Our Ref: 23206/LO.002/AIB

[redacted]

Vistry South East Midlands
Penman House
1 Penman Way
Grove Park
Enderby
LEICESTER
LE19 1SY

23 May 2025

[redacted]

Site Address: Former RAF Upwood, Ramsey Road, Bury, Huntingdon
Developer: Vistry South East Midlands
Planning Reference: 24/02095/NMA
None-material amendment of 21/01420/S73 to reword Condition 6
Environmental Health Reference: 402034

Updated Soil-Gas Risk Assessment

The requirements of the construction phase remediation works are detailed in "*Remediation Method Statement and Validation Plan*" (RMS) prepared by Georisk, reference 23206/2 Revision 1 dated November 2023. The latter document was informed by completing additional investigation and supersedes a previous document prepared by BWB Consulting Limited (BWB) Report No. NTE2578 UPW-BWB-ZZ-XX-RP-YE-0001_RS "*RAF Upwood, Ramsey, Cambridgeshire, Remediation Strategy Report*" dated January 2021.

In response to queries from the Local Authority Environmental Health Officer, we have pleasure in forwarding an updated Soil-Gas Risk Assessment in the context of the established ground conditions and in the light of current guidance/best practice. This document has been prepared to justify the downgraded gas risk for the development presented within the Georisk RMS.

Please do not hesitate to call should you need to discuss anything further.

Yours sincerely

[redacted]

Director

[redacted]

UPDATED SOIL-GAS RISK ASSESSMENT
FORMER RAF UPWOOD, RAMSAY ROAD, BURY, HUNTINGDON

Introduction

This document presents a Soil-Gas Risk Assessment for the above development site based on the findings of the following reports that have been previously prepared:

- BWB Consulting Limited (BWB) Report No. NTH051SE/02/V2 *"Phase II Geo-Environmental Assessment"* dated July 2012;
- BWB Report No. NTE2578 UPW-BWB-ZZ-XX-RP-YE-0001_RS *"RAF Upwood, Ramsey, Cambridgeshire, Remediation Strategy Report"* dated January 2021;
- *'Remediation Method Statement and Validation Plan'* prepared by Georisk reference 23206/2 Revision 1 dated November 2023.

This present document has been prepared to assist with the discharge of planning conditions and will be presented to the Local Authority for approval.

Proposed Development

The proposed development is to comprise the construction of 160 No. residential properties with private gardens and parking areas. This is shown on the "*Site Layout – Phase 1*" Drawing No. 100-001/017W.

Geoenvironmental Setting

Site History

The site was farmland from the earliest mapping reviewed until the 1917 mapping when the site became part of RAF Upwood. The buildings were demolished in the last few years.

Surrounding land use has been predominantly agricultural with increasing residential development.

Geology

The geology of the site is anticipated to comprise nominal Made Ground to generally less than 1 m below existing ground level (begl) overlying Glacial Till clay to depths over 10 m begl.

Mining

The site is not in an area affected by past underground coal mining.

Landfilling

The Local Authority (LA) and Environment Agency (EA) have no records of any operational or historic landfill sites within 250 m of the site.

Radon

Information provided on the BGS GeoIndex Onshore website (May 2025) indicates that radon protection measures are not required for a new housing development at the site.

Ground Conditions

Details in respect of the ground and groundwater conditions present at the site can be found in the BWB report and additional investigation completed by Georisk.

The general sequence of strata can be represented by a surface covering of topsoil or Made Ground generally comprising firm dark grey slightly gravelly slightly sandy clay with occasional ash and brick or light orangish brown slightly gravelly sandy clay with occasional ash and chert to depths of less than 1.0 m begl.

The topsoil/Made Ground is generally overlying superficial deposits of Glacial Till comprising firm locally orangish, light greenish brown, greyish brown slightly gravelly slightly sandy clay and orangish brown variably gravelly clayey sand.

Consideration of Volatile Contaminants

As part of the supplementary investigations completed by Georisk, 35 No. representative soil samples from the upper 1 m of the ground profile were analysed for speciated TPH. The hydrocarbon fractions aromatic C5 to C8 include the more volatile fractions. In all cases, concentrations were below the laboratory limit of detection of 0.1 mg/kg and the relevant S4UL assessment criteria appropriate for a residential end use.

In addition, all samples were tested for volatile hydrocarbons including BTEX and MTBE. In all cases the concentrations were below the laboratory limit of detection of 0.005 mg/kg and the relevant assessment criteria.

