

Ground Gas Risk Assessment

LAND OFF BURY OLD ROAD, DARN HILL, HEYWOOD

Project Ref: GUK-0224-05

For: ECS Capital Limited

CLIENT:

ECS Capital Limited

PROJECT:

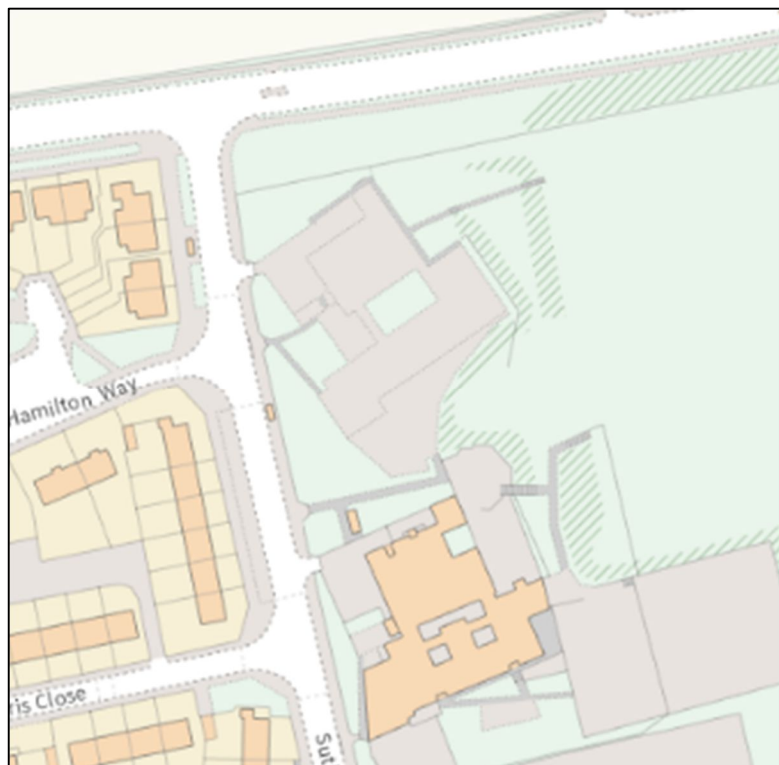
Residential Development

SITE REFERENCE:

**Land off Bury Old Road
Darn Hill
Heywood**

REPORT REFERENCE:

GUK-0224-05/Rp-003



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1 INTRODUCTION

1.1 Appointment

Groundsmiths (UK) Ltd ('Groundsmiths') were appointed by ECS Capital Limited (the 'Client') % Built Developments Limited to undertake periodic monitoring of biogenic ground gases at their residential development located off Bury Old Road, Darn Hill, Heywood (the 'Site').

Groundsmiths have prepared this report (the 'Report') for the sole use of the Client that commissioned it in accordance with the agreement under which our services are performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report. Any unauthorised third parties using the information presented do so entirely at their own risk and are duly excluded from any warranty, duty of care or skill.

No part of this Report shall be reproduced or redistributed without the prior written consent of Groundsmiths. However, the Report may be issued by the Client or their Agent to the Local Planning Authority to support the discharge of any pre-commencement, pre-occupancy or other stage of development condition as may be imposed in relation to the Site's assessment under the Town and Country Planning Act 1990.

1.2 Report Context and Objectives

Groundsmiths' recent involvement with the Site comprised the completion of an LCRM: Stage 1 Risk Assessment ^[1] and the undertaking of an intrusive site investigation ^[2]. These works were completed to support the Client's planning application for the development, although from an environmental perspective part of that was to identify the level of risk associated with any potential fugitive biogenic ground gas regime.

This Report therefore follows on from the aforementioned documentation and aims to provide a summary of the ground gas data acquired in relation to the development as proposed, and to identify where any remedial measures are required in construction.

It should be noted that it is not the intention of this Report to reproduce the content of the preliminary risk assessment and/or site investigation, so reference to those documents should be made as required. With the remit of this study, however, a brief summary of the Site's Conceptual Site Model is given for completeness.

1.3 Limitations of Study

All previously issued reports, data, and ground related information prepared for the Site should be referred to as necessary. Interpretation and recommendations given in this Report should not be assumed valid for adjacent areas of land, or for alternate land use. Should the proposed Site usage change, the recommendations and conclusions presented in this Report may need to be re-assessed in accordance with current guidance.

The appraisal presented herein has been undertaken subject to the limitations detailed in Section 4, and/or any other limitations as may be stated in the Report.

2 GROUND GAS RISK

2.1 Conceptual Site Model

As indicated above, an initial assessment of risk for the Site and a detailed phase of follow-on intrusive ground investigation has been completed. The general Conceptual Site Model, resulting from the findings of those studies, indicated that:

- Third party information recorded the presence of made ground both on and immediately adjacent to the Site. The investigation found that it appears to be underlain by a relatively thin and discontinuous mantle of made ground, with this being typically around 0.5m thick but deepening to ~2.0m within the footprint to the former school building. Material composition was observed to be largely consistent between each of the investigation positions, with the soils essentially comprising a loose or compact granular deposit of sand with some inclusions of concrete, hardcore, and gravel of mixed lithology. No deleterious or vegetative materials were apparent;
- Beneath the made ground were proven Glaciofluvial Deposits which extended to in excess of 15m bgl (based on dynamic probe data). These soils predominantly comprised loose becoming medium dense orange-brown gravelly sands. Some thin discrete partings of clay were recorded locally within the sands, but there was no evidence of organic material;
- The underlying bedrock is sandstone (Helpet Edge Rock) and that of the Coal Measures. These were not visibly observed during the investigation given their depth;
- Only localised groundwater seepage was recorded from a depth of 3.0m bgl at the position of borehole BH5;
- Risk associated with shallow coal mining (including mine gases) was not expected on the basis of available Coal Authority data;
- Third party data recorded the presence of former sand extraction pits on the northern side of Bury Old Road from c.1851. It is understood that these were subsequently used, in part, for landfilling. Records identify Boo-Hole Sand Quarry Extension from a distance of 38m from the Site, with this having been licensed to accept inert, industrial, commercial, household, and special wastes. The license was surrendered on 18th January 1991.

