

Our Ref C3096/22/E/4855
1st June 2023

A H Construction,
3 Stony Bank Chase,
Stony Bank Lane,
Thongsbridge,
Holmfirth,
HD9 7UD



For the attention of Alex Hadin,

Dear Sir,

Ref: 9 Miry Lane, Thongsbridge.

In addition to the contamination assessment report, Rogers Geotechnical Services C3096/22/E/4693, dated November 2022 a ground gas assessment was requested in accordance with planning condition from the local authority. This report outlines the work undertaken and provides an update to the site conceptual model.

Background

Prior to attending site the levels were reduced by between 0.50m and 1.00m due to the presence of a mound of made ground of which the contamination assessment was centred. This material was classified as contaminated with respect to lead and WAC testing has classified this as inert waste. This was then partially removed from site to attain a suitable formation level. In the environmental report a preliminary classification of CS3 was given for the site based on a pragmatic approach from organic content screening of natural material, thus further monitoring was undertaken.

Monitoring

Two boreholes, BH01 and BH02, were installed to depths of 2.5m and 2.8m respectively where refusal was met on suspected bedrock. Gas monitoring standpipes were installed at depths of 2.30m and 2.50m depth in the boreholes. In both cases the standpipe consisted of a 1m of plain pipe from the surface and a perforated pipe to the target depths. The response zone was filled with pea gravel and a bentonite seal up to 1m below the site. Six visits were made to the site between the 28th February and the 16th May 2023. The results of this work are tabulated below. The construction of the standpipes are presented on the borehole logs appended to this letter report.

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Rogers Geotechnical Services Ltd
Offices 1 & 2 Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU
☎ 01484 604354 Company No. 5130864

Table 1: Gas monitoring

Location	Date	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow (l/hr)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
BH01	28.02.2023	0.0	1.8	19.9	0.0	1022→	-	2.30
	07.03.2023	0.1	2.2	18.0	0.0	983→	-	
	14.03.2023	0.1	2.9	16.1	0.1	991↑	-	
	21.03.2023	0.0	2.7	12.8	0.0	990↓	2.09	
	18.04.2023	0.0	2.9	8.7	0.0	1019↑	-	
	16.05.2023	0.1	2.9	7.8	0.0	1012→	-	
BH02	28.02.2023	0.1	1.5	16.0	0.0	1022→	2.25	2.80
	07.03.2023	0.1	2.0	16.1	0.0	983→	2.24	
	14.03.2023	0.1	1.9	14.1	0.0	992↑	2.26	
	21.03.2023	0.1	2.3	10.7	0.0	989↓	2.25	
	18.04.2023	0.1	3.7	2.7	0.0	1019↑	2.24	
	16.05.2023	0.1	6.4	1.9	0.0	1012→	2.26	

↑ rising pressure

↓ falling pressure

→ steady pressure

The monitoring visits were undertaken using a Geotechnical Instruments (UK) Ltd. GA5000 (serial No G503524) which was last calibrated on the 24th August 2022. Full details of the ground gas results are appended to this letter report.

Gas Concentrations

With respect to ground gas, the results of the completed monitoring regime indicated a maximum concentration of 0.1% methane, with concentrations of carbon dioxide ranging between 1.5% and 6.4% in association with oxygen levels of between 1.9% and 19.9%. It should be appreciated that on non-contaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum flow rate of 0.1 litres per hour (l/hr) was recorded and should be employed in the calculations.

The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. Atmospheric pressure readings both above and below 1000mb and during periods of steady, rising and falling trends have been recorded during the monitoring period.

Risk Assessment

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case 0.1% (0.001) methane was recorded along with 6.4% (0.064) carbon dioxide, in association with a maximum flow rate of 0.1 l/hr. This results in a GSV of 0.0001 l/hr for methane and a GSV of 0.0064 l/hr for carbon dioxide. It is of note that during visit 6 that a concentration of carbon dioxide exceeding 5% was recorded alongside depleted oxygen in both boreholes (Oxygen concentration <19%). It should be appreciated that this is

¹ Adapted from tables 5.5a and 5.5b of CIRIA C665, 2007, *Assessing risks posed by hazardous ground gas to buildings*, p60.



above the action level of 5% for *Characteristic Situation Level 2 (CS2)* thus CS2 measures are required.