On this basis, the risk to human health via the vapour pathway associated with volatile contamination is considered to be low and specific remedial action is not required.

Soil-Gas Risk Assessment

Current Guidance

The primary guidance for the assessment of soil-gas risk to new built development is BS8485 (2015+A1:2019) '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*'. Reference has also been made to NHBC Foundation (2023) '*Hazardous Ground Gas – an essential guide for housebuilders'*.

BS8485 sets out a procedure for using a Gas Screening Value (GSV) derived from an assessment of gas monitoring data to determine the gas regime and associated risk. The general approach is as follows:

- Borehole hazardous gas flow rates (Q_{hg}) are calculated for each borehole standpipe for each monitoring event (with decisions made as to whether to use peak gas flow rates or steady state rates in each calculation);
- The reliability of measured gas flow rates and concentrations takes borehole construction into account and decisions are made about how to deal with any temporal or spatial shortages in the data; and
- Professional judgements are made regarding the site characteristic GSV in the assignment of the Characteristic Situation and for design purposes, taking all relevant information/lines of evidence and the conceptual site model into account.

Conceptual Site Model – Potential Sources of Ground Gas

In the same manner as contaminated land is assessed, the process of assessing risks from ground gas is based on '*source-pathway-receptor*' principles in order to establish the potential presence of '*pollutant linkage*'.

The potential sources of ground gas are further reviewed as follows:

- ***Landfill Sites;*** there are no active or historic landfill sites within 250 m of the development;
- ***Made Ground;*** ground investigation has confirmed Made Ground to be present across the site but is only nominal in most locations with depths of <1.0 m begl. The Made Ground material typically consisted of reworked clays and sands with occasional ash and brick. It does not contain significant degradable or deleterious matter. Making reference to NF94 (2023), Made Ground of this nature is 'very unlikely to be a significant source of ground gas';
- ***Natural Gas Plant;*** natural gas pipework is not present on site;
- ***Other Anthropogenic Sources;*** no other potential significant anthropogenic sources of ground gas have been identified;
- ***Natural Sources of Methane; Bacteriogenic Processes;*** methane can be produced by the microbial decay of organic material under anaerobic conditions. The main sources of such methane are from peat, bogs and other waterlogged vegetation. No such features have been identified at the site;
- ***Natural Sources of Methane: Thermogenic Processes;*** the site is not in an area of shallow coal mining and; therefore, the proposed development will not be affected by thermogenic methane;

- ***Radon;*** the site does not lie within a radon risk area.

Making reference to NF94 (2023) the ground gas sources identified in the Conceptual Model are low risk sources with a very low/low generation potential. These sources of ground gas can cause elevated gas concentrations in monitoring wells but cannot generate gas at a significant rate and therefore do not necessarily pose a hazard to above ground development:

- Made Ground: comprising reworked natural material.

Referring to the NHBC NF94 document entitled '*Hazardous Ground Gas*' published in 2023, Made Ground is not inherently a significant source of hazardous ground gas unless substantial proportions of putrescible materials such as vegetation, food waste, paper, cardboard and wood are present – no evidence of which was recorded. NF94 also states that Made Ground which comprises construction and demolition waste mixed with reworked natural soil is very unlikely to be a significant source of soil-gas. On this basis, on-site Made Ground is not considered to be a plausible source of hazardous soil-gas generation.

However, the previous BWB assessment did include a programme of gas monitoring and this data has therefore been considered further.

Monitoring Results

Soil-gas monitoring installations were constructed by BWB in 42 No. boreholes (across a wider site area than that encompassing the Phase 1 development) and monitoring was carried out on 12 No. occasions over a 6-month period. A summary of the gas monitoring results as prepared by BWB is appended.

No methane was typically recorded, with occasional low concentrations of 0.1 to 0.3 % by volume (% v/v).

Steady state carbon dioxide levels ranged from 0.0 to 5.9 % v/v during the monitoring programme, with elevated concentrations recorded in only 4 No. locations (all associated with monitoring wells located outside the Phase 1 development area).

No positive flow rates were typically recorded and ambient atmospheric pressures ranged from 979 to 1030 mb during the monitoring programme.

Borehole Hazardous Gas Flow Rates (Q_{hg})

The available monitoring data has been used to calculate borehole hazardous gas flow rates for both methane and carbon dioxide, associated with monitoring wells installed in the Phase 1 development area. The Q_{hg} has been calculated by multiplying the maximum gas concentration and the maximum borehole flow rate recorded in a particular borehole. Where no positive gas flow has been recorded within boreholes, a flow rate of 0.05 l/hr has been assumed.

