REMEDIATION AND ENABLING WORKS VALIDATION REPORT

Land to the rear of Suncroft, Warkworth, Northumberland, NE65 0PX

Prepared for:

Mr & Mrs Walton

Report Ref: 22-1214-VAL
Date Issued: July 2023

ERGO LIMITED

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QUALITY ASSURANCE

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PROJECT NUMBER	22-1214

IMS Template Reference
QR005-1

EXECUTIVE SUMMARY	
Site Address	Land to the rear of Suncroft, Station Road, Warkworth, NE65 0XP.
Grid Reference	E424780, N606370.
Site Area	~0.18 Ha.
Stated Objective	The primary purpose of this report is to document the implementation and subsequent validation of regulatory compliant Build Phase mitigation measures completed as part of the construction of a residential development at the site located at Suncroft, Warkworth in accordance with the approved ERGO Remediation Strategy (Ref: 22-1214-REM, dated May 2022).
Site Remediation Works	The validation of the Enabling Works items was completed by ERGO as specified within the ERGO Enabling Works Validation Report (ref: 22-1214-REM). It is understood that this report has been submitted and approved by the Council with no significant issues understood to have been raised following this report.

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APPENDICES

1. INTRODUCTION

1.1 Background

This report details the Validation of the Build Phase Remediation operations that were undertaken by ALCC Limited on behalf of their client under the supervision of ERGO to facilitate the preparation of the residential development of a parcel of land located to the rear of Suncroft, Warkworth; herein referred to as **the site**.

ERGO were appointed by ALCC Limited as independent Geo-Environmental Consultant for the validation of build phase site remediation items and the subsequent production of a suitably detailed report to ensure the discharge of relevant planning conditions and requirements for Building Control and warranty providers. ERGO have previously validated the remediation and enabling works package (ref: 22-1214-REM).

The development area is c.0.18ha in size and is situated to the rear of Suncroft, located off Station Road in the north of Warkworth (see ERGO drawing ref: 22-1214-001 within Appendix III). For the avoidance of doubt, ERGO can confirm that the parcel of land refers to the red-line boundary as indicated in Figure 1.1 below.

Figure 1.1 Site Location Plan – Land to the rear of Suncroft, Warkworth

1.2 Site Location / Setting

SITE ADDRESS	Land to the rear of Suncroft, Station Road, Warkworth, NE65 0XP.
NATIONAL GRID REFERENCE	E424780, N606370.
SITE AREA	~0.18 Ha.

Prior to the commencement of works, the site comprised an undeveloped area of relatively flat, grassy land to the rear of existing residential properties.

Historic mapping suggests the site generally comprised open ground, the north-eastern area was occupied by a 'quarry' in c.1855. 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 builder's yard with several structures noted in the south-western site area though noted to have been cleared by c.2013.

1.3 Development

Mr and Mrs Walton have constructed 2no. residential dwellings with associated gardens, garages, access road and infrastructure.

The detailed development layout for the site is presented within Drawing No. 22-1214-002 included within Appendix III. A snapshot of the development plan is shown in Figure 1.2.

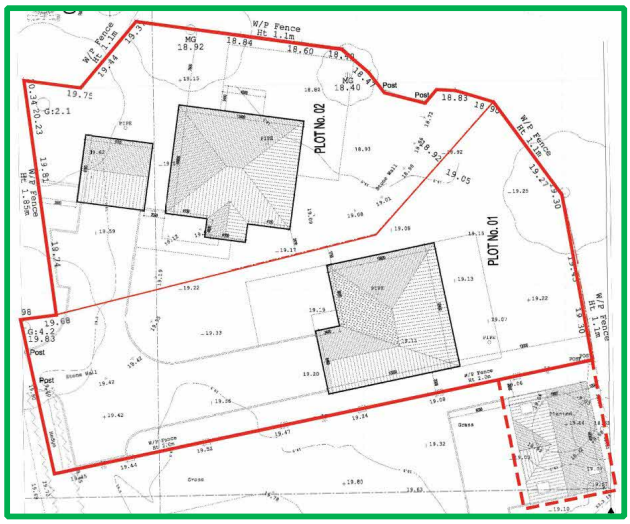


Figure 1.2 Proposed Development Plan

1.4 Summary of Parties Involved

NAME OF PARTY	FUNCTION / INTEREST
Land Owner	Mr and Mrs Walton
Developer	Mr and Mrs Walton
Geo-Environmental Consultant	ERGO.
Main Contractor	D.P. Builders Ltd.
Remediation Contractor	D.P. Builders Ltd.
Human Health Regulator / Local Planning Authority	Northumberland County Council.
Controlled Waters Regulator	Environment Agency.

1.5 Limitations

The limitations of this report are presented in Appendix I.

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. CONTAMINATION, REMEDIATION & ENABLING WORKS REQUIREMENTS

2.1 Summary of Contamination Issues

2.1.1 Human Health

The Tier I human health risk assessments completed by Intersoil (2013) and Arc Environmental (2021), determined that concentrations of the following determinants exceed guideline values for a residential end use:

- Arsenic;
- Lead;
- Benzo(b)Fluoranthene;
- Benzo(a)Pyrene; and,
- Dibenzo(a,h)Anthracene.

Asbestos was not identified within any of the soil samples submitted for chemical analysis.

In the case of Heavy Metals and non-volatile PAH compounds the viable exposure pathway is associated with direct contact, inhalation of particulates, consumption of homegrown vegetables and ingestion of soil. The proposed development of the site will include hard cover and the importation and placement of certified subsoil and topsoil within a validated clean cover system in areas of private gardens and landscaping, thus removing potential pathways associated with direct contact and ingestion thereby mitigating potential risks.

2.1.2 Controlled Waters

The site is underlain by a Secondary Undifferentiated Aquifer (bedrock), the river coquet is located 100m south of the site and a tributary is located 50m east of the site boundary.

The previous Conceptual Site Models identified a low risk to controlled water receptors due to the low permeability predominantly cohesive drift deposits and the absence of groundwater abstraction within the vicinity of the site.