Following completion of the qualitative risk assessment, which followed guidance prescribed by Rudland et al ^[3], it was identified that an overall moderate risk from biogenic ground gases should be anticipated based on the Site's setting, the expectant granular nature of the shallow underlying soils, and the identified potential migration pathways (i.e. via permeable soils with subsequent accumulation in buildings/void spaces). It was recommended that mitigation measures consistent with Characteristic Situation 2 of BS8485 ^[4] should be allowed for until confirmed through monitoring.

2.2 Monitoring Programme & Results

Toxic, asphyxiating, flammable, and potentially explosive ground gases can enter buildings and other structures on and below the ground. A potential risk to building development may therefore exist where methane and/or carbon dioxide concentrations exceed a calculated

Gas Screening Value¹ and there is measurable gas flow emission. Characteristic Situation 1 (very low hazard potential) is given a Gas Screening Value threshold of 0.07 L/hr, for either carbon dioxide or methane, and is the point at which no special precautions in construction are deemed necessary; methane concentrations for Characteristic Situation 1 need to be typically less than 1.00%v/v, whilst for carbon dioxide this is 5.00%v/v. Above these concentrations, *consideration* should be given to providing the appropriate level of gas protective measures as specified in current guidance, such as Characteristic Situation 2.

In light of the Site's potential gas risk, monitoring comprising 6 No. return visits commenced on the 27th September 2024 and finished on the 9th January 2025; monitoring has therefore been completed across a total period of 15 weeks. The objective of the monitoring was to establish general baseline gas concentrations for the Site and to identify if any protective measures in construction would be required. The piezometer wells (GW1 to GW4), as installed by the drilling contractor on the between the 25th September 2024, were utilised for the monitoring; the positions of these are indicated on appended Figure Ref. 0224-05-001.

Monitoring was undertaken using a Gas Data[®] GFM436-1 analyser which is equipped to monitor and analyse the gas content of landfill, biogas, and contaminated land sites. The parameters measured were CH₄, O₂, CO₂, H₂S, CO, atmospheric pressure, and gas flow. Specialist functionality of the instrument also includes measurement of Hexane and the Lower Explosive Limit (LEL) of methane, both of which are reported in the results tables given in Appendix A. Background conditions were monitored on each sampling event, the results of which are also provided for information.

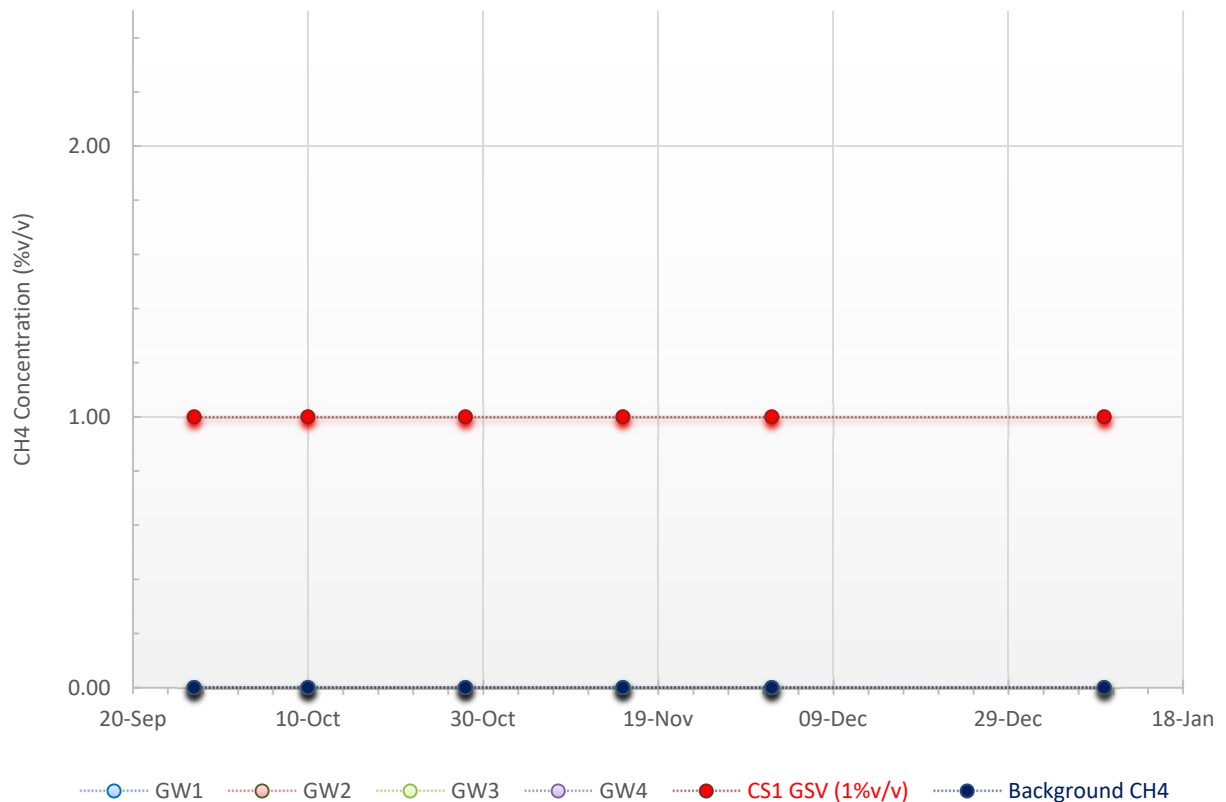
In summary, the following data may be reported:

Methane (CH₄)

With respect to methane, measured concentrations across all six monitoring events were recorded at 0.00%v/v in all four piezometers. A summary of the methane monitoring data is presented in Graph 1, overleaf.

Background atmospheric methane concentrations were measured at 0.00%v/v across the complete monitoring period, which would be expected.

¹ Gas Screening Value – The flow rate of a gas representative of a site or zone within a site, derived from the assessment of gas concentration and flow rate measurements, but taking into account all other factors in accordance with the Conceptual Site Model. The Gas Screening Value is based on measured data, but ultimately derived using professional judgement.