The calculated Q_{hg} for methane and carbon dioxide in each monitoring well located in Phase 1 is presented below.

Well	Response Zone	Q_{hg} Methane (l/hr)	Q_{hg} Carbon Dioxide (l/hr)
WS2	GLACIAL TILL	0.0001	0.0044
BH2	GLACIAL TILL	0.0001	0.0009
BH3	GLACIAL TILL	n/a	0.012
BH4	GLACIAL TILL	0.0001	0.0045
BH5	GLACIAL TILL	0.0001	0.0042
BH7	GLACIAL TILL	0.0001	0.0022
BH8	GLACIAL TILL	0.0001	0.0027

The maximum Q_{hg} is 0.012 l/hr.

Reviewing the Q_{hg} data throughout the monitoring period shows that there is no pattern of impact during varying atmospheric pressure conditions. There is no clear relationship between Q_{hg} for methane and barometric pressure. This is consistent with a source that is not generating a large volume of ground gas

Further Analysis of Data

Ternary plots have been used to allow further interpretation of the ground gas monitoring results and to assist in identifying trends in gas composition and possible sources (Wilson et al, 2018). Plots of the data are presented on Drawing No. 23206/2 which is attached and discussed further below.

The data consistently falls within the zone that is characteristic of microbial respiration of organic material in soil, with negligible methane and low flow. In this instance, there is a direct consumption of oxygen to produce carbon dioxide and the carbon dioxide is generated so slowly that it will not be emitted from the ground surface in quantities or at a rate that is sufficient to pose a risk to overlying development.

Derivation of Gas Screening Value (GSV)

The appropriate selection of the GSV must use a multiple lines of evidence approach and consider the conceptual site model. A summary of the main points is provided below:

- **Desk Study**: The site was farmland from the earliest mapping reviewed until the 1917 mapping when the site became part of RAF Upwood. The buildings were demolished in the last few year and significant thicknesses of Made Ground was not anticipated;
- **Soil Descriptions**: the Made Ground typically comprised reworked natural material with no organic or degradable content and is of only nominal thickness (<1 m);
- **Gas Monitoring Data**: a maximum Q_{hg} of 0.012 l/hr was calculated. There is no clear relationship between Q_{hg} for methane and barometric pressure which is consistent with a source that is not generating a large volume of ground gas. The monitoring data is indicative of very low rates of gas generation from Made Ground. In all cases the gas generation rates will be low and will not pose a high risk of hazardous surface gas emissions;
- **Ternary Plot:** this shows that the data consistently falls within the zone that is typical of elevated carbon dioxide caused by biological respiration or oxidation of organic material. The gas generation rates will be low and will not pose a high risk of hazardous surface gas emissions.

Based on the findings of the ground investigation it is considered that the data set is comprehensive, representative and consistent with the established conceptual site model. In this instance the site characteristic Gas Screening Value (GSV) may be set as the maximum Q_{hg} values. The GSV has therefore been set as 0.012 l/hr.

Given that suitable monitoring data is available from the Georisk investigation and the Conceptual Model has been well established in terms of potential gas risk, we would consider that a "worst-case" assessment in accordance with BS8485 is not warranted in this instance.

Determination of Characteristic Situation (CS)