Based on the above, there is considered to be no significant level of risk to the controlled water receptors.

Notwithstanding the above, precautions are detailed herein to mitigate potential impacts of unforeseen mobile contamination encountered during the subsequent works.

2.1.3 Ground Gas

The ground gas assessment as detailed within ERGO Gas Protection Verification Strategy (Ref: 22-1214-r01, dated May 2022) and the previous ARC report (2021) indicated that the site is Characteristic Situation 2/Amber 1.

This assessment was confirmed during the completed ground gas monitoring which identified elevated carbon dioxide (>5%) and depleted oxygen (<19%). The location of the site is within the Northumberland Coalfield in accordance with the guidance followed by Northumberland County Council.

ERGO Ground Gas Mitigation Verification Strategy sets out the validation requirements which is understood to have been accepted by Northumberland County Council.

2.2 Correspondence with Regulatory Authorities

2.2.1 Local Planning Authority – Human Health

ERGO has submitted our Remediation & Enabling Works Strategy (Ref: 22-1214-REM) dated May 2022 which clearly defines the protocols required for the legislatively compliant development to include protective measures ensuring no unacceptable level of risk is posed to future site end users.

2.2.2 Environment Agency – Controlled Water & Wider Environ

The EA act as a statutory consultee of Northumberland County Council Planning Authority and in this instance no consultation correspondence has been supplied by Northumberland County Council and as such, we presume the EA have no further requirements with respect to controlled waters.

2.3 Summary of Remediation & Enabling Works Objectives

The proposed remediation activities were detailed within the ERGO Remediation Strategy and Enabling Works Plan (22-1214-REM; dated May 2022).

This report has been prepared to document the completion of all necessary land remediation and enabling works and to record the presence of any variation in ground conditions or previously unidentified sources of potential contamination, environmental impact or potential nuisance to the wider environ. Table 2.1 outlines the Enabling works objectives.

Table 2.1 Enabling Works Objectives

ENABLING WORKS NO.	GENERAL OVERVIEW OF OBJECTIVES
EW-1	Pre-Commencement Regulatory Compliance
EW-2	Environment & Nuisance Control
EW-3	Identification, Isolation and Treatment of Invasive Plants
EW-4	Site Clearance Operations
EW-5	Importation of Bulk Fill
EW-6	Preparations of Gardens for Cover System
EW-7	Provision of Subsoil & Topsoil
EW-8	Removal of Excess Soil
EW-9	Independent Validation- Watching Brief
EW-10	Remedial Verification Report

Second Phase Remediation & Enabling Works – Build Phase

A second post demolition phase of works will be required to ensure the proposed development is constructed in a manner that incorporates the required mitigation measures to ensure the development is compliant with UK Building Regulations and the Local Authority Planning requirements.

Once the ground has been stabilised and rendered suitable for development, the builder will be required to undertake a second phase of remediation works to mitigate the identified theoretical risk to human health:

- Installation of appropriate pipework subject to the completion of a UKWIR assessment;
- The installation and validation of appropriate ground gas mitigation measures to be compliant with the completed ground gas risk assessment (prepared separately);
- Placement and validation of a suitable clean cover system within all areas of soft landscaped areas.

3. DETAILED REMEDIATION ACTIVITIES

The focus of the remediation works is to address the contaminant issues previously identified within the site investigations that presented an unacceptable risk to human health following the redevelopment of the site.

For completeness, each of the required activities outlined above in Section 2.4 has been discussed below within the context of the actual remediation works that were undertaken onsite.

EW-1 Pre Commencement Regulatory Compliance
Overview of Works Prior to commencement of works onsite, all reports relating to the assessment of risk to contaminated land were submitted to the regulatory authorities and gained written approval of the required actions.
EW-2 Environment and Nuisance Control
Overview of Works ERGO can confirm that all works were managed in such a way so as to ensure that no significant environmental nuisance was created.
EW-3 Identification, Isolation and Treatment of Invasive Species
Overview of Works In accordance with the agreed Remediation and Enabling Works Strategy, ALCC Ltd acting as the contractor appointed a specialist to assess the site and confirm that invasive species were not present within the site boundary or adjacent to the site boundary requiring subsequent treatment. It is understood that no evidence of invasive species was identified and no remediation works were subsequently required to be completed.
EW-4 Site Clearance Operations
Overview of Works General site clearance & provision of welfare, offices and site security were enacted as per the contractual requirements. All vegetation and root networks were removed in a controlled manner and stockpiled/removed from site in accordance with the Waste Permitting Regulations and the requirements of NHBC/LABC.
EW-5 Importation of Bulk Fill
Overview of Works ERGO can confirm no requirement to import materials for bulk fill was required to achieve proposed site levels was necessary. All bulk fill materials were site won and comprised natural and reworked soils suitable for the proposed end use.
EW-6 Preparation of Gardens for Cover System
Overview of Works ERGO can confirm that gardens were suitably prepared for the clean cover system. All proposed soft landscaping areas were reduced to 600mmbgl. to facilitate the placement of a suitable clean cover system.
EW-7 Provision of Subsoil and Topsoil
Overview of Works Topsoil and Subsoil materials were imported to the site from a greenfield site is Amble, testing was provided by ALCC Ltd which confirmed suitability. Results are enclosed.

EW-8 Removal of Excess Soil

Overview of Works

Excess soils were suitably removed from the site and disposed of accordingly, copies of the waste tickets provided by ALCC Ltd are enclosed for reference.

EW-9 Independent Validation – Watching Brief

Overview of Works

ERGO attended the site on several occasions during the remediation and enabling works and subsequent build phase program to inspect the works completed and ensure compliance with the Remediation Statement.

EW-10 Remedial Verification Report

Overview of Works

This report has been created and document all actions undertaken by the Remediation Contractor, on behalf of Mr & Mrs Walton under the supervision of ERGO as an independent party during the remediation phase.

This report should be submitted to the Council to confirm all required mitigation measures outlined within the ERGO Remediation and Enabling Works Strategy have been satisfactorily completed.

