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Our Ref: P10481/GAL
Date: 21st March 2024

Avant Homes (Midlands)
1 Phoenix Place
Phoenix Centre
Nottingham
NG8 6BA
By email only

Attention of Martyn Pask

Dear Martyn,

Re: Gas Addendum Letter Report for Lychgate Lane, Burbage

The gas monitoring programme at the above site is now complete. The assessment below supersedes the information in the Site Appraisal Report (P10481/PIISAR.1, dated January 2024) and should be submitted to the regulatory bodies for approval.

Both the Summary Phase I Desk Study and the Phase II Site Appraisal Report confirmed the lack of a viable source of ground gas (carbon dioxide and methane) and that the site is not recorded to be within an area requiring radon protection.

As the proposed end use has been classified as high sensitivity (residential with gardens), six 35mm diameter gas/water monitoring standpipes were installed across the site development area. The standpipes were installed in the window sample boreholes (WS01-WS06 inclusive), with response zones in the natural strata due to the absence of made ground.

To confirm potential liabilities, six gas monitoring visits have been carried out between the 15th January and the 14th March 2024, to assess the risk posed to the end user from potentially harmful ground gases. The first three monitoring visits were undertaken weekly, with the final three visits undertaken fortnightly. Atmospheric pressure ranged between 991mb and 1011mb, with four of the readings recorded during falling atmospheric pressure.

It should be noted that one of the standpipes, WS06, was not monitored as it was damaged.

A gas monitoring location plan is presented in Appendix A, with the gas monitoring results presented in Appendix B.



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The post fieldwork monitoring has been designed to identify and assess the groundwater and gas regimes below the site. The recently completed gas monitoring results are summarised below:

Borehole	Response Zone (m begl) / Strata	Contamination	No. of Monitoring Visits	Methane (%v/v)	Carbon Dioxide (%v/v)	Oxygen (%v/v)	Flow (l/hr)	Groundwater Depth (m)
WS01	1.0-4.0 / NS	None	6	0.0	0.0-0.3	19.4-20.6	0.0	0.5-1.1
WS02	1.0-4.0 / NS	None	6	0.0	0.0-0.7	19.4-20.5	0.0	0.5-2.8
WS03	1.0-4.0 / NS	None	6	0.0	0.0-0.4	19.3-20.6	0.0	0.2-2.3
WS04	1.0-4.0 / NS	None	6	0.0	0.0-0.8	19.4-20.6	0.0	0.4-0.7
WS05	1.0-4.0 / NS	None	6	0.0	0.1-0.6	19.5-20.7	0.0	0.0-0.9
WS06	1.0-4.0 / NS	None	6	N.R.	N.R.	N.R.	N.R.	0.0-0.6
Notes: NS= Natural Strata, N.R. = Not Recorded. Atmospheric Pressure: 991mb-1011mb								

Ground Gas Risk Assessment

The primary guidance document to determine if gas protection measures are required is BS8485:2015+A1:2019. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Screening Value (GSV) for the site. The gas regime is then determined based on the GSV and other factors including gas concentrations, flow rates, atmospheric conditions, water levels and the likely sources of the observed gas concentrations.

In summary no methane has been detected, whilst carbon dioxide of up to 0.8%v/v and oxygen as low as 19.3%v/v has been recorded. As the recorded flow rate has been consistently zero and methane concentrations have been consistently below the monitor's lower limit of detection a default flow rate of 0.1l/hr and a default methane concentration of 0.1%v/v have been used in the following assessment.

Using a default flow rate of 0.1l/hr and a default methane concentration of 0.1%v/v, a Q_{hg} of 0.0001l/hr has been calculated for methane. Using the same default flow rate, the maximum steady state carbon dioxide concentration of 0.8%v/v equates to a Q_{hg} of 0.0008l/hr. On this basis, the GSV for the site is determined as 0.0008l/hr.

As the maximum concentration of methane is <1%v/v, the maximum concentration of carbon dioxide is <5%, and the maximum GSV is <0.07l/hr, the site has been assessed as 'Characteristic Situation 1' or CS1 as outlined in BS8485:2015+A1:2019, for which gas protection measures are not required. This is in line with the sites conceptual site model. It should be noted that the majority of the response zones in the installations were recorded as being 'flooded' throughout the monitoring period. However, given the lack of a source of ground gas, the overall conceptual site model, and no significant differences in gas readings between the response zones that are flooded and those that are not flooded, the gas concentrations recorded are considered to be representative of the gas regime.