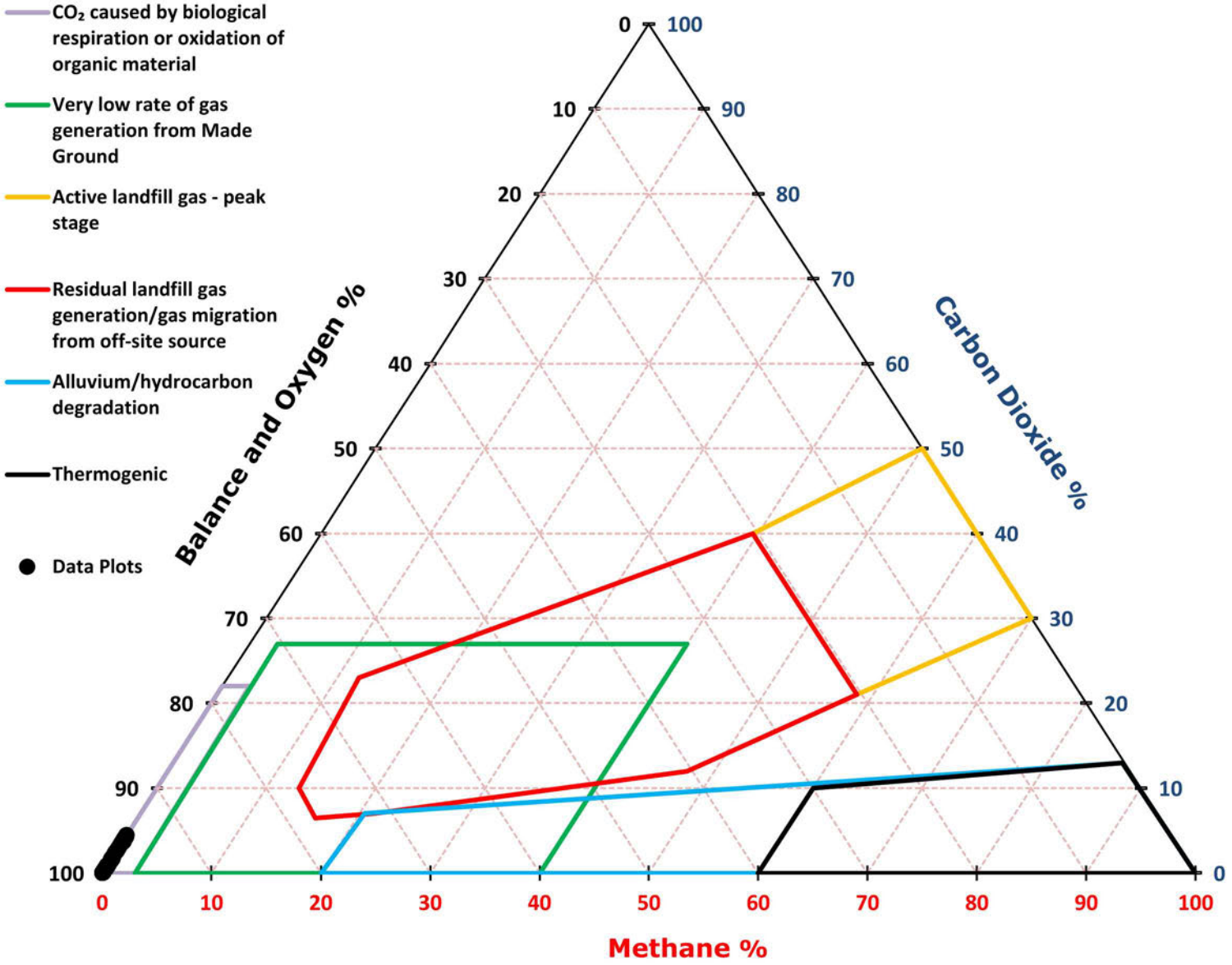
Based on the site characteristic GSV for methane and carbon dioxide the Characteristic Situation (CS) is determined for the site. The GSV is <0.07 l/hr and therefore a CS1 very low hazard potential is applicable site wide as supported by the various lines of evidence.

As a CS1 (very low hazard potential) is considered appropriate for the site, gas protection measures are not required for the proposed development.