BPW1 Installation of appropriate pipework

Overview of Works

It is understood that a UKWIR assessment was completed separately by others, details are understood to be available from ALCC Ltd.

BPW2 Installation and Validation of suitable ground gas protection measures

Date of Works Undertaken

November 2022 – June 2023

Report

22-1214-GVAL1 ERGO Ground Gas Protection Measures Validation Report

Overview of Works

A Gas Verification Strategy was prepared by ERGO to detail mitigation measures against potential relevant risks which was accepted by Northumberland County Council.

Following this, ERGO attended site on several occasions as required to inspect and validate the installation of the required Gas Mitigation Measures. ERGO report ref: 22-1214-GVAL1, enclosed, documents the appropriate installation of these measures.

BPW3 Placement of Cover System within Garden Plots & Landscaped Areas

Report

22-1214-GV ERGO Garden Validation Letter Report.

Overview of Works

ERGO have attended the site to validate the placement of subsoil and topsoil material within all garden plots. ERGO can confirm the suitability of the material placed and the placement of the material complies with the agreed Remediation Statement.

Further details are presented in ERGO Report 22-1214-GV enclosed.

4. CONCLUSION AND RECOMMENDATIONS

ERGO confirm the validation of the outstanding build phase remediation items have been completed in accordance agreed ERGO Remediation and Enabling Works Strategy for the regeneration of Land to the rear of Suncroft, Warkworth.

ERGO can confirm that the works have been implemented in accordance with the agreed Remediation Strategy with all materials managed in such a way as to ensure that the completed works posed no risk to construction operatives or the wider environ.

ERGO can also confirm that based on the observations and testing to date, all materials which remain in-situ and those imported for use within the scheme pose no unacceptable degree of potential risk to the identified receptors within the context of the previously completed developed Conceptual Site Model (CSM) and as such the site is deemed suitable for use.

END OF REPORT

APPENDIX I
LIMITATIONS

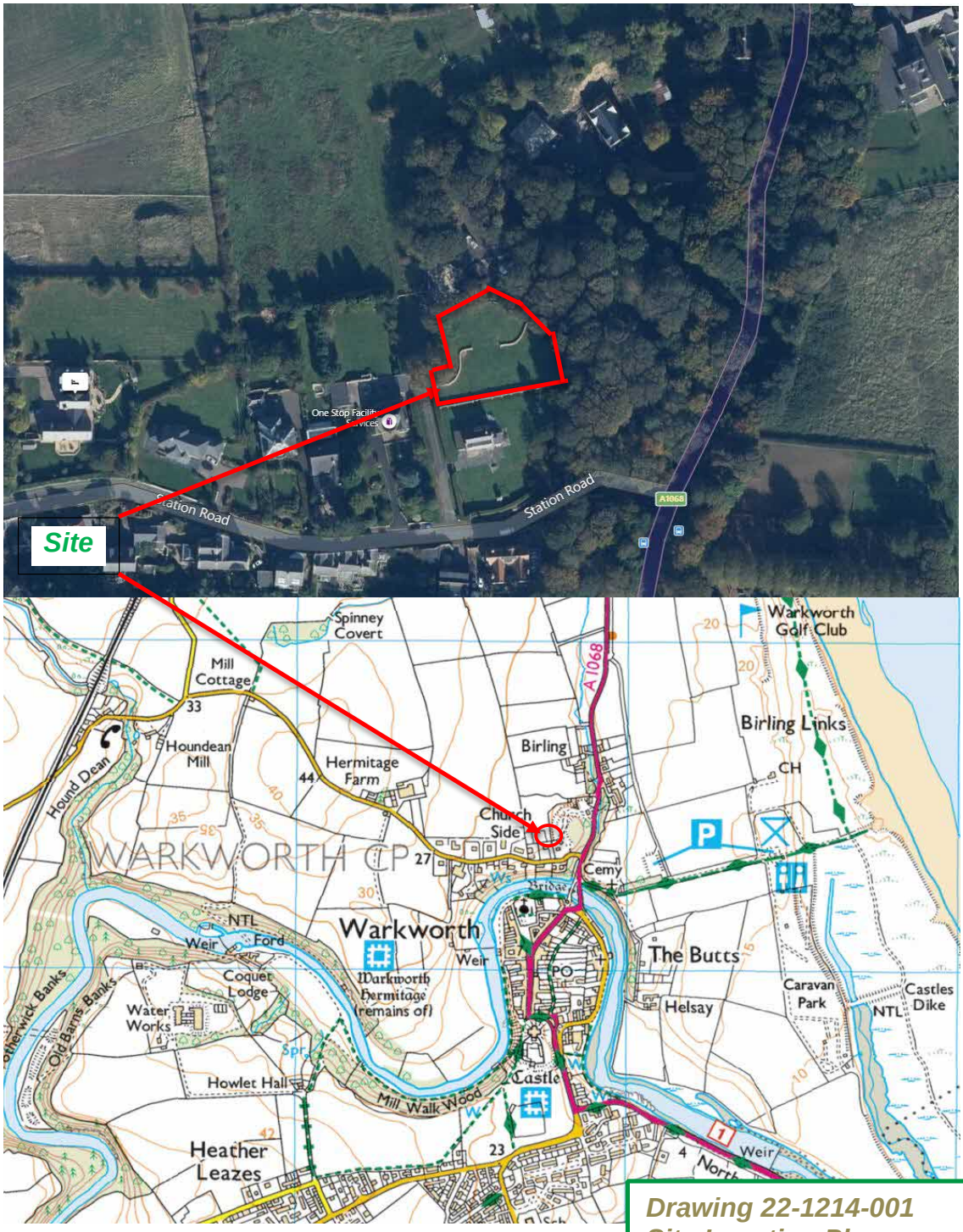
1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between ERGO and the Client as indicated in Section 1.2.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. ERGO cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by ERGO is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by ERGO in this connection without their explicit written agreement there to by ERGO.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