Graph 1: Methane Concentrations (%v/v) with Time

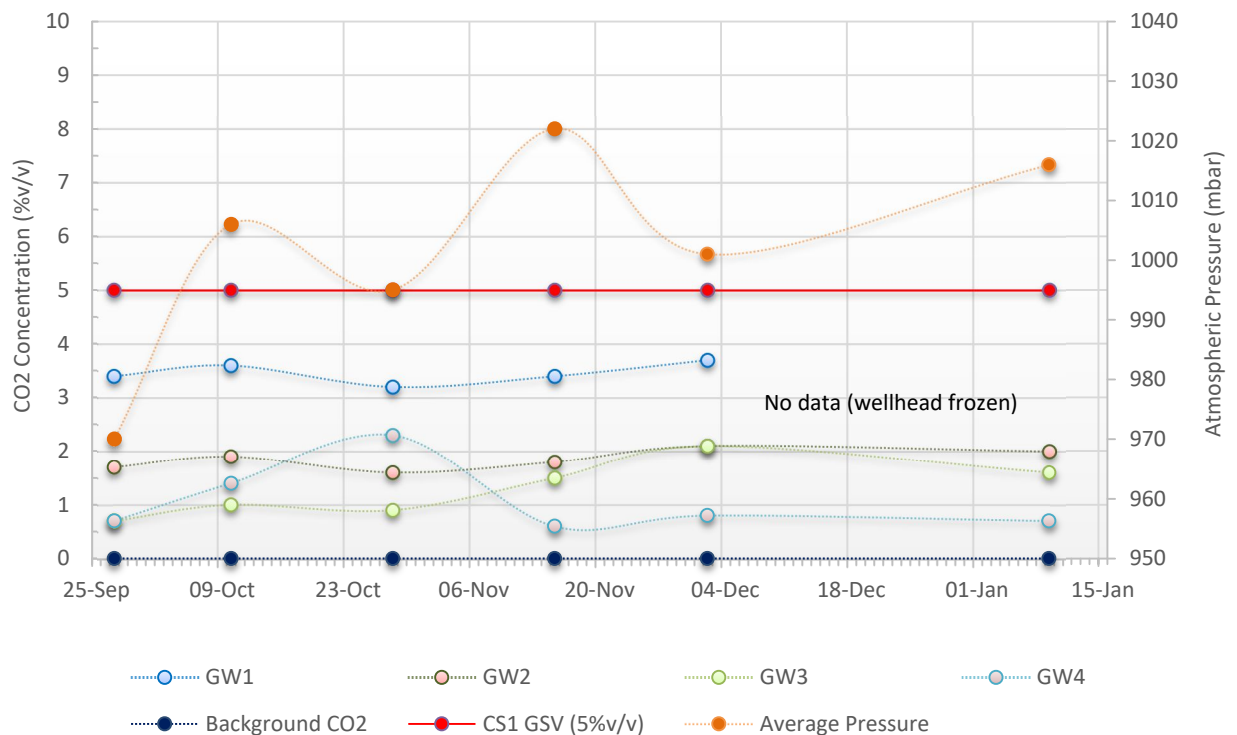
Carbon Dioxide (CO₂)

The measured concentrations of carbon dioxide within all four monitoring wells were found to be variable, but below the BS8485 Characteristic Situation 1 Gas Screening Value of 5.00%v/v across the monitoring period.

In GW1, carbon dioxide concentrations were higher than for the other three piezometers and ranged between 3.20%v/v (28th October 2024) and 3.70%v/v (2nd December 2024), with the average across the monitoring events being 3.46%v/v (the final monitoring event undertaken on the 9th January 2025 could not be completed for this position due to the wellhead being flooded and frozen over).

For GW2, the measured concentrations of carbon dioxide were between 1.60%v/v (28th October 2024) and 2.10%v/v (2nd December 2024), with the average across the monitoring events being 1.85%v/v. Further within the Site, measured concentrations in GW3 and GW4 were slightly lower again, often being less than 1.00%v/v (the average measured concentration in GW3 was 1.30%v/v, whilst for GW4 it was 1.08%v/v).

A graphical representation of the monitoring data is presented in Graph 2, overleaf. Background atmospheric carbon dioxide concentrations were measured to be 0.00%v/v across the monitoring period, which would be expected.



Graph 2: Carbon Dioxide Concentrations (%v/v) with Time & Pressure (mbar)

Hexane (Hex)

The GFM436 analyser incorporates an additional hexane calibration of the infra-red sensor which is used to indicate, quantify, and track hydrocarbon gases that would normally make an infra-red methane calibration read excessively high, or be over-range. The instrument is calibrated across a range between 0.00% and 2.00%v/v, so that common hydrocarbons (e.g. vapours associated with fuels and oils) from low level spillages or other sources can be detected and measured.

The result is expressed as a percentage hexane vapour equivalent. With respect to hexane, concentrations were observed to be consistently at 0.00%v/v across all monitoring events. On this basis, it is considered that significant risk associated with unknown hydrocarbon sources within the near surface or underlying soils would not be expected.

