

ERGO

GAS VERIFICATION STRATEGY REPORT

**Land to the rear of Suncroft,
Warkworth,
Northumberland**

Prepared for:

Mr and Mrs Walton

**Report Ref: 22-1214-r01
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QUALITY ASSURANCE

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Table of Contents

| | | |
|-----|--------------------------------------|---|
| 1. | INTRODUCTION..... | 2 |
| 1.1 | Background..... | 2 |
| 1.2 | Proposed Development..... | 2 |
| 1.3 | Objectives..... | 2 |
| 1.4 | Limitations..... | 2 |
| 1.5 | Sources of Information..... | 3 |
| 1.6 | Confidentiality..... | 3 |
| 2. | GROUND GAS ASSESSMENT..... | 4 |
| 2.1 | Ground Conditions..... | 4 |
| 2.2 | Site History..... | 4 |
| 2.3 | Gas Risk..... | 4 |
| 3. | GAS PROTECTION MEASURES..... | 5 |
| 3.1 | BS 8485 Property Considerations..... | 5 |
| 3.2 | Required BS 8485 Point Score..... | 5 |
| 3.3 | Proposed Protection Measures..... | 5 |
| 4. | VERIFICATION REQUIREMENTS..... | 7 |
| 4.1 | Visual Inspection Verification..... | 7 |
| 4.2 | Verification Reporting..... | 8 |

APPENDICES

Appendix I Limitations

Appendix II Glossary

Appendix III Drawings

Drawing No 22-1214-001 – Site Location Plan

Drawing No 22-1214-002 – Proposed Development Layout

Heddon Structures Limited Drawing No 0458-DR-S-004 – Foundation Detail

Appendix IV Summary of Gas Protection Measures

Appendix V Examples of Verification

Appendix VI Filoseal Data Sheet

Appendix VII Verification Proforma

1. INTRODUCTION

1.1 Background

ERGO has been instructed by Mr A Laurie to develop a Ground Gas Verification Strategy for the proposed residential development, located on land off Station Road, Warkworth.

1.2 Proposed Development

ERGO understands that the client intends to construct a residential development comprising 2No. dwellings with associated garages, landscaped areas, access and infrastructure.

Drawing 22-1214-002 (Appendix III) identifies the proposed development layout. A snapshot of the proposed development layout is indicated in Figure 1.1 below.