TERMS

AST	Above Ground Storage Tank	**SGV**	Soil Guideline Value
BGS	British Geological Survey	**SPH**	Separate Phase Hydrocarbon
BSI	British Standards Institute	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	**SPT**	Standard Penetration Test
CIEH	Chartered Institute of Environmental Health	**SVOC**	Semi Volatile Organic Compound
CIRIA	Construction Industry Research Association	**UST**	Underground Storage Tank
CLEA	Contaminated Land Exposure Assessment	**VCCs**	Vibro Concrete Columns
CSM	Conceptual Site Model	**VOC**	Volatile Organic Compound
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)	**WTE**	Water Table Elevation
DWS	Drinking Water Standard	**m**	Metres
EA	Environment Agency	**km**	Kilometres
EQS	Environmental Quality Standard	**%**	Percent
GAC	General Assessment Criteria	**%v/v**	Percent volume in air
GL	Ground Level	**mb**	Milli Bars (atmospheric pressure)
GSV	Gas Screening Value	**l/hr**	Litres per hour
HCV	Health Criteria Value	**µg/l**	Micrograms per Litre (parts per billion)
ICSM	Initial Conceptual Site Model	**ppb**	Parts Per Billion
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)	**mg/kg**	Milligrams per kilogram (parts per million)
ND	Not Detected	**ppm**	Parts Per Million
LMRL	Lower Method Reporting Limit	**mg/m^3**	Milligram per metre cubed
NR	Not Recorded	**m bgl**	Metres Below Ground Level
PAH	Polycyclic Aromatic Hydrocarbon	**m bcl**	Metre Below Cover Level
PCB	Poly-Chlorinated Biphenyl	**mAOD**	Metres Above Ordnance Datum (sea level)
PID	Photo Ionisation Detector	**kN/m^2**	Kilo Newtons per metre squared
QA	Quality Assurance	**µm**	Micro metre
SGV	Soil Guideline Value		

APPENDIX III
DRAWINGS



Drawing 22-1214-001
Site Location Plan

ERGO

APPENDIX IV
REMEDIATION TARGET VALUES

Remediation Validation Target Values

Determinand	Units	Within 1150mm Cover System (Garden)
Asbestos	%v/v	**NFD**
Arsenic	mg/kg	**37**
Cadmium	mg/kg	**11**
Chromium (VI)	mg/kg	**6.1**
Lead	mg/kg	**200**
Mercury	mg/kg	**40**
Nickel	mg/kg	**130**
Selenium	mg/kg	**250**
Copper	mg/kg	**2400**
Zinc	mg/kg	**3700**
Naphthalene	mg/kg	**2.3**
Acenaphthylene	mg/kg	**170**
Acenaphthene	mg/kg	**210**
Fluorene	mg/kg	**170**
Phenanthrene	mg/kg	**95**
Anthracene	mg/kg	**2400**
Fluoranthene	mg/kg	**280**
Pyrene	mg/kg	**620**
Benzo(a)Anthracene	mg/kg	**7.2**
Chrysene	mg/kg	**15**
Benzo(b)Fluoranthene	mg/kg	**2.6**
Benzo(k)Fluoranthene	mg/kg	**77**
Benzo(a)Pyrene	mg/kg	**2.2**
Indeno(123-cd)Pyrene	mg/kg	**27**
Dibenzo(ah)Anthracene	mg/kg	**0.24**
Benzo(ghi)Perylene	mg/kg	**320**
TPH C_5-C_6 (aliphatic)	mg/kg	**42**
TPH C_6-C_8 (aliphatic)	mg/kg	**100**
TPH C_8-C_{10} (aliphatic)	mg/kg	**27**
TPH C_{10}-C_{12} (aromatic)	mg/kg	**74**
TPH C_{12}-C_{16} (aromatic)	mg/kg	**140**
TPH C_{16}-C_{21} (aromatic)	mg/kg	**260**
TPH C_{21}-C_{35} (aromatic)	mg/kg	**1100**

Asbestos will be screened visually on-site by a qualified environmental consultant and where potential ACM is identified representative samples will be subject to quantitative analysis of % volume by weight. Should any ACM be identified within the soil matrices, further detailed % assessment would be required when the reported laboratory result exceeds the limit of detection for the analytical method at 0.01% by volume (weight).

Excludes matrices where free product is observed;

APPENDIX V
GARDEN VALIDATION REPORTS

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Ref: 22-1214-GV
Date: 24th July 2023

Andy Laurie
ALCC Limited
Unit 12,
Rake House Farm,
Rake Lane,
North Tyneside,
NE29 8EQ

BY Email

Dear Andy,

Garden Areas Validation – Suncroft, Warkworth

Introduction

ERGO understands that gardens have been completed within Plots 1 and 2 at the Suncroft, Warkworth site. in line with the previously completed and approved ERGO Remediation Strategy (Ref: 22-1214-REM, dated May 2022), plots were inspected to ensure the appropriate clean cover system.

A 600mm cover system is required where Made Ground remains at formation level within proposed garden areas, using certified material with appropriate validation within proposed garden areas.

The garden validation has been undertaken as per the specification detailed in the ERGO Remediation Strategy report.

ERGO were instructed by ALCC Limited to attend the site and inspect the depth of the clean cover later within garden plots.

Objectives

For the avoidance of doubt ERGO can confirm that our schedule of works will include the following key attributes:

- Attendance onsite by suitably qualified ERGO Engineers to inspect the thickness of the clean cover layer within the required plots; and,
- Production of a Letter Report detailing the findings of the inspection of the clean cover layer within the residential development gardens.

Validation Works

ERGO completed the works in accordance with the approved ERGO Remediation Strategy inspecting plots 1-2 and can confirm that the majority of plots generally comprised at least 150mm of grey sandy slightly gravelly topsoil overlying a firm brown sandy slightly gravelly clay with gravels of sandstone and mudstone to depths of 600mbgl.

Chemical Suitability

The chemical suitability of the materials has been assessed with chemical testing provided by the DP Builders Ltd.

ERGO understands the donor site to be a greenfield site located within Amble, no further details have been provided.