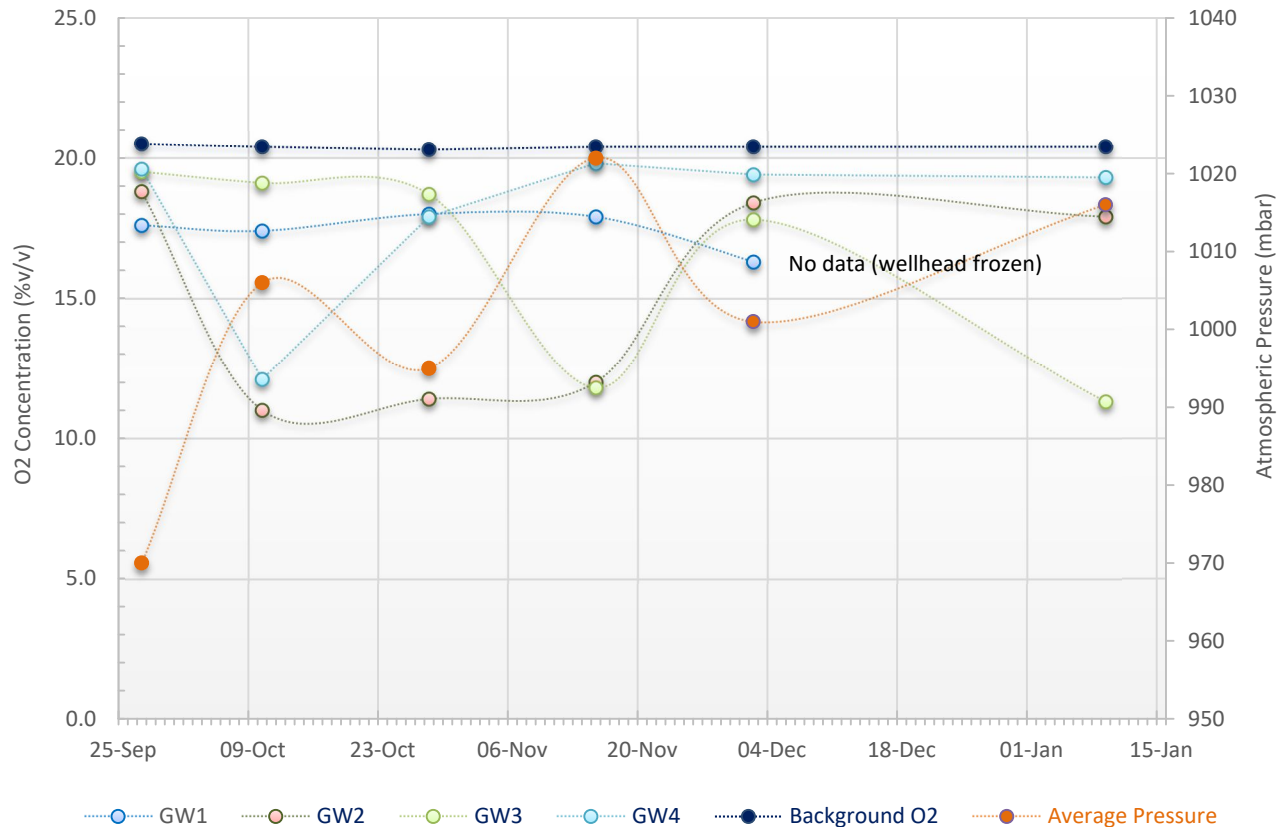
Oxygen (O₂)

Oxygen levels were observed to be slightly depleted across the monitoring event within each borehole, but more so in GW2, GW3, and GW4 on occasion. Measured concentrations were below background atmospheric readings (20.30%v/v to 20.50%v/v). The data indicates that anaerobic conditions exist within the underlying Glaciofluvial soils, although it should be noted that current guidance, such as BS8485, does not provide recommendations for where depleted oxygen conditions are present (this does not affect development in any way). The data is provided, therefore, for information purposes only:

- GW1 – 16.30%v/v to 18.00%v/v
- GW2 – 11.00%v/v to 18.80%v/v

- GW3 – 11.30%v/v to 19.50%v/v
- GW4 – 12.10%v/v to 19.80%v/v

A summary of the oxygen monitoring data is presented in Graph 3, below.



Graph 3 – Oxygen Concentrations (%v/v) with Time & Pressure (mbar)

Hydrogen Sulphide (H₂S) and Carbon Monoxide (CO)

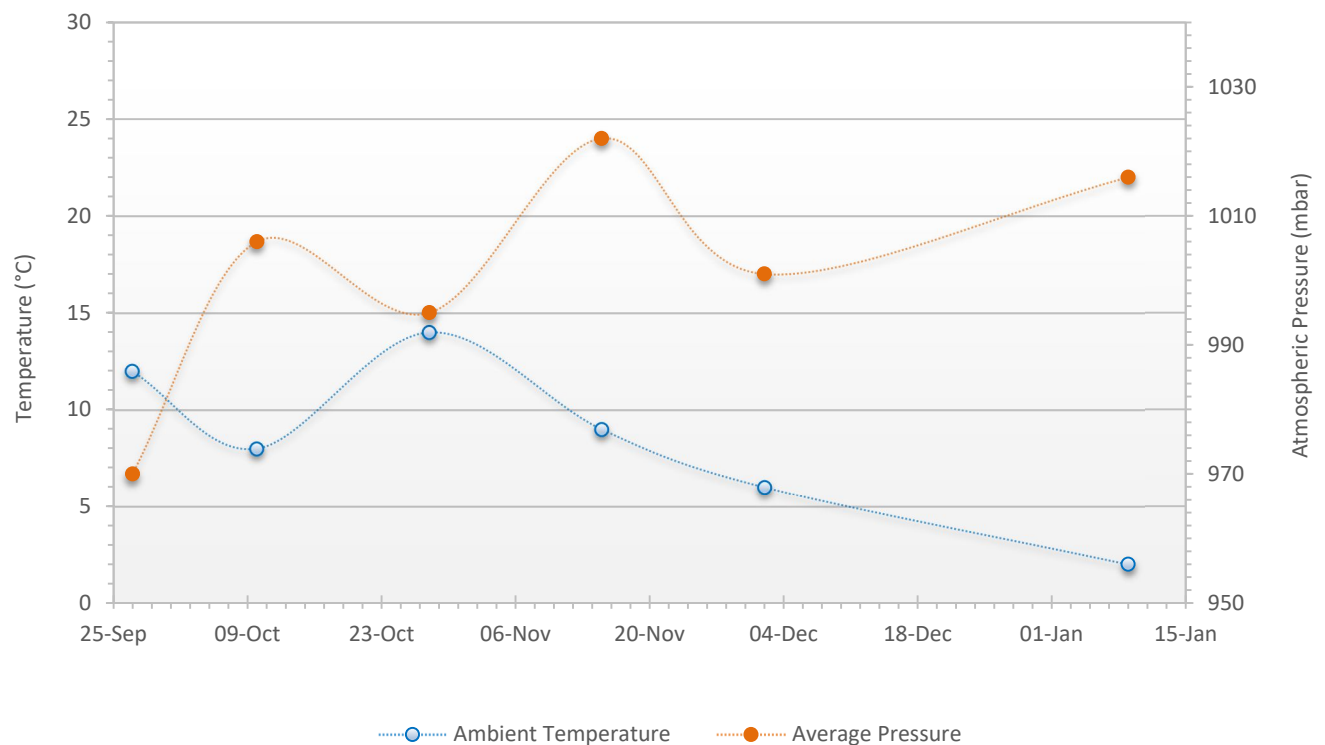
No hydrogen sulphide or carbon monoxide were measured during the monitoring period. Concentrations were observed to be consistently at 0.00%v/v in all four wells and are therefore considered to present no risk to Site end users, even though a 'lower-oxygen environment' appears to be present beneath the Site.

