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Our Ref: P10558/GAL.1

Date: 4th November 2024

Davidson Developments Ltd
Wilson House
207 Leicester Road
Ibstock
LE67 6HP

Attention of Natalie Pickford

Dear Natalie,

Re: Gas Addendum Letter for Kirkby Road, Desford

The gas monitoring programme at the above site is now complete. The assessment below supersedes the information in the GRM Development Solutions Ltd (GRM) Phase II Site Appraisal Report (Ref: GRM/P10558/PIISAR.1, dated August 2024) and should be submitted to the regulatory bodies for approval.

The Phase I desk study identified the following potential sources of ground gas:

- Made ground associated with demolition of previous buildings.
- Infilled pond in the northwestern corner of the site.

The site is not in an area where radon protective measures are required.

The ground investigation did not identify any significant sources of ground gas and the pond in the north west of the site, which was previously thought to have to been infilled, was observed to be present at the time of the fieldwork.

As the proposed end use has been classified as high sensitivity (residential with gardens), five 35mm diameter gas/water monitoring standpipes have been installed across the site in the window sample boreholes (WS01, WS02, WS03, WS05, WS06). In the absence of a potential significant source, the response zones have been targeted at the natural strata, to determine the natural ground gas regime.

The gas monitoring has been carried out fortnightly over a 6 month period from 13th August 2024 to 8th October 2024, to assess the risk posed to end users from potentially harmful ground gases.



Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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The results are enclosed for reference and 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	2.5-3.9	16.9-18.9	0.0	2.6-3.6
WS02	1.0-4.0 / NS	None	6	0.0	2.6-5.8	14.3-18.7	0.0	2.5-3.4
WS03	1.0-4.0 / NS	None	6	0.0	3.4-4.3	15.9-18.4	0.0-0.1	2.1-3.0
WS05	1.0-4.0 / NS	None	6	0.0	0.6-3.1	16.2-19.8	0.0	1.1-2.7
WS06	1.0-4.0 / NS	None	6	0.0	1.5-2.5	17.2-19.9	0.0	1.8-2.2

Notes: NS= Natural Strata Atmospheric Pressure: 975mb-1017mb

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.

Methane concentrations above 0.0%v/v and flow rates above 0.1l/hr were not detected during the monitoring period. Therefore, in the following assessment the monitors lower limit of detection for methane (0.1% v/v) has been used.

Using the default methane concentration of 0.1%v/v and the maximum flow rate of 0.1l/hr a Q_{hg} of 0.0001l/hr has been calculated for methane. Using the maximum recorded steady state carbon dioxide concentration of 5.8%v/v and the maximum flow rate of 0.1l/hr a Q_{hg} of 0.0058l/hr has been calculated for carbon dioxide. On this basis the GSV for the site is determined as 0.0058l/hr

Although the GSV is less than 0.07l/hr, concentrations of carbon dioxide have been recorded in excess of 5% and as such, further consideration has been given to the most appropriate Characteristic Situation.

Concentrations of carbon dioxide only marginally exceeded 5% on one occasion and in one borehole. In the absence of a significant source it is considered likely that the ground gas is generated by microbial activity within the soils, characterized by zero methane and low flow with carbon dioxide concentrations which could reach up to 21% (maximum of 5.8%v/v recorded). A ternary plot showing the ranges of data associated with microbial activity and the recorded values is enclosed. Given only low positive flow has been detected the concentrations are not being generated at a sufficient rate to pose a risk to the proposed development, as referred to in '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 Limited and EPG Limited'.

All of the commonly used screening approaches in the UK have a requirement to consider increasing the characterisation of a site identified as 'Characteristic Situation 1' (CS1) or 'Green' based on a GSV, if carbon dioxide concentrations exceeding 5%v/v have been recorded. However, the paper states "this increase in characterisation is not a mandatory requirement in any of the guidance documents. The distribution of elevated concentrations and the source of gas should be considered before deciding whether the increase is appropriate. In most cases there will not be any need to increase the classification if the carbon dioxide is caused by the biological respiration of small quantities of organic material, increasing the characteristic situation is only likely to be a requirement if the gas source is one of the high risk sources".

Therefore, it is considered that the characterisation of the site as CS1 is appropriate, for which no gas protection measures are required.

Groundwater

The monitoring program has confirmed the general presence of shallow groundwater beneath the site, between 1.10m and 3.60m bgl within the Glaciofluvial Deposits (classified as a Secondary A Aquifer) and is likely to be subject to seasonal variations. The groundwater observations are considered to represent true groundwater, rather than minor perched volumes.

It is considered unlikely that dewatering will be required for shallow short-term excavations. The observed groundwater conditions suggest that only simple dewatering techniques (e.g. sump pumping) will be needed to control water ingress into shallow excavations. The use of full dewatering systems (e.g. well pointing) may be necessary to dewater deeper excavations. Care should be taken to ensure that dewatering does not lead to settlement of soils below existing structures or services on or off-site.