The results of the testing have been compared against the site-specific remediation targets summarised within the ERGO Remediation Strategy report. Sample descriptions are described above with copies of the chemical testing enclosed and results summarised within Table 1 below.

Table 1 Summary of Toxicity Assessment for a Private Garden

DETERMINANT	UNIT	GAC	N	MC	LOC. OF EX	PATHWAY	ASSESSMENT
Asbestos Identification	-	Present	3	NFD	N/A	4	No Further Action
Arsenic	mg/kg	37	3	3.7	N/A	1	No Further Action
Cadmium	mg/kg	11	3	<0.2	N/A	1	No Further Action
Chromium (VI)	mg/kg	6.1	3	<4.0	N/A	1	No Further Action
Lead	mg/kg	200	3	35	N/A	1	No Further Action
Mercury	mg/kg	40	3	<0.3	N/A	2	No Further Action
Nickel	mg/kg	130	3	27	N/A	1	No Further Action
Selenium	mg/kg	250	3	<1.0	N/A	1	No Further Action
Copper	mg/kg	2400	3	46	N/A	1	No Further Action
Zinc	mg/kg	3700	3	72	N/A	1	No Further Action
Naphthalene	mg/kg	2.3	3	0.31	N/A	2	No Further Action
Acenaphthylene	mg/kg	170	3	<0.05	N/A	3	No Further Action
Acenaphthene	mg/kg	210	3	0.46	N/A	1	No Further Action
Fluorene	mg/kg	170	3	0.68	N/A	1	No Further Action
Phenanthrene	mg/kg	95	3	3.0	N/A	3	No Further Action
Anthracene	mg/kg	2400	3	0.83	N/A	3	No Further Action
Fluoranthene	mg/kg	280	3	2.6	N/A	3	No Further Action
Pyrene	mg/kg	620	3	2.0	N/A	3	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	3	1.1	N/A	3	No Further Action
Chrysene	mg/kg	15	3	1.1	N/A	3	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6	3	0.96	N/A	3	No Further Action
Benzo(k)Fluoranthene	mg/kg	77	3	0.45	N/A	3	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	3	0.76	N/A	3	No Further Action
Indeno(123-cd)Pyrene	mg/kg	27	3	0.38	N/A	3	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	3	<0.05	N/A	3	No Further Action
Benzo(ghi)Perylene	mg/kg	320	3	0.38	N/A	3	No Further Action
TPH C5-C6 (aliphatic)	mg/kg	42	3	<0.001	N/A	2	No Further Action
TPH C6-C8 (aliphatic)	mg/kg	100	3	<0.001	N/A	2	No Further Action
TPH C8-C10 (aliphatic)	mg/kg	27	3	<0.001	N/A	2	No Further Action
TPH C10-C12 (aromatic)	mg/kg	74	3	<1.0	N/A	2	No Further Action
TPH C12-C16 (aromatic)	mg/kg	140	3	4.0	N/A	2	No Further Action
TPH C16-C21 (aromatic)	mg/kg	260	3	12	N/A	1	No Further Action
TPH C21-C35 (aromatic)	mg/kg	1100	3	17	N/A	1	No Further Action

Notes

Main Exposure Pathways: 1 = Soil Ingestion, 2 = Vapour Inhalation (indoor), 3 = Dermal Contact & Ingestion, 4 = Dust Inhalation. Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance; NFD = No Fibres Detected

The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. ERGO has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C_5-C_{12}) and the Tier 1 values for aromatic compound for the non-volatile fractions (C_{12}-C_{35}). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

Based on the results above, no elevated concentrations of potential contaminants of concern have been identified within the sampled gardens when compared with Tier I GACs for a residential end use. Based on this assessment along with the visual soil description, the material placed within the plots has been deemed suitable for reuse within residential gardens with no significant potential unacceptable level of risk to human health for future residential end users and construction workers.

Conclusion

It is considered that within plots 1 and 2, the cover system has been installed in accordance with the agreed Remediation Strategy.

I trust this information is satisfactory to your requirements, and should I be able to be of any further assistance, please do not hesitate to contact me.

Yours sincerely,

For and on behalf of ERGO Ltd

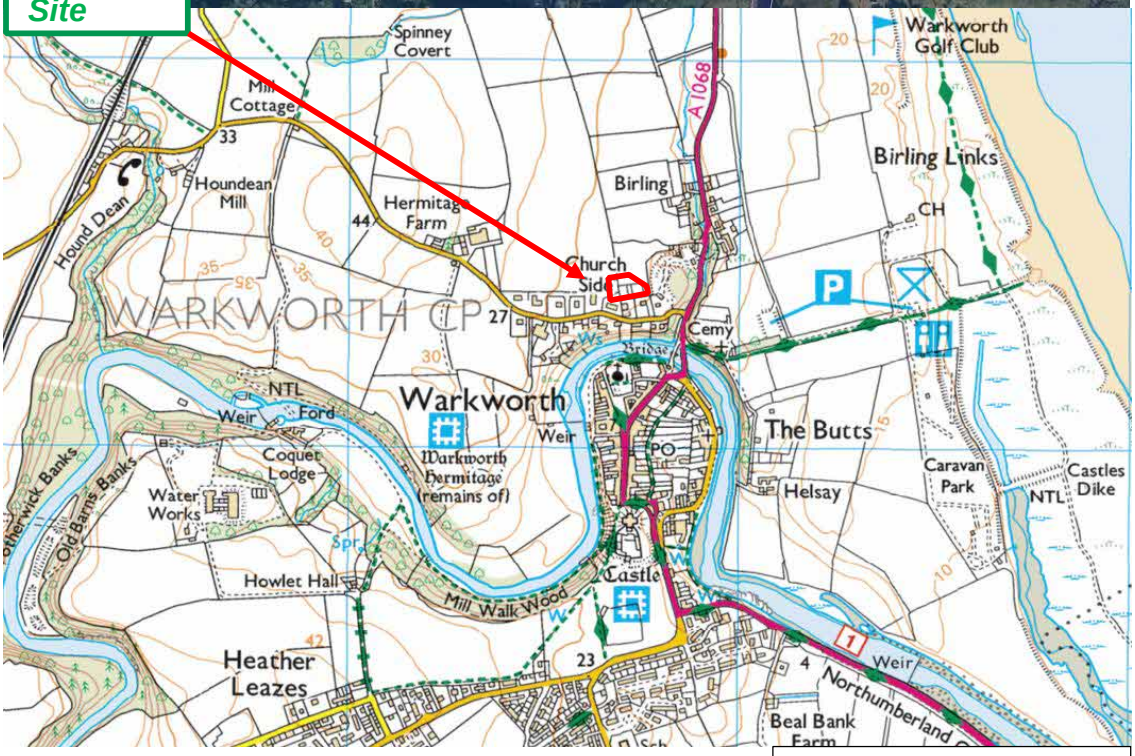
Phil Craigie
Geo-Environmental Consultant