Atmospheric Pressure (mbar) & Temperature (°C)

Atmospheric pressures measured across the monitoring period were recorded from between 970mbar and 1022mbar. Steady state pressure was noted during all monitoring visits.

Ambient air temperature across the monitoring period was measured between 2° and 14°C, which would be expected given the time of year.

A summary of the pressure and temperature data is presented in Graph 4, overleaf.



Graph 4 – Pressure (mbar) and Temperature Change (°C) with Time

Flow (L/hr)

Ground gas pressure (or gas flow) can be a significant driving force for vertical and/or horizontal ground gas migration through the sub-surface environment and in the calculation of the Site Characteristic Gas Screening Value. It may be reported that the gas flow rate for each of the four gas wells was consistently recorded as being 0.00 L/hr across the monitoring period.

Gas Screening Values & Site Characteristic Situation

The results of the qualitative analysis can be developed, together with gas monitoring results, to give a semi-quantitative estimate of risk for a development. The system proposed by Wilson and Card ^[5] was a development of the method described in CIRIA R149 ^[6] and is now widely used by consultants and regulators to assess the risks posed by development sites to sensitive end users. The method utilises gas concentrations and hazardous gas flow rates (volume per unit time) calculated from individual borehole measurements to define a characteristic gas situation for a site based on the limiting borehole gas volume flow for carbon dioxide and/or methane. The limiting borehole gas volume flow is referred to as the Gas Screening Value, the calculation of which is carried out for both gases. The 'worst case' value is adopted. The Gas Screening Value is calculated as:

$$\text{Gas Screening Value (litres of gas per hour)} = \text{maximum borehole flow rate (L/hr)} \times \text{maximum gas concentration (\%)}$$

In accordance with BS8485, the dwellings to be constructed will be categorised as Type A (high risk) since residential properties have smaller internal spaces that are generally less well-ventilated than larger commercial structures.

As part of the assessment, consideration has been given to the construction of the proposed structures, together with the control of any future structural changes to the buildings and their maintenance, since potential risks posed by ground gases may be strongly influenced by these factors. On this basis, the following Site Characteristic Gas Screening Values have been determined:

Ground Gas	Maximum Recorded Flow Rate Q_{hg} (L/hr)	Maximum Recorded Concentration (%v/v)	Gas Screening Value CO ₂ (L/hr)	Gas Screening Value CH ₄ (L/hr)
CO ₂	0.00	3.70	0.000	-
CH ₄	0.00	0.00	-	0.000

2.3 Site Determination

Whilst some measurable concentrations of carbon dioxide have been recorded, no detectable gas flow emission within any of the four boreholes was evident across the 15 week period of assessment. Whilst carbon dioxide concentrations were observed to be higher in GW1 and GW2 on the northern side of the Site, compared to those positioned further away from Bury Old Road, on the basis of the available data it was not possible to calculate a Site Characteristic Gas Screening Value for either carbon dioxide or methane. This effectively determines the Site as being Characteristic Situation 1, as the Gas Screening Value is <0.07 L/hr (very low risk).

As indicated above, the Site is underlain by a thin crust of anthropogenic largely granular made ground in addition to a deeper and much thicker and continuous layer of Glaciofluvial sand deposit (which undoubtedly underlies the wider area too). It is considered that neither the made ground or underlying natural strata would be capable of generating and/or sustaining elevated concentrations of ground gas given their composition and lack of vegetative matter, so risk associated with these underlying soils is not therefore anticipated.

The higher concentrations of carbon dioxide recorded in GW1 and GW2 could potentially be attributable to the off-site landfilling works at Boo Hole (and/or any other infilled site as may be situated beyond Bury Old Road) and some lateral migration through strata that will be permeable, although it is important to note that the measured concentrations do not exceed the upper Characteristic Situation 1 screening value of 0.07 L/hr (i.e. that which is taken to be the point where preventative measures in construction would be required) as defined in BS8485; risk associated with the off-site landfill(s) is not therefore anticipated at this time. Furthermore, and on the basis of the environmental laboratory suite testing (i.e. TPHCWG, VOC, SVOC), it may be concluded that the on-Site soils appear not to contain any undiscovered buried sources of organic contamination (e.g. fuels and/or oils) that could

potentially skew the monitoring data, or give rise to elevated concentrations of ground gas/vapour².

The current proposals for the Site are such that foundations are to be kept shallow within the near surface deposits and for there to be no deep penetration. It should be noted, however, that should the foundation approach change for any reason, due consideration will need to be given to the Site's characteristic determination and the potential for it to be upgraded to Characteristic Situation 2. This is because the higher of the measured carbon dioxide concentrations are nearer to 5.00%v/v than zero, and there remains a viable source of ground gas to the north of Bury Old Road in the form of infilled sand extraction pits.

Although there is no measurable gas emission at this time, risk assessment guidance states that it is important to acknowledge the potential for there being measurable flow at some point in the future, particularly when dealing with *significant gas concentrations*, rather than simply dismissing it. Whilst significant concentrations of carbon dioxide are not expected to arise, it is possible that piling (thus creating preferential pathways beneath the buildings for increased gas migration to the surface) could potentially lead to measurable flow rates at some point in the (as built) post-development case and higher gas concentrations than have been measured to date. Other influencing factors such as differing atmospheric conditions and/or the development itself (via the venturi effect) may also have some effect, although any change because of these is unlikely to be significant.

2.4 Further Works

On the basis of the data presented herein, it is considered that remedial works are not currently required to break any plausible source-pathway-receptor linkage identified between measured ground gas contamination and future Site end users, unless the construction approach to the development changes and the risk level increases.

If penetration was to be undertaken to depth, this could potentially trigger measurable gas emission and an increase in concentration to in excess of 5.00%v/v for carbon dioxide. Such conditions would require the need for remedial measures to be adopted in construction. Specific LCRM Stage 3 proposals and verification methodology for any remediation to be implemented would need to be submitted to the Local Planning Authority in the form of a standalone Remedial Strategy, with this being compliant with Yorkshire and Lincolnshire Pollution Advisory Group ('YALPAG')^[7] guidance.

² There are also no shallow coal or underground workings indicated to be present beneath the Site. The measured concentrations of carbon dioxide cannot therefore be attributable to mining legacy either.

3 REGULATORY APPROVAL

This Report has been compiled in accordance with good practice guidance for the assessment and management of land that may be affected by contamination (ground gas).

