

Site Investigations



Geologists



Environmental &  
Geotechnical  
Engineers



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FAO: Dempsey & Gannon

Date: 18<sup>th</sup> October 2024

## GROUND GAS RISK ASSESSMENT

**Milnsbridge, Huddersfield  
S240420/GAS**

### INTRODUCTION

#### Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Dempsey & Gannon, on land located at Royal Terrace, Milnsbridge, Huddersfield, HD3 4PL (Figure 1).

- *Solmek Phase 1 Desk Study (S230504/DS, May 2024)*
- *Solmek Phase 2 Investigation Report (S230504/SI, June 2024)*

Reference should be made to the above reports for details of the site's history, environmental/contamination setting and expected underlying geological conditions.

#### Scope of Works

The site is expected to be developed with multiple industrial units, access roads, parking, and open green spaces.

The information provided in this Ground Gas Assessment is based on the investigation fieldwork and is subject to the comments and approval of the various Regulatory Authorities. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information be available or provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

### GROUND GAS ASSESSMENT

Ground gases such as carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) can be classed as a form of contamination where there is a potential risk to human health. As a result, gas monitoring has been undertaken. Six visits have been carried out between June 2024 and September 2024 to assess the potential risks posed by ground gases.

The gas was monitored by measuring emissions from monitoring points installed into BH02, BH03 and BH05 during the fieldwork. Figure 2, appended to this letter report, shows the borehole locations.

The monitoring was generally carried out in accordance with current guidance provided within CIRIA C665:2007. The results are attached to this letter report.

#### Ground Gas Results

The atmospheric pressure has an impact on the concentrations of gas released. The atmospheric pressure ranged between 992 and 1018 millibars during the surveys. Times of falling and rising atmospheric pressure regional trends were noted during the survey. This is considered to be a good range of conditions for the time of year.

- Methane was not detected.
- Carbon dioxide concentrations were recorded between 0.0% and 3.0%.
- Oxygen levels were between 17.0% and 20.8%.
- No significant flow rates were recorded.

## Ground Gas Analysis

The results obtained have been compared with relevant guidance that includes the following:

- BRE/Environment Agency BR414 (2001) – Protective Measures for Housing on Gas-Contaminated Land
- Wilson & Card (1999) – Reliability and Risk in Gas Protection Design
- CIRIA 149 (1995) – Protecting Development from Methane
- CIRIA C665 (2007) – Assessing Risks Posed by Hazardous Ground Gases to Buildings.
- BS8485 (2015) + A1 (2019) – Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings

The Building Regulations set action levels for both methane and carbon dioxide from which an initial assessment can be made. The action threshold for methane is 1% while for carbon dioxide an initial consideration should be undertaken if gas concentrations exceed 1.5%. Action might be required if carbon dioxide concentrations exceed 5%. If these thresholds are exceeded, reference should be made to specific documentation to determine the nature and extent of the gas control measures required.

A Characteristic Situation ranking of between 1 and 6 is given based on the ground gas monitoring results coupled with the gas flow rate. These combined produces a Gas Screening Value (GSV). Where no flow is recorded a flow rate of 0.1l/hr is assumed. The GSV and risk classification define the characteristic situation, which are comparable to the table below, taken from CIRIA C665, and derived from CIRIA R149. Given that the site will be covered by hardstanding and the building will be for commercial use, the protection measures required are based on CIRIA R149, shown in Table 1 below.

### CIRIA R149 GAS REGIMES

Characteristic Situation (CS)	Risk Classification	Gas Screening Value CH <sub>4</sub> or CO <sub>2</sub> (l/hr)	Additional Factors
1	Very Low Risk	<0.07	CS1 where CH <sub>4</sub> is <1% and/or CO <sub>2</sub> is <5%. Otherwise increase to CS2
2	Low Risk	<0.7	
3	Moderate Risk	<3.5	
4	Moderate to High Risk	<15	
5	High Risk	<70	
6	Very High Risk	>70	

The worst case GSV can be taken from the highest flow rate recorded over the visits (0.1l/hr) along with the greatest volume of CO<sub>2</sub> (3.0%). Based on these figures the worst GSV has been calculated as 0.0030(l/hr). The gas screening values from the monitoring visits would place the site in **Characteristic Situation (CS) 1**.