In accordance with Table 8.5, *Modified Wilson and Card classification* of the CIRIA report C665, *Assessing risks posed by ground gasses to building*, the site may be characterised as *Characteristic Situation Level 2*. It is therefore considered that there is a potential risk of harm to end users and site operatives and special precautionary measures are required in accordance to Table 8.6, *Typical scope of gas protection measures*, of CIRIA report C665.

With regard to the number of monitoring visits required reference is made to Tables 5.5a and 5.5b of CIRIA report C665 (2007)¹. Accepting that the proposed development is of high sensitivity (one single residential house) and that the generation potential is very low, these tables suggest that 6 readings could be undertaken over a period of at least 3 months. However, C665 notes that *not all sites will require gas monitoring for the period and frequency indicated in Tables 5.5a and 5.5b*. In this case, a total of 6 monitoring visits were undertaken over a three month time period.

In view of the above it is considered that with respect to gas monitoring, the site is fully characterised.

Revised Conceptual Model

Following completion of the ground gas risk assessment the site can now be fully characterized with respect to ground gas risk. As a result the following table can be applied to the conceptual model presented in the Environmental Report C3096/22/E/4693 dated November 2022. The updated source, pathway model and risk assessment is presented below in the following table.

Table 2: Updated Conceptual Site Model and Site-Specific Risk Assessment (Ground Gas CS2 Measures)

Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – concentrations of carbon dioxide have been found to be present at the site which may pose a risk to human health (<i>Characteristic Situation Level 2</i>). Negligible levels of methane recorded.	High	Concentrations of carbon dioxide were recorded which may be harmful to human health.
	End User		High	Protection measures will be required in line with CS2 measures.
	Neighbours	Single dwelling and no adjoining structures on the site.	N/A	Site fully characterised with respect to ground gas.

Given the above information, there exists a potential risk to the proposed end use from ground gases. As a result ground gas protection measures in line with *Characteristic Situation Level 2* will be required. A remediation statement outlining the chosen ground gas protection measures shall be produced a suitably qualified engineer.



References

- British Standards Institution (2013), BS 8576 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds.
- British Standards Institution (2015 +A1:2019) BS8485: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, B.S.I., London.
- CIRIA Report C665, *Assessing risks posed by ground gasses to building*.

We trust that this information is of interest and should you have any other requirements do not hesitate to contact us.

For Rogers Geotechnical Services Ltd,

Yours Faithfully,



Scott Alexander BSc FGS
Geo-environmental Engineer



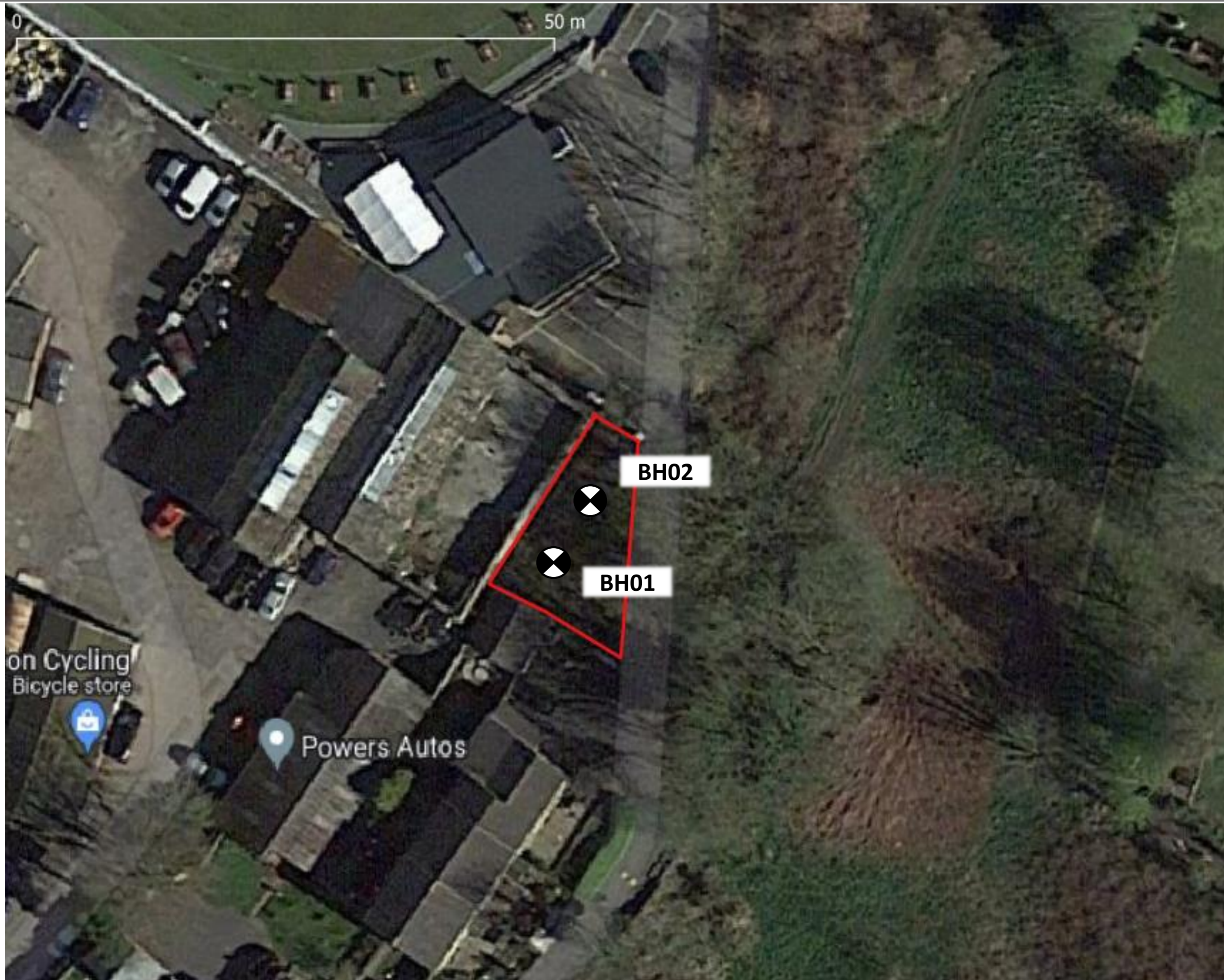
Imran Sakoor BEng FGS
Geo-environmental Engineer



