgl.
2. Groundwater strike at 17.1m bgl, rising to 15.9m bgl after 20 minutes.
3. Installation to 4.0m bgl: G.L. to 1.0m plain pipe, 1.0m - 4.0m slotted pipe.





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Rotary Core Log

Borehole No.

BH2

Sheet 3 of 3

Project Name: BACK TURNER STREET

Project No.
C3967

Co-ords:

Hole Type
CP+RC

Location: MANCHESTER

Level:

Scale
1:50

Client: DOMIS CONSTRUCTION LTD

Dates: 08/08/2018 - 10/08/2018

Logged By
JM

Well	Water Strikes	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		19.50 - 21.00	16	100	100	53	24.00				21
		21.00 - 22.50	10	100	100	72					22
		22.50 - 24.00	9	100	100	80					23
										End of Borehole at 24.000m	24
											25
											26
											27
											28
											29
											30

Remarks

1. Hand excavated inspection pit to 1.20m bgl.
2. Groundwater strike at 17.1m bgl, rising to 15.9m bgl after 20 minutes.
3. Installation to 4.0m bgl: G.L. to 1.0m plain pipe, 1.0m - 4.0m slotted pipe.



Ground Gas Monitoring Results



CLIENT:				Date	Operator	Analysr	Weather Observations				Temp (°C)		Pressure Trend		Min Barometric Pressure (mb)				Notes						
DOMIS CONSTRUCTION				31/08/2018	JM	GA2000	Sunny		Light breeze		Warm		15		Steady		1020								
JOB NO.				13/09/2018	JM	GA2000	Overcast		Light breeze		Warm		12		Steady		1024								
C3967				23/11/2020	MS	GA5000	Sunny		No wind		Cold		4		Falling		1017								
SITE:				27/11/2020	MS	GA5000	Overcast		Light breeze		Cool		8		Steady		1011								
BACK TURNER STREET, MANCHESTER				02/12/2020	PG	GFM436	Sunny		Light breeze		Cool		8		Falling		1010								
				03/12/2020	PG	GFM436	Light rain		No wind		Cold		4		Falling		978								
				04/12/2020	PG	GA5000	Overcast		No wind		Cold		3		Falling		967								
				07/12/2020	PG	GA5000	Overcast		No wind		Cold		3		Falling		994								
				09/12/2020	PG	GFM436	Overcast		No wind		Cool		6		Rising		1003								
				11/12/2020	PG	GFM436	Light rain		Light breeze		Cool		8		Falling		979								
Notes: mb = milibars; CH ₄ = methane; LEL = lower explosive limit = 5%v/v; CO ₂ = carbon dioxide; O ₂ = oxygen; CO=carbon monoxide; H ₂ S = hydrogen sulphide; TVOC= Total volatile organic compounds; PPM = parts per million. Where the flow is less than the limit of detection of the instrument, the detection limit is reported (Highlighted in green). Gas Screening Values (GSVs) are rounded to 3 decimal places. Calibration Records for analysers used availble on request.																									
Date	Time	Location	Response zone (m)	Pressures (mb)		Gas flows (l/hr)		CH ₄ (%v/v)		CH ₄ (%LEL)		CO ₂ (%v/v)		O ₂ (%v/v)		Other Gases (PPM)			Depth to Water (m)	Well Base (m)	Gas Screening Value (CH ₄) (l/hr)	Gas Screening Value (CO ₂) (l/hr)	Notes		
				Atmospheric Pressure	Relative Well Pressure	Initial	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	CO	H ₂ S	TVOC (PID)							
				Summary Statistics																					
Max. values:				1024	0.1	0.2	0.2	0.1	0.1	2.0	2.0	6.3	6.2	22.0	22.3	0.0	0.0	0.0	15.7	16.0	0.000	0.006			
Min. values:				967	-0.3	0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	16.6	15.7	0.0	0.0	0.0	2.8	4.0	0.000	0.000			