A series of tables adapted from **BS:8485** are attached to the rear of this letter.

The type of building and gas protection level generate a minimum gas protection points score, in this case a commercial building (Type D) combined with CS1 has a score of **0 points**. Given the ground gas levels and associated score, **no ground gas protection measures are considered necessary**.

The property is an Intermediate probability Radon Affected area, as 3 to 5% of homes are estimated to be at or above the Action Level. In accordance with the procedure described in BRE Publication BR211 Radon: Guidance on Protective Measures for New Dwellings, basic radon protective measures are necessary in the construction of new dwellings or extensions.

Yours sincerely,

Lauren Oxley  
Gas Technician  
On behalf of Solmek Ltd.



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**Figure Title**

Site Location Plan

**Project Number**

S240420

**Project Name**

Milnsbridge, Huddersfield

**Client**

Dempsey and Gannon

**Date**

June 2024

**DRG Number**

Figure 1

**Scale**

1:3000 @ A4 [DO NOT SCALE]

**Legend Key**

Project Bounds - Project Bounds



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**Figure Title**

Exploratory Hole Location Plan

**Project Number**

S240420

**Project Name**

Milnsbridge, Huddersfield

**Client**

Dempsey and Gannon

**Date**

June 2024




**DRG Number**

Figure 2

**Scale**

1:1500 @ A4 [DO NOT SCALE]

**Legend Key**

-  Locations By Type - BH
-  Locations By Type - TP
-  Project Bounds - Project Bounds



## GAS MONITORING RESULTS

Project number	S240420
Project name	Milnsbridge, Huddersfield
Client	Dempsey and Gannon
Visit no	1
Date	20/06/2024
Equipment	GFM 435 Gas Analyser
Operator	LO

Weather Conditions	Sunny
Ground Conditions	Dry
Ambient Atmospheric Pressure	1003
Regional Pressure Trend	Falling

Position	Flow	Pressure	CH4		CO2		O2 (% v/v)	CO (ppm)	H2S (ppm)	Groundwater Level (mbgl)	Depth to Base (mbgl)	Notes
			(% v/v)	GSV (l/hr)	(% v/v)	GSV (l/hr)						
BH02	0.1	1003	0.0	0.0000	1.7	0.0017	19.2	0.0	0.0	0.50	0.73	
BH03	0.1	1003	0.0	0.0000	1.4	0.0014	18.7	0.0	0.0	Dry	1.50	
BH05	0.1	1003	0.0	0.0000	0.1	0.0001	20.7	0.0	0.0	Dry	1.50	

### KEY

**CH<sub>4</sub>** = Methane, **CO<sub>2</sub>** = Carbon Dioxide, **O<sub>2</sub>** = Oxygen, **CO** = Carbon Monoxide, **H<sub>2</sub>S** = Hydrogen Sulphide, **GSV** = Gas Screening Value (If no flow is recorded a value of 0.1 is assumed), ND = Not Detected, \* = not measured, N/A = Not applicable, % = % by volume, mbgl = m below ground level, ppm = parts per million.



## GAS MONITORING RESULTS

Project number	S240420
Project name	Milnsbridge, Huddersfield
Client	Dempsey and Gannon
Visit no	2
Date	04/07/2024
Equipment	GFM 435 Gas Analyser
Operator	LO

Weather Conditions	Wet
Ground Conditions	Damp
Ambient Atmospheric Pressure	992
Regional Pressure Trend	Rising

Position	Flow	Pressure	CH4		CO2		O2 (% v/v)	CO (ppm)	H2S (ppm)	Groundwater Level (mbgl)	Depth to Base (mbgl)	Notes
			(% v/v)	GSV (l/hr)	(% v/v)	GSV (l/hr)						
BH02	0.1	992	0.0	0.0000	0.3	0.0003	19.9	0.0	0.0	0.60	0.73	
BH03	0.1	992	0.0	0.0000	0.1	0.0001	20.6	0.0	0.0	Dry	1.50	
BH05	0.1	992	0.0	0.0000	0.4	0.0004	20.2	0.0	0.0	Dry	1.50	

### KEY

**CH<sub>4</sub>** = Methane, **CO<sub>2</sub>** = Carbon Dioxide, **O<sub>2</sub>** = Oxygen, **CO** = Carbon Monoxide, **H<sub>2</sub>S** = Hydrogen Sulphide, **GSV** = Gas Screening Value (If no flow is recorded a value of 0.1 is assumed), ND = Not Detected, \* = not measured, N/A = Not applicable, % = % by volume, mbgl = m below ground level, ppm = parts per million.