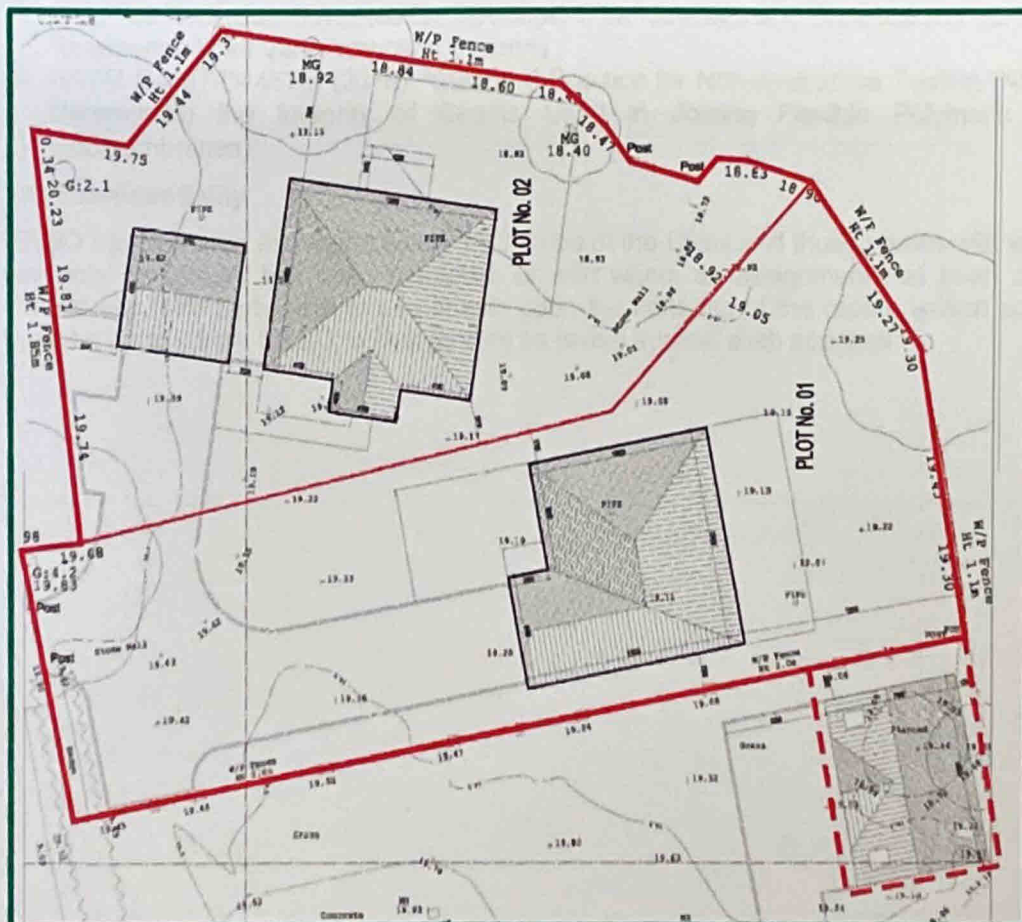


Figure 1.1 Snapshot of Proposed Development

1.3 Objectives

The objectives of the Geo-Environmental Investigation are to:

- Review previously completed reports outlining potential ground gas risks and liabilities;
- Summarise the proposed ground gas mitigation measures to be included within proposed plots; and,
- Outline the requirements to verify the suitable and appropriate installation of ground gas mitigation measures.

1.4 Limitations

The limitations of this report are presented in Appendix I.

1.5 Sources of Information

The following reports have been reviewed to complete this Verification Strategy:

Intersoil – *Environmental Study* Ref: 12023/amd2, dated June 2013.

Intersoil – *Environmental Soils Investigation Report*. Ref: 20003, dated January 2020

ARC Environmental – *Preliminary Data Sheet* Ref: Report No.20-610, dated May 2021.

The following guidance documents have been reviewed to complete this Verification Strategy:

- BS 8485:2015 (+A1 2019), 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings';
- CIRIA C735 (2014), 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases';
- YALPAG Technical Guidance for Developers, Landowners and Consultants, 'Verification Requirements for Gas Protection Systems';
- ASTM D4437/D4437M (2018), 'Standard Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheer Geomembranes'.

1.6 Confidentiality

ERGO has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from ERGO; a charge may be levied against such approval.

2. GROUND GAS ASSESSMENT

ERGO have reviewed the previously completed reports to establish the following. These reports should be read in line with this report to ensure maximum understanding.

2.1 Ground Conditions

Table 2.1 *Encountered Ground conditions*

| SUMMARY OF GROUND CONDITIONS | |
|------------------------------|--|
| Made Ground | Made Ground was encountered within all exploratory hole locations to maximum depths of 10.40mbgl and was recorded to be significantly deeper in the south/south east. Made Ground generally comprised a brown clayey topsoil overlying a dark grey ashy sandy gravel to a maximum depth of 4.70-5.00mbgl. with brick, glass, metal, plastic, ceramics, coal and sandstone noted overlying a firm reworked clay to a maximum recorded depth of 10.40mbgl. in the south east of the site, becoming shallower to the west. |
| Drift | No drift deposits were noted, clay deposits were noted to be reworked. |
| Bedrock | Suspected solid bedrock was encountered at depths between 2.00-10.70mbgl. comprising a weak weathered orange SANDSTONE, recovered as sand and gravel. Bedrock was noted to be significantly shallower to the west of the site (2.00mbgl). as per ARC's investigation (ref: 20-610) the significant difference in rockhead is likely associated with the high wall feature of the former quarry. |

2.2 Site History

Historic mapping suggests the site comprised open ground and was partially occupied by a 'Quarry' in c.1855 to the north/east. By c.1923, the quarry is shown to have expanded and occupied the majority of the site (approx. 90%). By c.1981, the site was in use as a builders yard with several structures noted in the south-western site area though noted to have been cleared by c.2013.