Enclosed:

ERGO Drawings
Photographs
Chemical Testing

ERGO Drawings

Site



Drawing 22-1214-001
Site Location Plan

ERGO

Photographs

PLATE 1 – GENERAL PLACEMENT OF MATERIALS WITHIN PLOT 1

PLATE 2 – DEPTH VALIDATION IN REAR GARDEN OF PLOT 1

PLATE 3 – GENERAL PLACEMENT OF MATERIALS WITHIN PLOT 2

PLATE 4 – DEPTH VALIDATION IN REAR GARDEN OF PLOT 2

Chemical Testing Results

Analytical Report Number: 21-85389
Project / Site name: Amble

Lab Sample Number					1929328	1929329	1929330
Sample Reference					T.P.	T.P.	T.P.
Sample Number					T/S	S/S	BOTTOM
Depth (m)					0.30	0.60	1.50
Date Sampled					27/02/2023	27/02/2023	27/02/2023
Time Taken					None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	HH GAC Houses with Gardens			
Stone Content	%	0.1	NONE		< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE		11	10	6.2
Total mass of sample received	kg	0.001	NONE		0.30	0.30	0.30
Asbestos in Soil	Type	N/A	ISO 17025		Not-detected	Not-detected	Not-detected
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS		8.0	7.6	8.3
Organic Matter	%	0.1	MCERTS		3.7	2.6	0.7
Total Organic Carbon (TOC)	%	0.1	MCERTS		2.1	1.5	0.4
Loss on Ignition @ 450oC	%	0.2	MCERTS		6.6	4.7	2.2
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	5.6	< 0.05	0.31	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	420	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	510	< 0.05	0.46	< 0.05
Fluorene	mg/kg	0.05	MCERTS	400	< 0.05	0.68	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	220	0.41	3.0	0.36
Anthracene	mg/kg	0.05	MCERTS	5400	< 0.05	0.83	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	560	0.48	2.6	0.53
Pyrene	mg/kg	0.05	MCERTS	1200	0.38	2.0	0.43
Benzo(a)anthracene	mg/kg	0.05	MCERTS	11	< 0.05	1.1	0.29
Chrysene	mg/kg	0.05	MCERTS	22	< 0.05	1.1	0.22
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	3.3	< 0.05	0.96	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	93	< 0.05	0.45	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.7	< 0.05	0.76	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	36	< 0.05	0.38	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.28	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	340	< 0.05	0.38	< 0.05
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS		1.27	15.0	1.83
Heavy Metals / Metalloids							
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	550	2.8	3.7	2.5
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	37	9.7	6.6	7.8
Barium (aqua regia extractable)	mg/kg	1	MCERTS	625	170	100	74
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	11	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	6	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	910	31	27	35
Copper (aqua regia extractable)	mg/kg	1	MCERTS	200	46	29	31
Iron (aqua regia extractable)	mg/kg	40	MCERTS	80000	32000	39000	44000
Lead (aqua regia extractable)	mg/kg	1	MCERTS	200	35	23	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	40	< 0.3	< 0.3	< 0.3
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	640	0.77	0.55	0.86
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	110	27	23	24
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	250	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	410	64	95	110
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	300	72	68	68

Analytical Report Number: 21-85389
Project / Site name: Amble

Lab Sample Number					1929328	1929329	1929330
Sample Reference					T.P.	T.P.	T.P.
Sample Number					T/S	S/S	BOTTOM
Depth (m)					0.30	0.60	1.50
Date Sampled					27/02/2023	27/02/2023	27/02/2023
Time Taken					None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	HH GAC Houses with Gardens			
Monoaromatics & Oxygenates							
Benzene	µg/kg	1	MCERTS		< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	0.087	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	130	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	47	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	58	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	60	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons							
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	78	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	230	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	65	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	330	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	2400	< 2.0	< 2.0	9.7
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	9200	< 8.0	< 8.0	23
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	9200	< 8.0	< 8.0	41
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS		< 10	< 10	74
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	140	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	290	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	330	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	330	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	2400	< 2.0	4.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	540	< 10	12	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	1500	< 10	17	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS		< 10	33	< 10
PCBs by GC-MS							
PCB Congener 28	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001
PCB Congener 52	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001
PCB Congener 101	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001
PCB Congener 118	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001
PCB Congener 138	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001
PCB Congener 153	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001
PCB Congener 180	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001
Total PCBs by GC-MS							
Total PCBs	mg/kg	0.007	MCERTS		< 0.007	< 0.007	< 0.007

U/S = Unsuitable Sample I/S = Insufficient Sample

Key:

Notes:

P1	-	05.06.2022	DRAFT	RB	JN
Phase	Revision	Date	Issue	Drawn	Authorised

Client:	Job No:	Date:
Andy Laurie, ALCC Limited	22-1214	05.06.2022
	Drawing No: 002	Scale: NTS
Job Title: Suncroft, Warkworth	Drawing Title: Proposed Development Plan	

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APPENDIX VI
GAS VALIDATION REPORTS

