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FURTHER SOIL GAS MONITORING FOR RESIDENTIAL DEVELOPMENT OF FORMER AGRICULTURAL PREMISES EAUGATE ROAD MOULTON EAUGATE SPALDING LINCOLNSHIRE

Report Reference C15587B

On behalf of:

Woodgate Farms Limited
109 Eaugate Road,
Moulton Chapel
Spalding
PE12 0XJ

November 2022

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WOODGATE FARMS LIMITED

OGLESBY & LIMB LIMITED
ARCHITECTS

FURTHER SOIL GAS MONITORING

FOR RESIDENTIAL DEVELOPMENT

OF

FORMER AGRICULTURAL PREMISES

EAUGATE ROAD

MOULTON EAUGATE

SPALDING

LINCOLNSHIRE

Report Reference No. C15587B **November 2022**

INTRODUCTION

Ground Engineering Limited was instructed by the client, Woodgate Farms Limited, through Oglesby and Limb Architects, to carry out further soil gas monitoring in preparation for the construction of a detached dwelling on their farm premises on Eaugate Road, Moulton Eaugate, Spalding. Reference should be given to the findings of an initial site investigation provided in Ground Engineering Report C15587: April 2022.

This report provides the findings of all seven return gas monitoring visits and makes comment on the design of protective measures for methane and carbon dioxide ground gases for new buildings.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

The fenland site is located 8km to the south-east of Spalding and lies within the hamlet of Moulton Eaugate as shown in Figure 1. The National Grid Reference at the centre of the site is TF 2998 1673.

The site comprises an irregular polygonal shaped plot of land with four sides of lengths 70m, 90m, 55m and 45m. A belt of mature deciduous trees wraps around the southern, western and northern margins of the site and encloses a 40m long by 30m wide gravel/earth surfaced storage yard. Within the north-western corner of the yard was a 20m long by 13m wide agricultural shed with double height pitched roof. The roof and side cladding comprised what appeared to be cement bonded asbestos sheet materials.

Freshwater Drain runs along the eastern edge of the site alongside Eaugate Road. The site was surrounded by fenland fields and the nearest property comprised a dwelling some 0.5km to the north.

The site was flat and level and Eaugate Road, to the east, stands at about 3mOD.

The geological map at 1:50,000 scale, Sheet 145, and the BGS Geology of Britain viewer indicates the site to be directly underlain by sand/silt/clay Tidal Flat Deposits comprising the Terrington Beds and Barroway Drove Beds. The underlying solid geology is indicated to be the Oxford Clay Formation, which is expected to be present at depth.

SUMMARY OF GROUND ENGINEERING REPORT C15587: APRIL 2022

The scope of the site investigation, documented by Ground Engineering Report C15587: April 2022, comprised desk study research, and five window sample boreholes with laboratory chemical testing on recovered samples to determine the nature of the underlying soil.

There are no current or historical industrial land uses recorded for the site or within 250m. There are no landfill or waste sites within a 250m radius of the site.

The site work was carried out on 10 February 2022 and comprised five window sample boreholes (WS1 to WS5) at locations shown in Figure 2. On completion soil gas and groundwater monitoring installations were fitted into WS2, WS4 and WS5 to a depth of 3.00m.

The borehole findings indicate the presence of 0.50m and 1.00m thickness of made ground over Tidal Flat Deposits. The made ground comprised dark brown and grey brown layers/mixtures of gravelly, silty sand; sandy silt; sandy, gravelly silt; clayey silt; and silty, sand and gravel. The gravel fraction comprised brick, macadam, ash, clinker, flint and quartzite.

The Tidal Flat Deposits were encountered below the made ground and comprised brown, orange brown and grey, very silty fine sand. The boreholes were completed at a depth of 3.00m within the Tidal Flat Deposits. Groundwater levels were recorded standing between 2.37m and 2.50m depth.

Three return visits to site were undertaken on 8, 15 and 22 April 2022 to monitor the standpipe installations for depth to groundwater and the concentrations of methane, carbon dioxide and oxygen. The monitoring results are provided in Appendix 1. Concentrations of less than 0.1% by volume methane were encountered and carbon dioxide concentrations between 2.3% and 4.0% by volume were recorded. Oxygen levels of between 16.7% and 19.1% were measured. The results indicate a Gas Screening Value (GSV) of 0.0001l/hr for methane and 0.0040l/hr for carbon dioxide. The results fall into Characteristic Situation 1 as defined by BS8485:2015+A1:2019 ‘Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings’.