## GAS MONITORING RESULTS

Project number	S240420
Project name	Milnsbridge, Huddersfield
Client	Dempsey and Gannon
Visit no	3
Date	16/07/2024
Equipment	GFM 435 Gas Analyser
Operator	LO

Weather Conditions	Wet
Ground Conditions	Wet
Ambient Atmospheric Pressure	995
Regional Pressure Trend	Rising

Position	Flow	Pressure	CH4		CO2		O2 (% v/v)	CO (ppm)	H2S (ppm)	Groundwater Level (mbgl)	Depth to Base (mbgl)	Notes
			(% v/v)	GSV (l/hr)	(% v/v)	GSV (l/hr)						
BH02	0.1	995	0.0	0.0000	2.2	0.0022	19.0	0.0	0.0	0.50	0.73	
BH03	0.1	995	0.0	0.0000	2.3	0.0023	18.4	0.0	0.0	Dry	1.50	
BH05	0.1	995	0.0	0.0000	0.6	0.0006	20.4	0.0	0.0	Dry	1.50	

### KEY

**CH<sub>4</sub>** = Methane, **CO<sub>2</sub>** = Carbon Dioxide, **O<sub>2</sub>** = Oxygen, **CO** = Carbon Monoxide, **H<sub>2</sub>S** = Hydrogen Sulphide, **GSV** = Gas Screening Value (If no flow is recorded a value of 0.1 is assumed), ND = Not Detected, \* = not measured, N/A = Not applicable, % = % by volume, mbgl = m below ground level, ppm = parts per million.



## GAS MONITORING RESULTS

Project number	S240420
Project name	Milnsbridge, Huddersfield
Client	Dempsey and Gannon
Visit no	4
Date	07/08/2024
Equipment	GFM 435 Gas Analyser
Operator	LO

Weather Conditions	Cloudy
Ground Conditions	Damp
Ambient Atmospheric Pressure	1008
Regional Pressure Trend	Rising

Position	Flow	Pressure	CH4		CO2		O2 (% v/v)	CO (ppm)	H2S (ppm)	Groundwater Level (mbgl)	Depth to Base (mbgl)	Notes
			(% v/v)	GSV (l/hr)	(% v/v)	GSV (l/hr)						
BH02	0.1	1008	0.0	0.0000	1.2	0.0012	19.6	0.0	0.0	Dry	0.73	
BH03	0.1	1008	0.0	0.0000	0.2	0.0002	20.8	0.0	0.0	Dry	1.50	
BH05	0.1	1008	0.0	0.0000	0.1	0.0001	20.7	0.0	0.0	Dry	1.50	

### KEY

**CH<sub>4</sub>** = Methane, **CO<sub>2</sub>** = Carbon Dioxide, **O<sub>2</sub>** = Oxygen, **CO** = Carbon Monoxide, **H<sub>2</sub>S** = Hydrogen Sulphide, **GSV** = Gas Screening Value (If no flow is recorded a value of 0.1 is assumed), ND = Not Detected, \* = not measured, N/A = Not applicable, % = % by volume, mbgl = m below ground level, ppm = parts per million.