ERGO

ENVIRONMENTAL LTD

GROUND GAS PROTECTION MEASURES VALIDATION REPORT

Land to the rear of Suncroft, Warkworth, Northumberland

Prepared for:

Mr and Mrs Walton

Report Ref: 22-1214-GVAL1
Date Issued: February 2023

ERGO LIMITED

Hoults Yard,
Walker Road,
Newcastle upon Tyne,
NE6 2HL

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Registered in England
No.: 11162116

QUALITY ASSURANCE

REMARKS	Final
DATE	February 2023
PREPARED BY	P Craigie
QUALIFICATIONS	Beng
SIGNATURE	[redacted]
CHECKED BY	J Malley
QUALIFICATIONS	MSc, BSc, MCIWEM, C.WEM
SIGNATURE	[redacted]
AUTHORISED BY	J Nairn
QUALIFICATIONS	MSc, BSc, MIENvSc, CEnv, FGS
SIGNATURE	[redacted]
PROJECT NUMBER	22-1214

QR007-1

Table of Contents

APPENDICES

1. INTRODUCTION

1.1 Introduction

ERGO have been appointed by Mr & Mrs Walton to validate the adequate installation of required ground gas mitigation items within proposed plots at the site.

This report includes validation of the specific details of gas protection measures installed within the properties, to fully protect the future site residents as outlined within the ERGO Gas Verification Strategy Report.

1.2 Site Setting

Site Address	Land to the Rear of Suncroft, Station Road, Warkworth, NE65 0XP.
National Grid Reference	E424780, N606370.

1.3 Proposed Development

ERGO understands that Mr and Mrs Walton intend to develop the site with 2no. residential dwellings and garages with associated infrastructure and access road.

A proposed development plan is indicated within ERGO Drawing 22-1214-002 within Appendix III. A snapshot of the proposed development is presented within Figure 1.1 below.

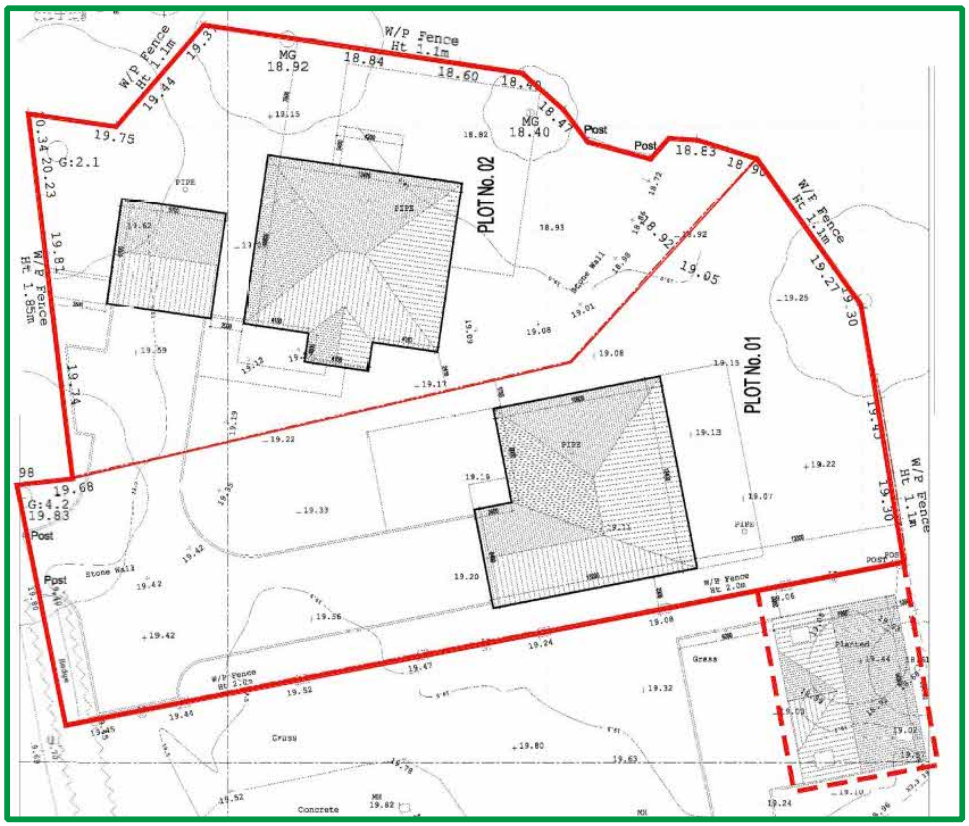


Figure 1.1 Snapshot of Proposed Development

1.4 Objectives

The objectives of the Verification Reporting are to:

- Document, validate and verify the installation of appropriate ground gas mitigation measures within the constructed properties to mitigate potential risks in accordance with the agreed Ground Gas Verification Strategy.

1.5 Sources of Information

The following reports have been reviewed to complete this Validation Report:

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.

ERGO – Ground Gas Verification Strategy Ref: 22-1214-R01, dated May 2022.

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 Limitations

For the avoidance of doubt, works associated with the installation of Filoseal around service penetrations was beyond the scope of agreed works with confirmation available from the Developer.

1.7 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. SUMMARY OF PREVIOUS ASSESSMENTS

The previous investigation by ARC Environmental suggested the site 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%) and depleted oxygen levels (19%).

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

ERGO subsequently produced a Ground Gas Verification Strategy Report (Ref: 22-1214-r01, dated May 2022) to mitigate potential risks. This strategy has been accepted by Northumberland County Council.

3. VALIDATION SPECIFICATION

3.1 Site Works

ERGO Ltd have attended the site on 4no. separate occasions between 10th June 2022 and 24th February 2023 to verify the condition of the membrane installed within Plots 1-2 and the associated garage in accordance with the ERGO Gas Verification Strategy ref: 22-1214-r01, dated May 2022.

Works were undertaken in accordance with the outlined detailed design specification for foundations as indicated within Hedley Structures Drawing 0458-DR-S-004-Rev4, enclosed within Appendix III.

The visits were undertaken to coincide with the completion of each set of plots and immediately prior to the laying of insultation and pouring of the concrete screed.