FURTHER GAS MONITORING

Four further return visits to site were undertaken on 18, 24 and 30 October and 7 November 2022 to monitor the existing standpipe installations (WS2, WS4 and WS5) for depth to groundwater and the concentrations of methane, carbon dioxide and oxygen. Measurement was carried out using a Gasdata GFM430, which also recorded the atmospheric pressure and flow rate. The monitoring results for all seven visits are provided in Appendix 1.

SUMMARY OF GAS MONITORING RESULTS

A total of seven return visits to site were undertaken on 8, 15 and 22 April, 18, 24 and 30 October and 7 November 2022. Concentrations of less than 0.1% by volume methane were encountered, with carbon dioxide concentrations between 2.3% and 6.7% by volume measured during the seven visits. Oxygen levels of between 13.4% and 19.1% were recorded. A flow rate of less than 0.1l/hr was measured on all occasions.

A summary of the worst case Gas Screening Value (GSV) for methane and carbon dioxide is presented in Table 1.

Table 1 Worst case implied Characteristic Gas Concentration (CS) derived using maximum concentrations and maximum flow rate

Maximum Methane Concentration	Maximum Carbon Dioxide Concentration	Maximum Flow Rate	Methane Gas Screening Value (GSV)	Carbon Dioxide Gas Screening Value (GSV)	Implied Methane CS	Implied Carbon Dioxide CS
<0.1%	6.7%	<0.1l/hr	0.0001l/hr	0.0067l/hr	1	1

The results indicate a Gas Screening Value (GSV) of 0.0001l/hr for methane and 0.0067l/hr for carbon dioxide. These values are an order of magnitude 10 times less than the 0.07l/h threshold between CS1 and CS2 as defined by BS8485:2015+A1:2019 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'. This document suggests that consideration should be given to increasing the CS category from CS1 to CS2 if the gas results exceed 1% methane and 5% carbon dioxide. In view of the seven gas monitoring visits, with low barometric pressure of 999mb and 1001mb on two occasions, emission rates of less than 0.1l/h, and corresponding carbon dioxide concentrations of between 4.1% and 6.4%, a CS1 category is considered to be most representative.

CONCLUSIONS

According to database information, there are no landfills within 250m of the site and the composition of the underlying natural soil, which was inorganic silt/sand/gravel would suggest a very low hazard potential. Also from our experience, in such soils, it is not unusual to encounter such carbon dioxide concentrations particularly with very low gas emission rates and high groundwater levels.

In conclusion, in the absence of a source of soil gas, we believe that the characteristic gas situation for this site should fall within CS1, very low gas hazard potential category, and as such gas protection measures would not be considered necessary for the proposed dwelling in relation to methane and carbon dioxide soil gases.