				Worst-case GSVs based on maximum recorded steady flow and maximum individual peak concentrations:																		0.000	0.013		
31/08/2018	AM	Ambient		1020																					
		BH01	4.00 - 16.00		0.1	0.2	0.2	0.1	0.1	2.0	2.0	1.7	1.4	22.0	22.3	0.0	0.0	NA	NGW	16.00	0.000	0.003			
		BH02	1.00 - 4.00		0.1	0.1	0.1	0.1	0.1	2.0	2.0	2.8	2.7	20.3	20.6	0.0	0.0	NA	3.40	4.00	0.000	0.003			
31/08/2018	AM	Ambient		1020																					
13/09/2018	AM	Ambient		1024																					
		BH01	4.00 - 16.00		0.1	0.1	0.1	0.1	0.1	2.0	2.0	2.3	2.0	20.3	21.5	0.0	0.0	NA	NGW	16.00	0.000	0.002			
		BH02	1.00 - 4.00		0.1	0.1	0.1	0.1	0.1	2.0	2.0	3.0	2.5	21.7	21.7	0.0	0.0	NA	2.87	4.00	0.000	0.003			
19/09/2018	AM	Ambient		1024																					
23/11/2020	AM	Ambient		1017					0.1		2.0		0.1		21.1										
		BH01	4.00 - 16.00		-0.1	NA	0.1	NA	0.1	NA	2.0	NA	0.3	NA	20.8	0.0	0.0	NA	NGW	15.85	0.000	0.000	No peak, installation located & repaired during visit		
		BH02	1.00 - 4.00		-0.1	NA	0.2	NA	0.1	NA	2.0	NA	2.5	NA	19.4	0.0	0.0	NA	3.55	4.10	0.000	0.005	No peak, installation located & repaired during visit		
23/11/2020	AM	Ambient		1017					0.1		2.0		0.1		21.1										
27/11/2020	AM	Ambient		1011					0.1		2.0		0.1		21.2										
		BH01	4.00 - 16.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.4	0.1	20.8	21.0	0.0	0.0	NA	NGW	15.85	0.000	0.000			
		BH02	1.00 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.1	0.4	20.0	20.3	0.0	0.0	NA	3.63	4.10	0.000	0.001			
27/11/2020	AM	Ambient		1011					0.1		2.0		0.1		21.1										
02/12/2020	PM	Ambient		1010					0.1		2.0		0.1		20.0										
		BH01	4.00 - 16.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	2.7	3.3	17.6	17.3	0.0	0.0	NA	15.54	15.85	0.000	0.003			
		BH02	1.00 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	19.8	20.0	0.0	0.0	NA	2.75	4.10	0.000	0.000			
02/12/2020	PM	Ambient		1010					0.1		2.0		0.1		20.0										
03/12/2020	PM	Ambient		978					0.1		2.0		0.1		19.7										
		BH01	4.00 - 16.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	NA	NA	NA	NA	0.0	0.0	NA	15.49	15.85	0.000	-			
		BH02	1.00 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	0.6	0.1	18.7	19.7	0.0	0.0	NA	2.77	4.10	0.000	0.001			
03/12/2020	PM	Ambient		978					0.1		2.0		0.1		19.7										
04/12/2020	PM	Ambient		967					0.1		2.0		0.1		21.6										
		BH01	4.00 - 16.00		-0.3	0.1	0.1	0.1	0.1	2.0	2.0	6.3	6.2	17.7	17.8	0.0	NA	NA	15.52	15.85	0.000	0.006			
		BH02	1.00 - 4.00		-0.3	0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	21.6	21.6	0.0	NA	NA	2.76	4.10	0.000	0.000			
04/12/2020	PM	Ambient		967					0.1		2.0		0.1		21.6										

TEST DATE AND CONDITIONS	
Date	26/06/20
Atmospheric Pressure	998mB
Ambient Temp	21.7°C
EnviroNics Serial No.	2633

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB

Tel 02476303311 Fax 02476307711



GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
13361	Brownfield Solutions Ltd

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G436.0027/0010
Labels Fitted	✓	Recalibration Date	26/6/21

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	4.9	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	59.6	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	39.6	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.0	+0.1	20.9	+/-0.5