The conclusions presented are considered reasonable on the basis of available information and the assessment of the Site as carried out by Groundsmiths under instruction from the Client. However, it remains the responsibility of the Client to ensure that the Site poses no significant risk to any sensitive receptor(s) and that it remains aligned with the proposed end-use and assessment framework adopted in this Report and any previously submitted reports prepared for the development.

If at any time in the future, additional information comes to light that puts into doubt the accuracy of the professional opinion or third party information presented herein, then it would be necessary to revisit the assessment.

Works undertaken cannot be guaranteed to gain approval by the regulatory authorities and / or your warranty provider, so copies of this Report should be made available to the relevant organisations for comment and approval, prior to undertaking any irrecoverable works associated with the Site.

4 REPORTING LIMITS

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The findings and opinions provided in this Report are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described.

Whilst every effort has been made to carry out an assessment that enables a realistic characterisation of the environmental parameters to be identified, the possibility of significant variation in actual ground conditions beneath the Site cannot be discounted. The findings and opinions presented in this Report are relevant to the time this assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date. Further information, supplementary ground investigation, construction activities, change of Site use, or the passage of time may reveal conditions that were not indicated in the data presented and therefore could not have been considered in the preparation of this Report. Where such information might impact upon stated opinions, Groundsmiths reserve the right to modify the opinions expressed in this Report.

Where opinions expressed in this Report are based on current available guidelines and legislation, no liability can be accepted for the effects of any future changes to such guidelines and legislation. New information or improved practices and changes in legislation may require reinterpretation of the Report as a whole, or in part.

This Report does not constitute an archaeological, ecological, or arboriculturalist / invasive plant species survey. Any comment given in relation to these is for information only. Further assessments to assess these may be required as part of any planning condition and should therefore be undertaken by suitably qualified experts as required.

Groundsmiths reserve the right to edit and / or retract any conclusion or recommendation made in this Report should any further information, with respect to the Site, become available.

Groundsmiths disclaim any obligation to update the Report for events taking place after the time during which the assessment was carried out.

Groundsmiths do not provide or purport to provide legal advice. Should the client require such advice, then that of lawyers should be sought.

Groundsmiths accept no responsibility if any findings given in this Report are not implemented by the Client or their agents.

Groundsmiths accept no responsibility if any further works, as requested by the Local Planning Authority in the discharge of their duty of care, are not implemented by the Client or their agents.

5 INFORMATION SOURCES

The following references have been cited in the production of this report:

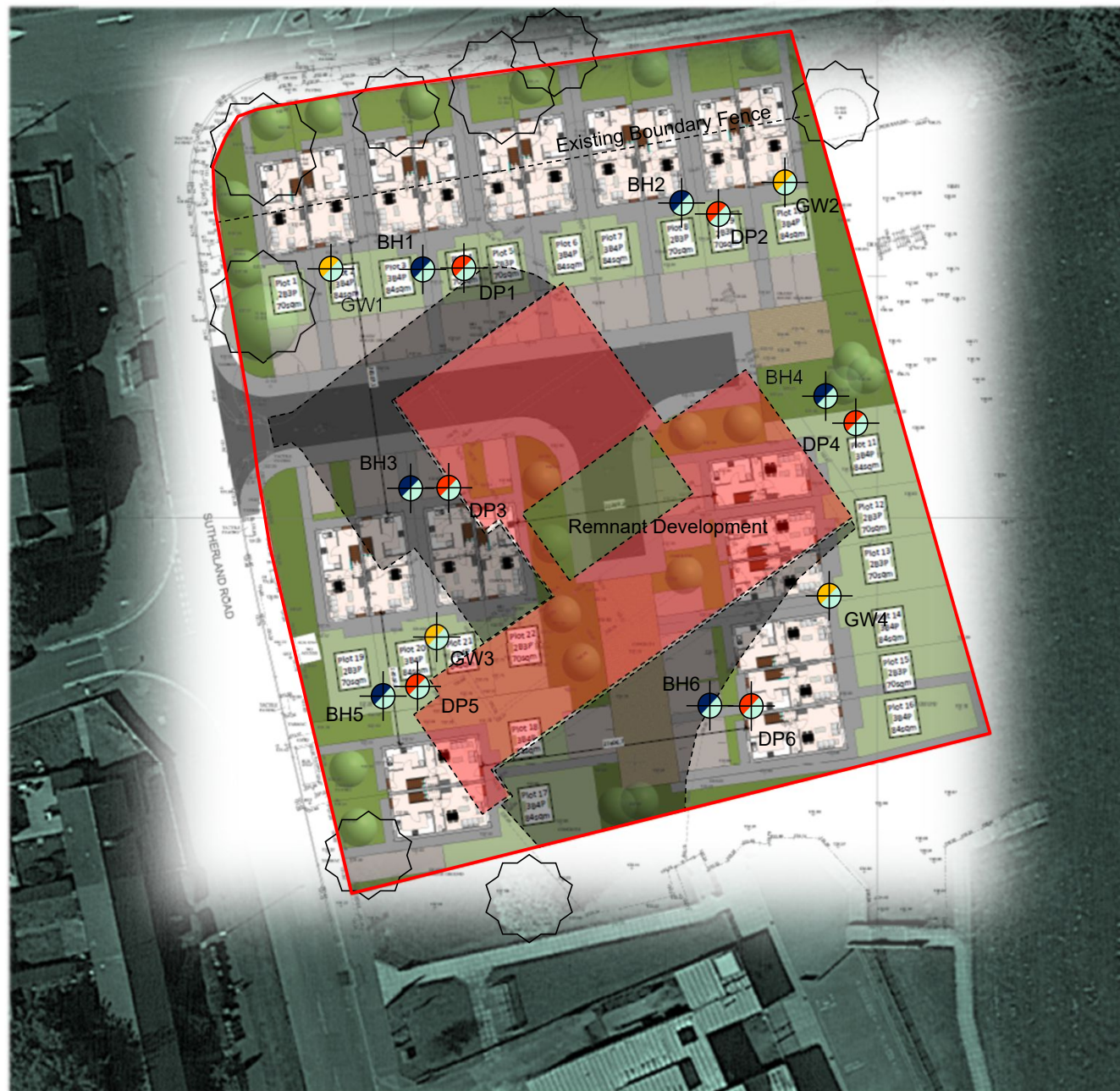
- 1 Groundsmiths (UK) Ltd (2024). LCRM Stage 1 Risk Assessment. Land off Bury Old Road, Darn Hill, Heywood. Ref. GUK-0224-05/Rp-001, dated 19th February.
- 2 Groundsmiths (UK) Ltd (2024). LCRM: Intrusive Site Investigation. Land off Bury Old Road, Darn Hill, Heywood. Ref. GUK-0224-05/Rp-002, dated 15th November.
- 3 D. J. Rudland, R. M. Lancefield & P. N. Mayel (2001). CIRIA C552 - Contaminated Land Risk Assessment – A Guide to Good Practice.
- 4 BS8485 (2015+A1:2019) Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.
- 5 Wilson, S.A. and Card, G.B. (1999) Reliability and Risk in Gas Protection Design. Ground Engineering, 32, 2, pp.32-36, February, EMAP, London.
- 6 CIRIA Report 149 (1995). Protecting Development from Methane.
- 7 Yorkshire and Lincolnshire Pollution Advisory Group (2016). Verification Requirements for Gas Protection Systems. Technical Guidance for Developers, Landowners and Consultants. Version 1.1.