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Figures

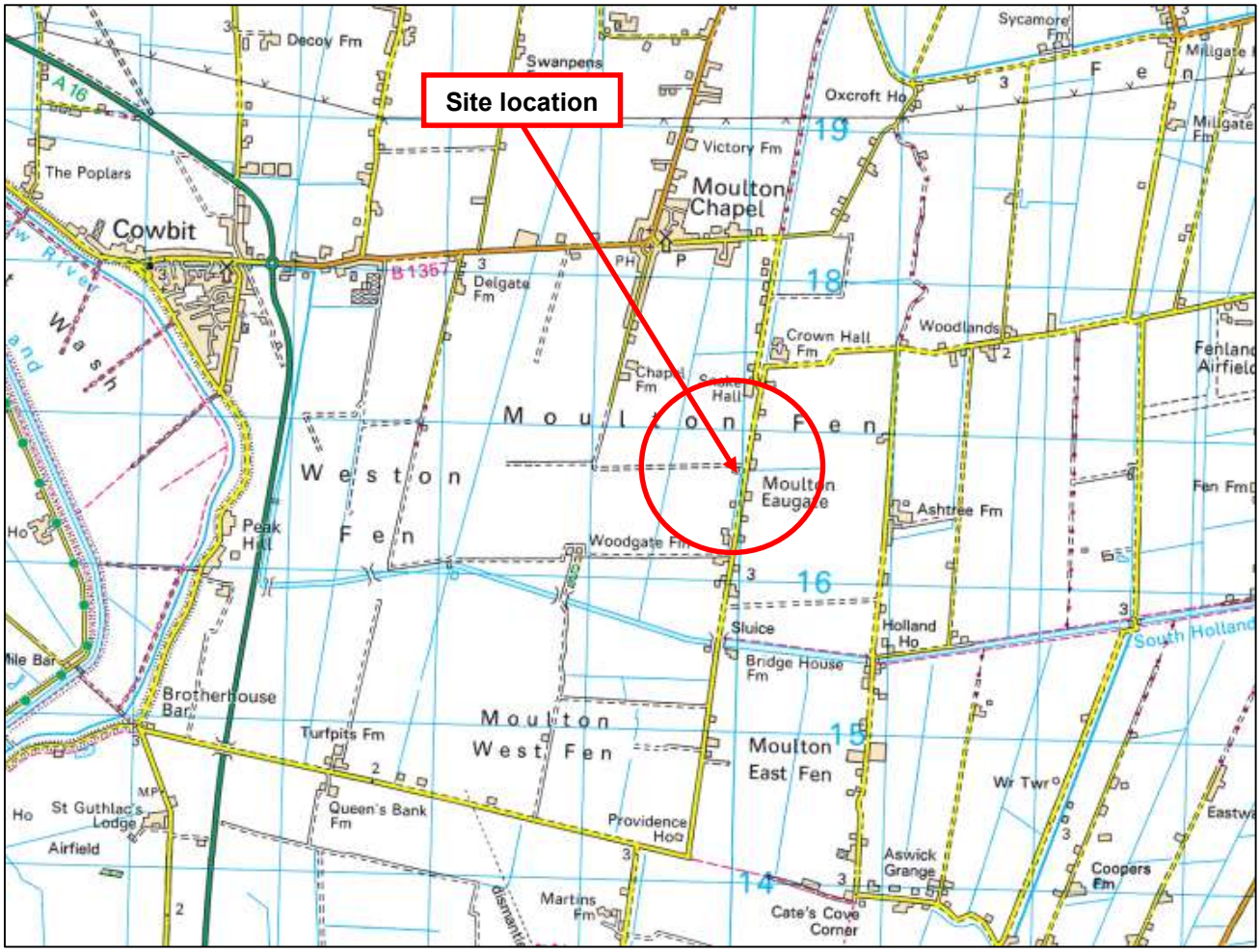
Figure 1: Site Location Plan

Figure 2: Exploratory Hole Location Plan

Site Location Plan

Figure 1

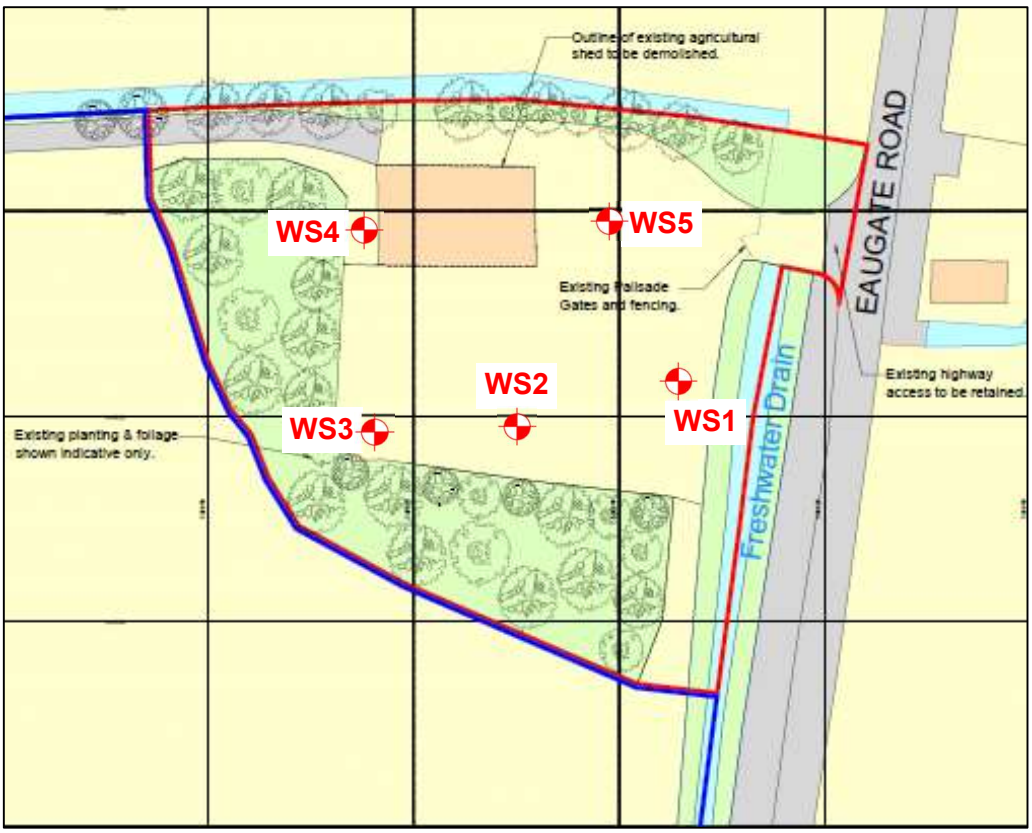
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Project : Former Agricultural Premises, Eaugate Road, Moulton Eaugate **Client : Woodgate Farms Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C15587B**