Georisk Management Limited
23 May 2025

BWB GAS AND GROUNDWATER MONITORING SUMMARY

Ref	Flow (l/hr)		Methane (%v/v)			Carbon Dioxide (%v/v)			Methan GSV (l/hr)	Carbon Dioxide GSV (l/hr)
	min.	max.	min.	max.	avg.	min.	max.	avg.		
BH3	<0.1	0.4	<0.1	<0.1	0.1	<0.1	3.0	0.7	0.0001	0.0120
WS14	<0.1	0.2	<0.1	<0.1	<0.1	0.5	5.3	3.8	0.0001	0.0106
WS6	<0.1	0.1	<0.1	0.3	0.1	0.3	5.9	3.5	0.0003	0.0059
WS11	<0.1	0.1	<0.1	0.1	<0.1	<0.1	5.7	3.1	0.0001	0.0057
WS13	<0.1	0.1	<0.1	0.1	<0.1	0.3	5.5	3.7	0.0001	0.0055
WS18	<0.1	0.1	<0.1	0.1	<0.1	2.6	4.9	4.0	0.0001	0.0049
BH18	<0.1	0.1	<0.1	0.2	0.1	<0.1	4.7	1.5	0.0002	0.0047
BH4	<0.1	0.1	<0.1	0.1	0.1	<0.1	4.5	1.1	0.0001	0.0045
WS2	<0.1	0.1	<0.1	0.1	<0.1	<0.1	4.4	2.7	0.0001	0.0044
BH5	<0.1	0.1	<0.1	0.1	0.1	0.5	4.2	2.7	0.0001	0.0042
BH11	<0.1	0.1	<0.1	0.1	0.1	1.2	4.0	3.2	0.0001	0.0040
BH6	<0.1	0.1	<0.1	0.1	0.1	1.1	3.9	2.6	0.0001	0.0039
BH9	<0.1	0.1	<0.1	0.1	0.1	1.2	3.7	2.5	0.0001	0.0037
BH20	<0.1	0.1	<0.1	0.1	0.1	0.4	3.7	2.2	0.0001	0.0037
WS22	<0.1	0.1	<0.1	0.1	<0.1	1.2	3.7	2.6	0.0001	0.0037
WS21	<0.1	0.1	<0.1	0.1	<0.1	<0.1	3.5	1.7	0.0001	0.0035
BH12	<0.1	0.1	<0.1	0.1	0.1	<0.1	3.4	1.1	0.0001	0.0034
BH16	<0.1	0.1	<0.1	0.1	0.1	<0.1	3.1	0.7	0.0001	0.0031
WS7	<0.1	0.1	<0.1	0.1	<0.1	<0.1	3.0	1.1	0.0001	0.0030
BH8	<0.1	0.1	<0.1	0.1	0.1	<0.1	2.7	1.0	0.0001	0.0027
BH15	<0.1	0.1	<0.1	<0.1	0.1	0.1	2.6	1.2	0.0001	0.0026
WS12	<0.1	0.1	<0.1	0.1	<0.1	<0.1	2.4	1.1	0.0001	0.0024
WS19	<0.1	0.1	<0.1	0.1	<0.1	<0.1	2.3	0.4	0.0001	0.0023
BH7	<0.1	0.1	<0.1	0.1	0.1	0.2	2.2	1.1	0.0001	0.0022
WS8	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	2.1	0.6	0.0001	0.0021
BH10	<0.1	0.1	<0.1	0.2	0.1	<0.1	2.0	0.8	0.0002	0.0020
WS10	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	1.9	0.3	0.0001	0.0019
WS1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	1.7	0.9	0.0001	0.0017
BH13	<0.1	0.1	<0.1	0.2	0.1	<0.1	1.5	0.4	0.0002	0.0015
WS9	<0.1	0.1	<0.1	0.1	<0.1	<0.1	1.5	0.8	0.0001	0.0015
WS17	<0.1	0.1	<0.1	0.1	<0.1	<0.1	1.5	0.2	0.0001	0.0015
BH1	<0.1	0.1	<0.1	0.2	0.1	<0.1	1.4	0.6	0.0002	0.0014
WS20	<0.1	0.1	<0.1	0.1	<0.1	0.2	1.4	0.7	0.0001	0.0014
WS3	<0.1	0.1	<0.1	0.1	<0.1	<0.1	1.3	0.3	0.0001	0.0013
WS5	<0.1	0.1	<0.1	0.1	<0.1	<0.1	1.1	0.4	0.0001	0.0011
WS16	<0.1	1.1	<0.1	0.1	<0.1	<0.1	0.1	0.1	0.0011	0.0011
BH2	<0.1	0.1	<0.1	0.1	0.1	<0.1	0.9	0.3	0.0001	0.0009
WS4	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.9	0.2	0.0001	0.0009
BH17	<0.1	0.1	<0.1	0.1	0.1	<0.1	0.8	0.3	0.0001	0.0008
BH19	<0.1	0.1	<0.1	<0.1	0.1	<0.1	0.8	0.3	0.0001	0.0008
WS15	<0.1	0.1	<0.1	0.1	<0.1	<0.1	0.2	0.1	0.0001	0.0002
BH14	<0.1	0.1	<0.1	0.2	0.1	<0.1	0.1	0.1	0.0002	0.0001
*Atmospheric pressure ranged between 979mb and 1030mb during the monitoring period.										



georisk MANAGEMENT	Figure Title: Ternary Plot - Ground Gas	Job Title: Former RAF Upwood
	Dwg. Number: 23206/2	Client: Vistry Partnerships Limited