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Notes:

BS/DP91 positions approximated from site operative's notes.



Environmental Geotechnical Specialists

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:

A H Construction

Job Number:

C3096/22/E/4693

Project Details:

Miry Lane, Thongsbridge

Scale: Not to scale - reference only



...delivered using our own drilling rigs / crews / soils lab / engineers





Borehole Log

Borehole No.

BH01

Sheet 1 of 1

Project Name: Miry Lane, Thongsbridge	Project No. C3096/22/E/4693	Co-ords:	Hole Type WLS
Location: Miry Lane, Thongsbridge	Level:		Scale 1:50
Client: AH Construction	Dates: 20/02/2023		Logged By SA

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
						0.40			MADE GROUND. (Soft brown, sandy, gravelly CLAY. Gravel is angular to sub angular, fine to coarse of sandstone, brick, mortar. Rare plastic)	
		1.20	SPT						Soft light brown and grey, sandy, slightly gravelly CLAY. Gravel is fine to medium of sandstone.	1
		2.00	SPT			2.10				2
		2.50	SPT			2.50			Light grey completely weathered SILTSTONE recovered as firm sandy gravelly clay. Sand is fine to medium. Gravel is angular to sub rounded fine to medium of siltstone lithorelicts. Sampler refusal, hole terminated.	3
						2.50			End of Borehole at 2.50m	
										4
										5
										6
										7
										8
										9
										10

Remarks
 1. No groundwater encountered. 2. Gas installation





Borehole Log

Borehole No.

BH02

Sheet 1 of 1

Project Name: Miry Lane, Thongsbridge	Project No. C3096/22/E/4693	Co-ords:	Hole Type WLS
Location: Miry Lane, Thongsbridge	Level:		Scale 1:50
Client: AH Construction	Dates: 20/02/2023		Logged By SA

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
G										
		1.20	SPT			N=4 (1,1/1,0,1,2)	1.40		MADE GROUND. (Soft brown, sandy, gravelly CLAY. Gravel is angular to sub angular, fine to coarse of sandstone, brick, mortar. Rare plastic).	1
		2.00	SPT			N=14 (3,2/3,4,4,3)	2.10		Soft light brown and grey, sandy, slightly gravelly CLAY. Gravel is fine to medium of sandstone.	2
		2.80	SPT			50 (25 for 115mm/50 for 125mm)	2.80 2.80		Dark brown and grey completely weathered SILTSTONE recovered as firm slightly sandy gravelly clay.	3
								Sampler refusal. Borehole terminated. End of Borehole at 2.80m		4 5 6 7 8 9 10

Remarks
1. No groundwater encountered. 2. Gas installation