2.3 Gas Risk

ARC suggested the site was to be classified as Gas Characteristic Situation 2/Amber 1 following a review of the completed ground gas monitoring data identifying elevated carbon dioxide levels (>5%), depleted oxygen concentrations (<19%) and the location of the site within the Northumberland Coalfield in accordance with the guidance followed by Northumberland County Council.

This assessment is understood to have been accepted by Northumberland County Council.

A verification report is also required to confirm gas protective measures have been installed in general accordance with CIRIA C735, for submission and approval to the LPA.

3. GAS PROTECTION MEASURES

3.1 BS 8485 Property Considerations

British Standard BS8485:2015+A1:2019 provides two types of commercial property that require assessment. These building types are:

- **Type A building:** private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.
- **Type B building:** private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small to medium size rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

It is understood that the proposed building will be 'Type A'.

3.2 Required BS 8485 Point Score

Based on the previously completed gas risk assessment and in accordance with the requirements of Northumberland County Council; the proposed structures at the site require installation and validation of specialist Ground Gas Mitigation Measures in line with a CS2/Amber 1 classification to be constructed in accordance with BS8485:2015+A1:2019 as is displayed below in Table 3.1.

Table 3.1 BS8485:2015+A1:2019 Points Required for Type A and B Building

| CHARACTERISTIC SITUATION | NHBC TRAFFIC LIGHT SYSTEM | MINIMUM GAS PROTECTION SCORE (POINTS) | |
|--------------------------|---------------------------|---------------------------------------|-----------------|
| | | High Sensitivity | |
| | | Type A building | Type B building |
| 1 | Green | 0 | 0 |
| 2 | Amber 1 | 3.5 | 3.5 |
| 3 | Amber 2 | 4.5 | 4 |
| 4 | Red | 6.5 | 5.5 |
| 5 | N/A | — | 6 |
| 6 | N/A | — | — |

3.3 Proposed Protection Measures

It is understood that the proposed plots within the development will include the following protection measures displayed in Table 3.2 below. A summary of all gas protection measures is shown within Appendix V.

Table 3.2 Summary of Proposed Measures

| PROTECTION MEASURE | SCORE ^A |
|---|--------------------|
| Precast suspended segmental subfloor (i.e. beam and block). | 0.0 |
| Ventilation Protection Measures - Passive sub-floor void | 1.5 |
| Gas Membrane in accordance with BS 8485 | 2.0 |
| Total Score | 3.5 |

Subject to the suitable installation, the above proposed protection measures will achieve a point score in excess of the required 3.5-point score for a CS2/Amber 1 property.

Architectural drawings showing the floor construction and membrane detailing have not been provided by the Client to date. These will need to be confirmed subsequently within planning.

It has not been confirmed which Ground Gas Barrier product will be used within the development. However, it will need to be compliant with BS8485. A data sheet for the chosen product will be included in the overall verification report.

Northumberland County Council require all service penetrations to be sealed with a closed-cell expanding foam. Northumberland County Council and Northumbrian Water have previously confirmed the suitability of FiloSeal and FiloSeal+HD products, a data sheet for the selected product is enclosed in Appendix II. Where a product other than FiloSeal is used then the applicant will need to seek approval from Northumbrian Water prior to submitting the details to the LPA.

The following information is provided for the information of the client and is not intended to be used for any other purpose. The client is responsible for the use of this information.

Table 4.1: Gas Verification Strategy

| Item | Notes |
|------|---------------------------|
| 1.00 | Gas Verification Strategy |
| 2.00 | Gas Verification Strategy |
| 3.00 | Gas Verification Strategy |
| 4.00 | Gas Verification Strategy |
| 5.00 | Gas Verification Strategy |

Notes: 1. The information provided in this table is for the information of the client and is not intended to be used for any other purpose. The client is responsible for the use of this information.