## GAS MONITORING RESULTS

Project number	S240420
Project name	Milnsbridge, Huddersfield
Client	Dempsey and Gannon
Visit no	5
Date	21/08/2024
Equipment	GFM 435 Gas Analyser
Operator	LO

Weather Conditions	Cloudy
Ground Conditions	Damp
Ambient Atmospheric Pressure	997
Regional Pressure Trend	Falling

Position	Flow	Pressure	CH4		CO2		O2 (% v/v)	CO (ppm)	H2S (ppm)	Groundwater Level (mbgl)	Depth to Base (mbgl)	Notes
			(% v/v)	GSV (l/hr)	(% v/v)	GSV (l/hr)						
BH02	0.1	997	0.0	0.0000	1.6	0.0016	19.3	0.0	0.0	Dry	0.73	
BH03	0.1	997	0.0	0.0000	0.1	0.0001	20.8	0.0	0.0	Dry	1.50	
BH05	0.1	997	0.0	0.0000	0.0	0.0000	20.8	0.0	0.0	Dry	1.50	

### KEY

**CH<sub>4</sub>** = Methane, **CO<sub>2</sub>** = Carbon Dioxide, **O<sub>2</sub>** = Oxygen, **CO** = Carbon Monoxide, **H<sub>2</sub>S** = Hydrogen Sulphide, **GSV** = Gas Screening Value (If no flow is recorded a value of 0.1 is assumed), ND = Not Detected, \* = not measured, N/A = Not applicable, % = % by volume, mbgl = m below ground level, ppm = parts per million.



## GAS MONITORING RESULTS

Project number	S240420
Project name	Milnsbridge, Huddersfield
Client	Dempsey and Gannon
Visit no	6
Date	17/09/2024
Equipment	GFM 435 Gas Analyser
Operator	LO

Weather Conditions	Sunny
Ground Conditions	Dry
Ambient Atmospheric Pressure	1018
Regional Pressure Trend	Steady

Position	Flow	Pressure	CH4		CO2		O2 (% v/v)	CO (ppm)	H2S (ppm)	Groundwater Level (mbgl)	Depth to Base (mbgl)	Notes
			(% v/v)	GSV (l/hr)	(% v/v)	GSV (l/hr)						
BH02	0.1	1018	0.0	0.0000	3.0	0.0030	17.7	0.0	0.0	0.78	0.73	
BH03	0.1	1018	0.0	0.0000	2.3	0.0023	17.0	0.0	0.0	Dry	1.50	
BH05	0.1	1018	0.0	0.0000	1.2	0.0012	19.6	0.0	0.0	Dry	1.50	

### KEY

**CH<sub>4</sub>** = Methane, **CO<sub>2</sub>** = Carbon Dioxide, **O<sub>2</sub>** = Oxygen, **CO** = Carbon Monoxide, **H<sub>2</sub>S** = Hydrogen Sulphide, **GSV** = Gas Screening Value (If no flow is recorded a value of 0.1 is assumed), ND = Not Detected, \* = not measured, N/A = Not applicable, % = % by volume, mbgl = m below ground level, ppm = parts per million.

## GAS PROTECTION REQUIREMENTS IN LINE WITH BS8485:2015 + A1:2019

Characteristic Situation	Minimum gas protection score (points)			
	High Risk	Medium Risk		Low Risk
	Type A (Private)	Type B (Private or commercial /public)	Type C (Commercial /public)	Type D (Commercial /industrial)
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4	3	2.5
4	6.5 A)	5.5 A)	4.5	3.5
5	B)	6.0 A)	5.5	4.5
6	B)	B)	B)	6.0

A) Residential should not be built on CS4 or higher without additional levels of protection  
 B) The gas hazard is too high for this empirical method used to define gas protection measures

*Adapted from Table 4 of BS:8485:2015 +A1:2019*

Element	Score
<b>Floor and Substructure Design</b>	
Precast suspended segmental subfloor (i.e. Beam and block)	0
Cast in situ ground bearing floor slab (with only minimum mesh reinforcement)	0.5
Cast in situ monolithic reinforced ground bearing raft or suspended floor slab with minimal penetrations	1 or 1.5
Basement floor and walls conforming to BS8102:2009 Grade 2 C) + D)	2
Basement floor and walls conforming to BS8102:2009 Grade 3 C) + D)	2.5
<b>Venting Design</b>	
Pressure relief pathway	0.5
Passive sub floor dispersal layer	1.5 or 2.5
Active dispersal layer	1.5-2.5
Active positive pressurization	1.5-2.5
Ventilated car park	4
<b>Gas Membrane</b>	
Gas membrane meeting requirements	2

*Adapted from Tables 5, 6 and 7 of BS:8485:2015 +A1:2019*

**♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2024)**

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3<sup>rd</sup> parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2011 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.