Therefore, it is considered that gas protection measures for methane or carbon dioxide are not required for the proposed residential development. In addition, the desk study risk assessment determined that no radon gas protection measures are required.

This assessment confirms that contained in the Phase II Site Appraisal Report dated January 2024.

Groundwater

Slight seepages of perched groundwater or damp / wet strata were recorded within rare sand pockets, within the Bosworth Clay Member. Perched groundwater within separate bands of sand were recorded in TP09 (1.6-1.85m begl), WS04 (1.9-2.2m begl and 3.0-3.2m begl) and WS06 (1.5-2.4m begl and 3.1-3.5m begl).

Six groundwater monitoring visits have been conducted between the 15th January and the 14th March 2024, as part of the monitoring programme. In summary, standing water was recorded in each of the installations, varying between 0.0m and 2.8m begl, over the course of the monitoring visits. On the final monitoring visit, the standing water in all the installations was recorded at very shallow depths between ground level and 0.8m begl.

Although the initial standing water in the installations is considered to be representative of 'perched water' within the natural cohesive strata, it should be noted that all the response zones in the installations were recorded as being 'flooded'. It is believed that the installations are acting as 'sump holes' for groundwater from the sand layers and shallow surface water ingress (due to persistent rain), and the levels recorded are not a true reflection of shallow groundwater. It is believed that during the drier summer months, a significantly different scenario would exist regarding the presence of groundwater in any excavations.

From the ground investigation undertaken, it is likely that excavations will remain stable. Some side trench collapse is inevitable particularly in the medium term and during inclement periods of weather. Granular soils (intermittent bands of wet sand) are liable to collapse without warning; this situation is likely to be exacerbated by water ingress.

The observed groundwater conditions during the digging of the trial pits suggest that the use of conventional sump pumping would be adequate to control any water ingress in shallow excavations.

We trust this is suitable for your current requirements, should you require any further information or would like any clarification of the points raised please do not hesitate to contact us.

Yours sincerely,
For GRM Development Solutions Ltd



Robert Crossland MSc FGS CGeol
Senior Engineering Geologist

Appendices

Appendix A – Gas Monitoring Location Plan

Appendix B – Gas Monitoring Results



A P P E N D I X A

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Legend:

Site Boundary

Exploratory Holes

⊗ Window Sample Borehole with Gas / Groundwater Monitoring Installation

NOTES: Notes	CLIENT: Avant Homes (Midlands)	PROJECT No: P10481	DATE: January 2024	DESIGN/DRAWN: RHC	 GRM Development Solutions Ltd Tel: 01283 551 249 mail@grm-uk.comwww.grm-uk.com
	PROJECT: Lychgate Lane, Burbage, Leicestershire	DRAWING NUMBER: Figure 4	ISSUE: Final		
	TITLE: Gas Monitoring Plan	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100			



A P P E N D I X B



In-Situ Gas Monitoring Results

Project Name	Lychgate Lane, Burbage
Project Number	P10481
Client	Avant Homes (Midlands)
Date	15/01/2024
Weather	Sunny
Atmospheric Pressure (mb)	1011
Pressure Trend	Rising
Equipment	Gas Data GFM436
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.2	0.2	19.5	19.5	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.7	0.7	19.4	19.4	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.1	0.1	19.7	19.7	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.5	0.5	19.7	19.7	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.6	0.6	19.7	19.7	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	Not Recorded		Not Recorded		Not Recorded		Not Recorded		Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.1	3.9
2.8	3.8
0.9	3.9
0.6	4.0
0.9	3.8
0.5	3.5

Notes				Ground Material Key	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)			NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v		
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v		
PID	Photo-Ionising Detector	MG	Made Ground		
%	By volume	NS	Natural Strata		
				Key	
					Response Zone Flooded



In-Situ Gas Monitoring Results

Project Name	Lychgate Lane, Burbage
Project Number	P10481
Client	Avant Homes (Midlands)
Date	23/01/2024
Weather	Rain
Atmospheric Pressure (mb)	1007
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.4	19.4	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.6	19.6	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.4	0.4	19.3	19.3	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.3	0.3	19.4	19.4	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.5	19.5	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.6	19.6	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.0	4.0
0.8	3.9
2.3	3.9
0.5	4.0
0.3	3.9
0.4	3.4