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	Label Range	H2S 5000ppm	CO 2000ppm		Hexane 2.00%	tol. (% vol.)
N2	100%		0	0		0	+/- 5.0
H2S	1500ppm		1510	0			+/- 5.0
CO	1000ppm		40	998			+/- 5.0
Hexane	2.00%					2.0	+/- 10.0

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All Ports	Current Atmospheric	999	+/-2.0		0.0		
Ap Port (Internal)	+800mB(a)	801	+/-5.0		0.0		
	+1200mB(a)	1203	+/-5.0		0.0		

CERTIFICATION OF CALIBRATION



Date Of Calibration: 12-Jun-2020

Certificate Number: G502031_1/25842

Issued by: QED Environmental Systems Ltd.

Customer: Brownfield Solutions Ltd
William Smith House 173-183 Witton Street Northwich
Cheshire CW9 5LP UNITED KINGDOM

Description: Gas Analyser

Model: GA5000

Serial Number: G502031

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	59.8	0.94

Carbon Dioxide (CO ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	4.9	0.43
15.0	14.7	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 08-Jun-2020.

The maximum adjustment was less than the inwards assessment uncertainty.

Inwards assessment data is available if requested.

All concentrations are molar.

CH₄, CO₂ readings recorded at : 32.2 °C ± 2.5 °C

O₂ readings recorded at : 22.2 °C ± 2.5 °C

Barometric Pressure : 0999 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:109 IGC Instance:109

Page 1 of 2 | LP015GIUKAS-2.4

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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: 12-Jun-2020

Certificate Number: G502031_1/25842

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
999	998

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

Internal Flow	
Applied (l/hr)	Instrument Reading (l/hr)
5	5.3
10	10.3

Date of Issue : 15-Jun-2020

Approved by Signatory

Laura McBride

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: 109 IGC Instance: 109

Page 2 of 2 | LP015GIUKAS-2.4

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

Registered in England and Wales 1898734

SERVICE REPORT



Issued by: QED Environmental Systems Ltd.

Customer Name: Brownfield Solutions Ltd

Model: GA5000

Date of Service: 15-Jun-2020

Part Number: GA5K00C0-301

Service Engineer: Ricky Cottrill

Serial Number: G502031

Calibration Engineer: Suk Balrey

Verification / Approved By: Laura McBride

Signature:

Reason for Return (inc. Customer Comments):

Returned for full service and calibration

We have issues relating to the unit powering off after a short period of time despite being charged

Service Comments/Feedback:

Thank you for returning your gas analyser to the QED Service Centre for full service and calibration. We are pleased to inform you that the analyser was received and fully assessed by one of our experienced Service Engineers. Despite our significant effort to try and identify the reported issue, we have been unable to replicate it. Our extensive service was carried out, and any necessary components replaced. The analyser has successfully passed all of our rigorous testing and quality checks and has been calibrated using our bespoke, state of the art calibration facility. For further information about how to get the best use from your instrument please visit our YouTube channel <http://www.youtube.com/GeotechTV> and on our Website <http://www.qedenv.com>

If you require any further assistance with your instrument please email our Technical Support Team at technical@qedenv.co.uk or call us on +44 (0) 333 800 0088 (Monday to Thursday 08.30 - 17.00 & Friday 08.30 - 15.30) UK time zone.

Next Service Due: 15-Dec-2020

17025

Our ISO accreditation
for our customised
auto-calibration facilities

5

Number of days we
aim to complete
your service within

50

Number of checks
instruments are subject
to when serviced

65

Number of countries from
which we service instruments
/accessories each year

7,384

Number of calibrations
completed in last
12 months

340

Minimum number
of service instruments
we process each month

25

Cost (in £) of fully insured
analyser collection for
our UK customers

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

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SERVICE REPORT



Issued by: QED Environmental Systems Ltd.

17025

Our ISO accreditation
for our customised
auto-calibration facilities

5

Number of days we
aim to complete
your service within

50

Number of checks
instruments are subject
to when serviced

65

Number of countries from
which we service instruments
/accessories each year

7,384

Number of calibrations
completed in last
12 months

340

Minimum number
of service instruments
we process each month

25

Cost (in £) of fully insured
analyser collection for
our UK customers

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