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Table 4.2: Gas Verification Strategy

| Item | Notes |
|------|---------------------------|
| 1.00 | Gas Verification Strategy |
| 2.00 | Gas Verification Strategy |
| 3.00 | Gas Verification Strategy |
| 4.00 | Gas Verification Strategy |
| 5.00 | Gas Verification Strategy |



4. VERIFICATION REQUIREMENTS

To achieve the required gas mitigation scores detailed in Section 3, it is necessary to ensure the adequate workmanship and installation of all proposed protection measures. This will involve the following:

- Independent validation of the works undertaken;
- Attendance to the site a sufficient number of times in accordance with the requirements set out within the YALPAG guidance document to ensure the adequate installation of the proposed gas protection measures;
- Verification of the completed installation works immediately prior to concrete pours to ensure no damage to the membrane by follow on trades; and,
- Full photographic records of the plots validated during each visits; and,
- Production of verification proformas for the inspected plots.

The verification requirements are assessed using guidance within the aforementioned YAHPAG guidance document and CIRIA C735. This assessment determines the risk associated to the works. This assessment is outline is Table 4.1 below.

Table 4.1 Verification Assessment

| ITEM | RISK |
|-----------------------------|--|
| Hazardous Ground Gas Regime | CS1 requiring CS2 - Low/Moderate |
| Design Complexity | Simple with limited penetrations - Low/Moderate |
| Number of plots | 4no. small structures– Low/Moderate |
| Installers | Groundworkers of unknown experience - High |

Based on YALPAG guidance and the experience of the installers this will comprise a full assessment of the entire gas membrane by primary means of pick-testing and inspection of all joints and service penetrations.

Verification should be undertaken immediately prior to all concrete pours to ensure that no damage is possible by follow on trades.

Any alteration to the verification assessment will require suitable revisions to the required verification process.

4.1 Visual Inspection Verification

To ensure the adequate installation of the proposed protection measures the following items, shown in table 4.2, are required to be verified within each plot by an independent verifier.

Table 4.2 Visual Inspection Verification

| INSPECTION | METHOD |
|------------------------|--|
| Product Verification | Confirmation that suitable products have been installed to consist of photographs of product types, labels on packaging and delivery tickets. |
| Wall Cavity Inspection | Confirmation that gas membrane spans the external wall cavity above the periscopic vents. |
| General Condition | The membrane is to be inspected to ensure there are no tears, punctures or rips. |
| Jointing | The engineer is to check the overlaps between membranes are correctly sealed with sufficient overlaps. |
| Service Entry Points | Verification of the presence of closed cell expanding foam, preformed top hats sealed to the pipe and membrane as per the construction detail. |

To ensure the future site users will be at no significant risk from possible ground gas related issues, the Gas Membrane Verifier should attend the site a sufficient number of times in line with YAHPAG guidance to adequately inspect the installed membrane and subfloor voids immediately prior to the concrete pours within the plot requiring Gas Mitigation Measures. Given the size of the plot, all seams should be adequately inspected during the validation programme.

Examples of gas membrane verification (photographs include different membrane types for demonstrative purposes only – gas membranes are site specific) are shown in Appendix VII. Should the gas mitigation measures be deemed to be non-compliant with the remediation strategy, minor amendments will be made under observation until deemed sufficient. Major non-compliance with the remediation strategy will result in the re-installation and subsequent revalidation of mitigation measures where necessary.

Upon completion of the verification a proforma will be produced detailing the inspection and adequate installation of gas protection measures within inspected plots.

4.2 Verification Reporting

Upon completion of the installation works ERGO will produce a document detailing the adequate workmanship involved in the installation of the proposed mitigation. This report will be submitted to and approved by the Local Authority prior to the occupation of the building.

Also included within the report will be a summary and experience of the independent verifier.

END OF REPORT