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

Yours sincerely,
for GRM Development Solutions Ltd

Matthew Tomkins BSc (Hons) PGDip FGS
Acting Principal Engineering Geologist

Joe Baker MSci (Hons) FGS
Senior Engineering Geologist

Enc:
P10558 Gas Monitoring Location Plan
P10558 Gas Monitoring Results
P10558 Ternary Gas Plot



NOTES:

CLIENT:

DAVIDSONS DEVELOPMENTS LTD

PROJECT No:

P10558

DATE:

AUG 2024

DESIGN/DRAWN:

JB

PROJECT:

KIRKBY ROAD, DESFORD

DRAWING NUMBER:

004

ISSUE:

FINAL

TITLE:

GAS MONITORING PLAN

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In-Situ Gas Monitoring Results

Project Name	Kirkby Road, Desford, Leicestershire
Project Number	10558
Client	Davidsons Developments Ltd
Date	13/08/2024
Weather	Hot
Atmospheric Pressure (mb)	993
Pressure Trend	Steady
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	3.9	3.9	18.2	18.2	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	5.8	5.8	17.3	17.3	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	3.4	3.4	18.4	18.4	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	3.1	3.1	18.8	18.8	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	1.5	1.5	19.6	19.6	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
3.2	3.6
2.7	3.6
2.7	3.9
1.9	3.9
2.1	3.9

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)		
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

Ground Material Key

NS	Natural Strata
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Key

	Threshold gas concentration exceeded
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In-Situ Gas Monitoring Results

Project Name	Kirkby Road, Desford, Leicestershire
Project Number	10558
Client	Davidsons Developments Ltd
Date	29/08/2024
Weather	Mostly Cloudy
Atmospheric Pressure (mb)	1000
Pressure Trend	Steady
Equipment	Gas Data GFM436
Operator	Steffan Williams

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	2.5	2.5	18.9	18.9	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	3.1	3.1	18.7	18.7	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	3.4	3.4	18.2	18.2	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	2.3	2.3	19.3	19.3	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	1.5	1.5	19.9	19.9	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
3.5	3.8
2.9	3.5
3.0	3.9
2.6	4.0
2.2	3.9

Notes

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

Ground Material Key



In-Situ Gas Monitoring Results

Project Name	Kirkby Road, Desford, Leicestershire
Project Number	10558
Client	Davidsons Developments Ltd
Date	11/09/2024
Weather	Light rain
Atmospheric Pressure (mb)	993
Pressure Trend	Steady
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	3.1	3.1	18.0	18.0	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	2.6	2.6	17.8	17.8	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	3.9	3.9	17.1	17.1	0.1	0.1	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	2.5	2.5	18.2	18.2	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	1.7	1.7	19.2	19.2	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
3.6	3.7
3.4	3.5
2.9	4.0
2.1	3.6
2.2	3.9

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



In-Situ Gas Monitoring Results

Project Name	Kirkby Road, Desford, Leicestershire
Project Number	10558
Client	Davidsons Developments Ltd
Date	27/09/2024
Weather	Light rain
Atmospheric Pressure (mb)	975
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	2.5	2.5	17.5	17.5	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	3.5	3.5	15.5	15.5	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	4.2	4.2	16.3	16.3	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	3.0	3.0	16.2	16.2	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	2.0	2.0	17.3	17.3	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
3.5	3.8
3.0	3.5
2.8	4.0
2.7	3.7
2.0	3.9

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	
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

Ground Material Key

NS	Natural Strata
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In-Situ Gas Monitoring Results

Project Name	Kirkby Road, Desford, Leicestershire
Project Number	10558
Client	Davidsons Developments Ltd
Date	08/10/2024
Weather	Rain
Atmospheric Pressure (mb)	977
Pressure Trend	Steady
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	3.5	3.5	17.1	17.1	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	4.6	4.6	14.3	14.3	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	4.0	4.0	16.4	16.4	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.9	0.9	19.3	19.3	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	2.5	2.5	17.2	17.2	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
2.6	3.8
2.5	3.5
2.2	4.0
1.1	3.7
1.8	3.9

Notes

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

Ground Material Key



In-Situ Gas Monitoring Results

Project Name	Kirkby Road, Desford, Leicestershire
Project Number	10558
Client	Davidsons Developments Ltd
Date	23/10/2024
Weather	Sunny
Atmospheric Pressure (mb)	1017
Pressure Trend	Steady
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	3.2	3.2	16.9	16.9	0.0	0.0	Not Recorded	
WS02	1.0	4.0	NS	0.0	0.0	4.5	4.5	14.7	14.7	0.1	0.1	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	4.3	4.3	15.9	15.9	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.6	0.6	19.8	19.8	0.0	0.0	Not Recorded	
WS06	1.0	4.0	NS	0.0	0.0	2.3	2.3	17.8	17.8	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
2.9	3.8
2.6	3.5
2.1	4.0
1.1	3.8
1.9	4.0

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

NS	Natural Strata
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a	Methane => 1% v/v
b	Carbon Dioxide => 5% v/v
MG	Made Ground
NS	Natural Strata

**Ternary Gas Plot as discussed in Ground Gas
Information Sheet 1 (Wilson, Collins & Lavery 2018)**

Project Number: P10558

Site Name: Kirkby Road,
Desford
Produced By: CF

Date: 04/11/2024



-  Indicative of microbial respiration of organic material
-  Indicative of landfill gas
-  Indicative of geogenic gas
-  Illustrative of landfill gas migration