FIGURES & DRAWINGS

APPENDIX A

GROUND GAS MONITORING DATA

FIGURES & DRAWINGS



Position	Easting	Northing	Elevation (m AOD)
BH1	410423	383451	132.78
BH2	410428	383475	133.91
BH3	410402	383458	132.73
BH4	410415	383496	135.86
BH5	410382	383453	132.67
BH6	410381	383482	132.80
DP1	410424	383451	132.78
DP2	410429	383475	133.91
DP3	410403	383458	132.73
DP4	410416	383494	135.86
DP5	410383	383453	132.67
DP6	410382	383482	132.80
GW1	410422	383444	132.70
GW2	410432	383488	135.38
GW3	410393	383468	132.66
GW4	410393	383491	132.73

-  Gas Well
-  Percussive Sampler Borehole with *in situ* SPT
-  Dynamic Probe (DPSH)

Project: Bury Old Road, Heywood

Client: ECS Capital Limited

Drawing: Investigation Locations Plan

Drawn/Checked: AJS

Project No: 0224-05

Drawing No: 001

Date: Oct. 2024

GROUNDSMITHS
GEOTECHNICAL ENGINEERS

APPENDIX A

GROUND GAS MONITORING DATA

GROUND GAS MONITORING RECORD SHEET						GROUND SMITHS GEOTECHNICAL ENGINEERS						
Project: Residential Development		Project No: GUK-0224-05		Visit No: 1 of 6								
Location: Bury Old Road, Darn Hill, Heywood					Operative: LTS							
Client: ECS Capital Limited					Date: 27/09/2024							
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	3.40	0.00	0.00	17.60	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	0.00	1.70	0.00	0.00	18.80	0.00	0.00	0.000	0.000	Natural Strata	-
GW3	0.00	0.00	0.70	0.00	0.00	19.50	0.00	0.00	0.000	0.000	Natural Strata	-
GW4	0.00	0.00	0.70	0.00	0.00	19.60	0.00	0.00	0.000	0.000	Natural Strata	-
Background	0.00	0.00	0.00	0.00	0.00	20.50	0.00	-				-

Meteorological Conditions

Ground Conditions

☒
Dry

☐
Moist

☐
Wet

☐
Snow

☐
Frozen

☒
Unsurfaced

☐
Hardstand

Wind

☐
Calm

☒
Light

☐
Moderate

☐
Strong

Cloud Cover

☒
None

☐
Slight

☐
Cloudy

☐
Overcast

Rain

☒
None

☐
Slight

☐
Moderate

☐
Heavy

Barometric Pressure (mb)

970

Pressure Trend during Test

☐
Falling

☒
Steady

☐
Rising

Temperature (C)

12

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

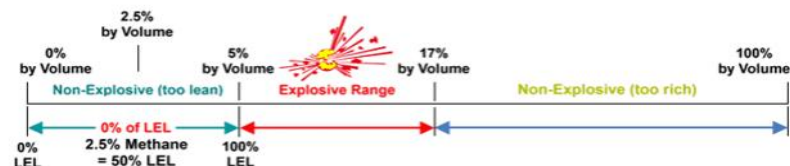
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET						GROUND SMITHS GEOTECHNICAL ENGINEERS						
Project: Residential Development		Project No: GUK-0224-05		Visit No: 2 of 6								
Location: Bury Old Road, Darn Hill, Heywood					Operative: LTS							
Client: ECS Capital Limited					Date: 10/10/2024							
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	3.60	0.00	0.00	17.40	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	0.00	1.90	0.00	0.00	11.00	0.00	0.00	0.000	0.000	Natural Strata	-
GW3	0.00	0.00	1.00	0.00	0.00	19.10	0.00	0.00	0.000	0.000	Natural Strata	-
GW4	0.00	0.00	1.40	0.00	0.00	12.10	0.00	0.00	0.000	0.000	Natural Strata	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions

☐ Dry

☒ Moist

☐ Wet

☐ Snow

☐ Frozen

☒ Unsurfaced

☐ Hardstand

Wind

☒ Calm

☐ Light

☐ Moderate

☐ Strong

Cloud Cover

☐ None

☒ Slight

☐ Cloudy

☐ Overcast

Rain

☒ None

☐ Slight

☐ Moderate

☐ Heavy

Barometric Pressure (mb)

Pressure Trend during Test

☐ Falling

☒ Steady

☐ Rising

Temperature (C)

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

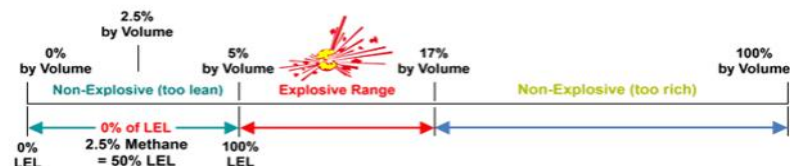
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET						GROUNDSMITHS GEOTECHNICAL ENGINEERS						
Project: Residential Development		Project No: GUK-0224-05		Visit No: 3 of 6								
Location: Bury Old Road, Darn Hill, Heywood					Operative: LTS							
Client: ECS Capital Limited					Date: 28/10/2024							
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	3.20	0.00	0.00	18.00	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	0.00	1.60	0.00	0.00	11.40	0.00	0.00	0.000	0.000	Natural Strata	-
GW3	0.00	0.00	0.90	0.00	0.00	18.70	0.00	0.00	0.000	0.000	Natural Strata	-
GW4	0.00	0.00	2.30	0.00	0.00	17.90	0.00	0.00	0.000	0.000	Natural Strata	-
Background	0.00	0.00	0.00	0.00	0.00	20.30	0.00	-				-