Exploratory Hole Location Plan

Figure 2



Scale

30m

KEY

Boreholes WS1 to WS5

Project : Former Agricultural Premises, Eaugate Road, Moulton Eaugate **Client : Woodgate Farms Limited**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C15587B**

Appendix 1

Gas Monitoring Results

GROUND ENGINEERING LIMITED

Groundwater/Gas Monitoring Record

Site: Former Agricultural Premises, Eaugate Road, Moulton Eaugate, Spalding
Report Ref: C15587B

Date	Borehole No.	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Flow Rate (l/hr)	Atmosph. Pressure (mb)	Depth of Well (m bgl)	Depth to Groundwater (m bgl)
		Peak	Steady	Peak	Steady	Min.	Max.				
08/03/22	WS2	<0.1	<0.1	4.0	4.0	17.0	17.0	<0.1	1012 falling	3.00	2.46
15/03/22	WS2	<0.1	<0.1	3.9	3.9	16.7	16.7	<0.1	1020 falling	3.00	2.50
22/03/22	WS2	<0.1	<0.1	3.8	3.8	16.7	16.7	<0.1	1028 steady	3.00	2.46
18/10/22	WS2	<0.1	<0.1	6.7	6.7	14.7	14.7	<0.1	1027 rising	2.58	Dry (Hole silted up)
24/10/22	WS2	<0.1	<0.1	6.4	6.4	14.3	14.3	<0.1	999 rising	2.58	Dry (Hole silted up)
30/10/22	WS2	<0.1	<0.1	5.9	5.9	13.4	13.4	<0.1	1013 steady	2.58	Dry (Hole silted up)
07/11/22	WS2	<0.1	<0.1	5.4	5.4	12.3	12.3	<0.1	1001 falling	2.58	Dry (Hole silted up)
08/03/22	WS4	<0.1	<0.1	2.3	2.3	18.0	18.0	<0.1	1012 falling	3.00	2.40
15/03/22	WS4	<0.1	<0.1	2.3	2.3	18.1	18.1	<0.1	1020 falling	2.70	2.40
22/03/22	WS4	<0.1	<0.1	2.3	2.3	17.6	17.6	<0.1	1028 steady	3.00	2.37
18/10/22	WS4	<0.1	<0.1	5.7	5.7	16.6	16.6	<0.1	1028 rising	2.58	Dry (Hole silted up)
24/10/22	WS4	<0.1	<0.1	5.7	5.7	15.9	15.9	<0.1	999 rising	2.58	Dry (Hole silted up)
30/10/22	WS4	<0.1	<0.1	4.9	4.9	15.3	15.3	<0.1	1013 steady	2.58	Dry (Hole silted up)
07/11/22	WS4	<0.1	<0.1	5.9	5.9	14.8	14.8	<0.1	1001 falling	2.58	Dry (Hole silted up)
08/03/22	WS5	<0.1	<0.1	3.8	3.8	17.6	17.6	<0.1	1013 falling	3.00	2.44
15/03/22	WS5	<0.1	<0.1	3.0	3.0	19.1	19.1	<0.1	1020 falling	3.00	2.43
22/03/22	WS5	<0.1	<0.1	3.2	3.2	18.1	18.1	<0.1	1028 steady	3.00	2.41
18/10/22	WS5	<0.1	<0.1	5.9	5.9	16.0	16.0	<0.1	1028 rising	2.58	Dry (Hole silted up)
24/10/22	WS5	<0.1	<0.1	5.4	5.4	16.0	16.0	<0.1	999 rising	2.58	Dry (Hole silted up)
30/10/22	WS5	<0.1	<0.1	2.0	2.0	18.4	18.4	<0.1	1013 steady	2.58	Dry (Hole silted up)
07/11/22	WS5	<0.1	<0.1	4.1	4.1	16.9	16.9	<0.1	1002 falling	2.58	Dry (Hole silted up)