

Our ref. 24-112.01L

Michael Parham
Broadgrove Planning & Development Ltd
Regent House
Suite Four
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Heaton Lane
Stockport
SK4 1BS

9th July 2024

Dear Michael,



Arc Environmental Ltd
Solum House
Unit 1 Elliott Court
St Johns Road
Meadowfield
Durham
DH7 8PN

Re: Highfields Apartments, New North Road, Huddersfield, HD1 5LS – Hazardous Ground Gas Risk Assessment Addendum Report

This letter report is an addendum to the Phase 2: Ground Investigation Report (Project ref. 24-112, May 2024) undertaken for the proposed development at the above location.

Please find enclosed:

- ARC Environmental Ground Gas Monitoring Certificate

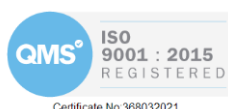
Monitoring was undertaken using Gas Data GFM 435 infra-red gas analyser with integral flow meter, and an electronic dipmeter.

Based on the findings of the intrusive investigation works, in accordance with CIRIA Report C665, November 2007, Report Edition No. 04, March 2007 and BS8485:2015+A1 2019 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, it is felt that an adequate risk assessment can be undertaken based on the following limiting factors:

- The development has been considered as **moderate sensitivity** i.e. apartments (Tables 5.5a & 5.5b – Typical/Idealised frequency and period of monitoring, after Wilson et al, 2005).
- The risk associated with the generation potential of a source is considered as **low** (Based on the findings of intrusive works).
- Monitoring over a **minimum of three months** with **six recorded** readings (Tables 5.5a & 5.5b – Typical /idealised frequency and period of monitoring after Wilson et al, 2005).
- **Negligible** flow rates are recorded during the monitoring period (Table 8.5 – Modified Wilson & Card classification).

Historically, site visits to undertake gas monitoring were typically carried out at regular intervals (i.e. weekly, fortnightly, monthly, etc.), however this does not always correlate with ‘worst case’ scenarios for falling atmospheric conditions. Within CIRIA C665 it is suggested that a ‘worst case’ scenario for ground gas emissions is more likely to occur during rapid falls in atmospheric pressure, in particular from c.1020mb and c.1010mb. In addition, it has also been suggested that low atmospheric pressures (i.e. c.1000mb and below) can give rise to greater emission potential for lighter gases, in particular methane.

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Re: Highfields Apartments, New North Road, Huddersfield, HD1 5LS – Hazardous Ground Gas Risk Assessment Addendum Report (Cont'd)

As such for this monitoring, a targeted and phased programme of gas monitoring has been completed which has obtained gas monitoring readings during varying atmospheric conditions and which also covers the ‘worst case’ scenarios.

The monitoring visits correlate to worst case conditions with falling atmospheric pressure trends, and atmospheric pressures close to 1000mb. As such it is felt that this programme of monitoring has adequately characterised the site. The monitoring results for all 6 no. visits undertaken can be seen attached with this report.

As can be seen from the results, no concentrations Methane (CH₄) have been recorded during the monitoring period. Concentrations of Carbon Dioxide (CO₂) have been recorded, up to a maximum recorded level of 4.4% v/v, with associated depleted oxygen (O₂) concentrations (16.1% v/v). Negligible flow rates have been recorded during the monitoring period.


For the purposes of assessing the proposed development, the site is characterised based on the limiting borehole hazardous gas flow rate (Q_{hg}) for Methane and Carbon Dioxide, known as the Gas Screening Value (GSV), which in turn determines the level of any gas protection required, in accordance with Table 2 in BS8485 and Tables 8.5 & 8.7 in CIRIA C665.

- Methane (CH₄) – Due to the lack of Methane recorded, a GSV cannot be calculated.
- Carbon Dioxide (CO₂) - multiplying the maximum concentration recorded (taken as 4.4%) by the maximum flow rate (taken as 0.1 l/hr.) which gives a GSV of 0.0044 l/hr. (calculated from 4.4% (0.044) x 0.1 l/hr. maximum flow rate) for CO₂.

When considering these results, in accordance with CIRIA C665, the GSV for CO₂ falls below the lower target concentration of 0.07 l/hr and would equate to a Characteristic Situation 1 (CS1) site classification, resulting in no gas protective measures being required for the proposed development.

I trust the information we have provided to you is to your satisfaction. However, if you require any further information or clarification, please do not hesitate to contact us.

Yours sincerely,



For and on behalf of Arc Environmental Ltd
Thomas White BSc MEnvSc
Associate

Arc Environmental Ground Gas & Groundwater Monitoring Certificate



Site:	HIGHFIELD APARTMENTS
Ref:	24-112

Visit	Date	Time	Equipment	Weather	Initials	Comments	Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Trend	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Hydrocarbons (GFM 435 only)		Other Gases (PPM)			Depth to Water (m bgl)
											Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Hex %	PID Cf	PID (Isobutylene)	H ₂ S	CO	
1	24/04/24	9.30am	GFM435	OVERCAST	PR		WS02	<0.1	1005			0.0	0.0		2.7		17.4				0.0	0.0	DRY	
							WS03	<0.1	1005			0.0	0.0		0.8		19.6				0.0	0.0	DRY	
							WS04	<0.1	1005			0.0	0.0		2.4		17.8				0.0	0.0	DRY	
2	09/05/2024	10.15am	GFM435	SUNNY	PR		WS02	<0.1	1016			0.0	0.0		2.5		18.7				0.0	0.0	DRY	
							WS03	<0.1	1014			0.0	0.0		0.3		20.1				0.0	1.0	DRY	
							WS04	<0.1	1015			0.0	0.0		3.2		16.7				0.0	0.0	DRY	
3	22/05/24	9.40am	GFM435	RAIN	PR		WS02	<0.1	992			0.0	0.0		1.7		19.2				0.0	0.0	DRY	
							WS03	<0.1	992			0.0	0.0		2.0		17.5				0.0	1.0	DRY	
							WS04	<0.1	991			0.0	0.0		4.4		16.1				0.0	0.0	DRY	
4	06/06/2024	11.30am	GFM435	CLOUDY	PR		WS02	<0.1	1003			0.0	0.0		0.7		19.8				0.0	1.0	0.9	
							WS03	<0.1	1003			0.0	0.0		0.9		19.6				0.0	1.0	DRY	
							WS04	<0.1	1002			0.0	0.0		2.6		18.4				0.0	1.0	DRY	
5	20/06/24	10.45am	GFM435	CLOUDY	PR		WS02	<0.1	1008			0.0	0.0		2.4		18.3				0.0	0.0	1.1	
							WS03	<0.1	1008			0.0	0.0		1.7		18.1				0.0	1.0	DRY	
							WS04	<0.1	1008			0.0	0.0		3.9		15.9				0.0	0.0	DRY	
6	03/07/2024	10:00am	GFM435	OVERCAST	PR		WS02	<0.1	994			0.0	0.0		2.7		18.1				0.0	0.0	1.1	
							WS03	<0.1	994			0.0	0.0		1.7		18.1				0.0	1.0	DRY	
							WS04	<0.1	994			0.0	0.0		1.2		19.7				0.0	0.0	DRY	

Notes:
 Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr
 Monitoring order is from **Left to Right** across table
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes
 N/A = Not applicable = Off the scale

Cf = PID compensation Factor (1-10) - Must be used to multiply the PID reading to give an accurate measure of the total hydrocarbons in the borehole when methane is present
 Hex = Hexane (Valid and in range up to 2.000%) - Recorded when abnormally high methane is present.
 PID = Photo Ionisation Detector (Calibrated to Isobutylene)