Meteorological Conditions

Ground Conditions

☒ Dry

☐ Calm

☐ None

☒ None

☐ 995

☐ Moist

☒ Light

☒ Slight

☐ Slight

☐ Wet

☐ Moderate

☐ Cloudy

☐ Moderate

☐ Snow

☐ Strong

☐ Overcast

☐ Heavy

☐ Frozen

☒ Unsurfaced

☐ Hardstand

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

Barometric Pressure (mb)

☐ 995

Pressure Trend during Test

☐ Falling

☒ Steady

☐ Rising

Temperature (C)

☐ 14

BRITISH STANDARD

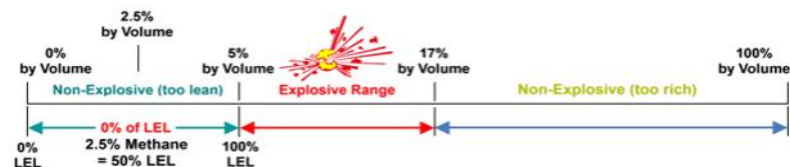
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
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CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET												
Project: Residential Development		Project No: GUK-0224-05		Visit No: 4 of 6								
Location: Bury Old Road, Darn Hill, Heywood					Operative: LTS							
Client: ECS Capital Limited					Date: 15/11/2025							
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	3.40	0.00	0.00	17.90	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	0.00	1.80	0.00	0.00	12.00	0.00	0.00	0.000	0.000	Natural Strata	-
GW3	0.00	0.00	1.50	0.00	0.00	11.80	0.00	0.00	0.000	0.000	Natural Strata	-
GW4	0.00	0.00	0.60	0.00	0.00	19.80	0.00	0.00	0.000	0.000	Natural Strata	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions

☐ Dry

☒ Moist

☐ Wet

☐ Snow

☐ Frozen

☒ Unsurfaced

☐ Hardstand

Wind

☐ Calm

☒ Light

☐ Moderate

☐ Strong

Cloud Cover

☒ None

☐ Slight

☐ Cloudy

☐ Overcast

Rain

☒ None

☐ Slight

☐ Moderate

☐ Heavy

Barometric Pressure (mb)

Pressure Trend during Test

☐ Falling

☒ Steady

☐ Rising

Temperature (C)

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

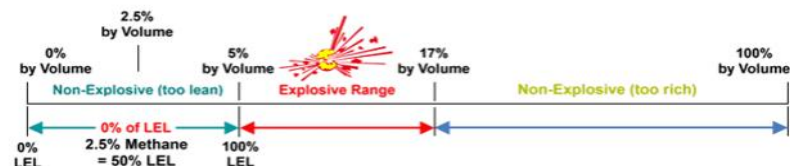
BS 8485:2015

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^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET						GROUND SMITHS GEOTECHNICAL ENGINEERS						
Project: Residential Development		Project No: GUK-0224-05		Visit No: 5 of 6								
Location: Bury Old Road, Darn Hill, Heywood					Operative: LTS							
Client: ECS Capital Limited					Date: 02/12/2024							
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	3.70	0.00	0.00	16.30	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	0.00	2.10	0.00	0.00	18.40	0.00	0.00	0.000	0.000	Natural Strata	-
GW3	0.00	0.00	2.10	0.00	0.00	17.80	0.00	0.00	0.000	0.000	Natural Strata	-
GW4	0.00	0.00	0.80	0.00	0.00	19.40	0.00	0.00	0.000	0.000	Natural Strata	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions

☐ Dry

☒ Moist

☐ Wet

☐ Snow

☐ Frozen

☐ Unsurfaced

☐ Hardstand

Wind

☐ Calm

☒ Light

☐ Moderate

☐ Strong

Cloud Cover

☐ None

☐ Slight

☒ Cloudy

☐ Overcast

Rain

☒ None

☐ Slight

☐ Moderate

☐ Heavy

Barometric Pressure (mb)

Pressure Trend during Test

☐ Falling

☒ Steady

☐ Rising

Temperature (C)

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

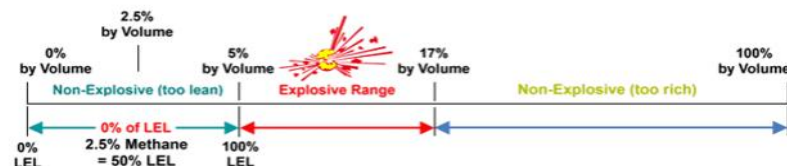
BS 8485:2015

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CS5	High	15 to <70	–
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^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET												
Project: Residential Development		Project No: GUK-0224-05		Visit No: 6 of 6								
Location: Bury Old Road, Darn Hill, Heywood					Operative: LTS							
Client: ECS Capital Limited					Date: 09/01/2025							
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	Flooded and frozen											
GW2	0.00	0.00	2.00	0.00	0.00	17.90	0.00	0.00	0.000	0.000	Natural Strata	-
GW3	0.00	0.00	1.60	0.00	0.00	11.30	0.00	0.00	0.000	0.000	Natural Strata	-
GW4	0.00	0.00	0.70	0.00	0.00	19.30	0.00	0.00	0.000	0.000	Natural Strata	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions	☐ Dry	☒ Moist	☐ Wet	☐ Snow	☐ Frozen	☒ Unsurfaced	☐ Hardstand
Wind	☐ Calm	☒ Light	☐ Moderate	☐ Strong			
Cloud Cover	☐ None	☒ Slight	☐ Cloudy	☐ Overcast			
Rain	☒ None	☐ Slight	☐ Moderate	☐ Heavy			
Barometric Pressure (mb)	1016						
Pressure Trend during Test		☐ Falling	☒ Steady	☐ Rising			
Temperature (C)	2						

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

BS 8485:2015

Table 2 CS by site characteristic GSV

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CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

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