Notes				Ground Material Key	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)			NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v		
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v		
PID	Photo-Ionising Detector	MG	Made Ground		
%	By volume	NS	Natural Strata		
				Key	
					Response Zone Flooded



In-Situ Gas Monitoring Results

Project Name	Lychgate Lane, Burbage
Project Number	P10481
Client	Avant Homes (Midlands)
Date	29/01/2024
Weather	Mostly Cloudy
Atmospheric Pressure (mb)	1008
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.0	0.0	20.0	20.0	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.0	0.0	20.0	20.0	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.4	0.4	19.8	19.8	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.4	0.4	19.7	19.7	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.9	19.9	1.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	Not Recorded		Not Recorded		Not Recorded		Not Recorded		Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.1	4.0
0.9	4.0
2.0	3.8
0.7	4.0
0.5	3.9
0.6	3.4

Notes				Ground Material Key	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)			NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v		
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v		
PID	Photo-Ionising Detector	MG	Made Ground		
%	By volume	NS	Natural Strata		
				Key	
					Response Zone Flooded

Comments

WS01 bailed to 2.65m = 1cm in 22 secs after 40 mins dipped at 1.60m
Ws02 bailed to 3.1 = 1cm in 45secs after 30mins dipped at 2.24m
WS03 bailed to 3m recharge after 40m dipped at 3m
WS04 bailed to 2.5m 1cm in 10 secs. after 20mins dipped at 1.79
WS05 bailed to 3m recharge, after



In-Situ Gas Monitoring Results

Project Name	Lychgate Lane, Burbage
Project Number	P10481
Client	Avant Homes (Midlands)
Date	14/02/2024
Weather	Cloudy
Atmospheric Pressure (mb)	1000
Pressure Trend	Rising
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.1	0.1	20.2	20.2	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.4	0.4	20.0	20.0	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.1	0.1	20.2	20.2	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.5	0.5	20.1	20.1	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.4	0.4	20.2	20.2	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	Not Recorded		Not Recorded		Not Recorded		Not Recorded		Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
0.5	4.0
0.5	4.0
0.2	3.8
0.4	4.0
0.0	3.9
0.0	3.3

Notes				Ground Material Key	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)			NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v		
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v		
PID	Photo-Ionising Detector	MG	Made Ground		
%	By volume	NS	Natural Strata		
				Key	
					Response Zone Flooded

Comments

field water logged



In-Situ Gas Monitoring Results

Project Name	Lychgate Lane, Burbage
Project Number	P10481
Client	Avant Homes (Midlands)
Date	28/02/2024
Weather	Dreary (Overcast)
Atmospheric Pressure (mb)	1003
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Bryan Burgh

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.3	0.3	19.8	19.8	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.2	0.2	20.0	20.0	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.1	0.1	20.0	20.0	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.8	0.8	19.6	19.6	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.3	0.3	19.9	19.9	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	Not Recorded		Not Recorded		Not Recorded		Not Recorded		Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
0.8	3.9
0.7	3.9
0.2	3.8
0.4	4.0
0.2	3.9
0.4	3.3

Notes				Ground Material Key	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)			NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v		
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v		
PID	Photo-Ionising Detector	MG	Made Ground		
%	By volume	NS	Natural Strata		
				Key	
					Response Zone Flooded



In-Situ Gas Monitoring Results

Project Name	Lychgate Lane, Burbage
Project Number	P10481
Client	Avant Homes (Midlands)
Date	14/03/2024
Weather	Mostly Cloudy
Atmospheric Pressure (mb)	991
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	4.0	NS	0.0	0.0	0.0	0.0	20.6	20.6	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	0.1	0.1	20.5	20.5	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.0	0.0	20.6	20.6	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	0.0	0.0	20.6	20.6	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.0	0.0	20.7	20.7	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	Not Recorded		Not Recorded		Not Recorded		Not Recorded		Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
0.8	3.8
0.5	3.8
0.4	3.8
0.4	4.0
0.0	3.8
0.1	3.3

Notes				Ground Material Key	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)			NS	Natural Strata
N.D.	Not Detected	a	Methane => 1% v/v		
N.R.	Not Recorded	b	Carbon Dioxide =>5% v/v		
PID	Photo-Ionising Detector	MG	Made Ground		
%	By volume	NS	Natural Strata		
				Key	
					Response Zone Flooded