3.2 Membrane Specification

In accordance with the outlined specification, ERGO can confirm that the Visqueen Gas Barrier Gas Membrane, complaint with BS 8485:2015 + A1:2019, was used within the plots.

A product data sheet is available within Appendix IV.

3.3 Filoseal Specification

In accordance with the outlined specification, ERGO can confirm that Filoseal was used within the plots.

A product data sheet is available within Appendix IV.

3.4 Verifiers

3no. trained ERGO Verifiers attended site to inspect the works undertaken. Details pertaining the verifiers, their experience and qualifications are detailed below:

- Jonathan Malley BSc, MSc, MCIWEM C.WEM – Associate Director

Jonathan has 7 years of experience within the Geo-Environmental Sector. He has completed Ground Gas Risk Assessments for sites, documented appropriate mitigation items and verified the adequate installation of these measures on numerous projects.

Jonathan attended the CL:AIRE Gas Verification course in February 2019.

- Kevin Flannigan BSc (Hons) – Senior Design Manager

Kevin has over 15 years of experience within the Construction Industry as an Architectural Technologist.

Kevin attended the CL:AIRE Gas Verification course in January 2023

Further details and case studies for the verifier(s) can be made available on request.

- Jess Campbell BSc (Hons) – Geo-Environmental Consultant

Jess has 4 years of experience within the Geo-Environmental Sector. She has completed Ground Gas Risk Assessments for sites, documented appropriate mitigation items and verified the adequate installation of these measures on numerous projects.

Jess attended the PA Geotechnical Gas Verification course in November 2021.

Further details and case studies for the verifier(s) can be made available on request.

4. GENERAL CONDITION OF MEMBRANE

The membrane comprised a Visqueen Gas Barrier gas membrane resistant to carbon dioxide and low levels of methane. The photographs show the general condition of the plot membranes prior to the laying insulation and pouring the concrete screed. Plot were swept prior to the laying of the gas membrane. Installation was completed by means of perimeter and infill.

Where damage was observed during the inspection, suitable repair was undertaken as necessary under supervision by ERGO to ensure the membrane was installed appropriately. ERGO can confirm there were no holes or rips in the membrane prior to the laying of insulation and pouring of the concrete.

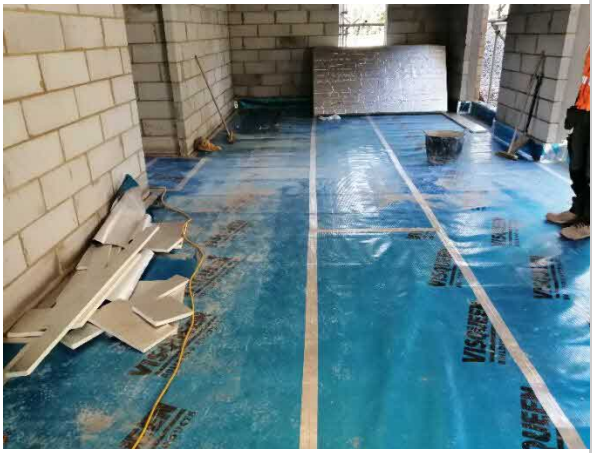
PLATE 1	PLATE 2
	
General overviews of membrane at Plot 1 following internal placement. No materials were stored on the membrane which had the potential to cause damage.	
PLATE 3	**PLATE 4**
	
General overviews of membrane at Plot 2 following internal placement. No materials were stored on the membrane which had the potential to cause damage.	

PLATE 5	PLATE 6
	
General overviews of membrane within the garden following internal placement. No materials were stored on the membrane which had the potential to cause damage.	

5. VERIFICATION OF JOINTS & CORNER UNITS

All external joints were inspected and ERGO can confirm that the membrane was overlapped and taped appropriately. Where evidence of incorrectly sealed gas membrane joints was encountered, contractors were supervised whilst adequate repairs were undertaken. Photos detailing examples of the quality of works under are displayed below.

PLATE 7	PLATE 8
	
General condition of membrane of corner units and joints within Plots 1-2.	

PLATE 9	PLATE 10
	
General condition of membrane of corner units and joints within Plots 1-2. Note protection placed during works within Plate 9.	

PLATE 11	PLATE 12
	
General condition of membrane of corner units and joints within the garage plot.	

6. VERIFICATION OF SUBFLOOR VOIDS AND VENTILATION

Plots were installed with an adequate number of ventilation blocks and can confirm that they appear to be clear of debris and unimpeded. Photos detailing examples of the quality of works are displayed below.

PLATE 13	PLATE 14
	
Periscopic ventilation bricks shown to be free of obstructions in Plots 1-2.	

PLATE 15	PLATE 16
	
Periscopic ventilation bricks shown to be free of obstructions in Plot 1.	

PLATE 17	PLATE 18
	
Showing the sub-floor areas to be clear of waste and/or obstruction. ERGO can confirm a 225mm void was apparent within each substructure.	

7. VERIFICATION OF SERVICE ENTRIES

Service entries were present within the footprint of all plots, adjacent to periphery walls. ERGO inspected each one and can confirm that the service entries have been adequately sealed against the membrane.

PLATE 19	PLATE 20
	
Membrane sealed around service entries within Plot 1. ERGO can confirm these service entries were adequately sealed.	
PLATE 21	**PLATE 22**
	
Membrane sealed around service entries within Plot 2. ERGO can confirm these service entries were adequately sealed.	

PLATE 23	
	
Membrane sealed around service entries within the garage plot. ERGO can confirm these service entries were adequately sealed.	

Following conversation with the Developer, ERGO understand the service penetrations to have been adequately installed with Filoseal products. Details of the installation are available from the developer.

8. CONCLUSIONS

ERGO can confirm that all plots have been installed with gas protection measures in line with Characteristic Situation 2/Amber 1 and in accordance with the approved ERGO Gas Verification Strategy, ref 22-1214-r01.

Based on the information provided within this report, the site inspections and photographic evidence, ERGO can confirm that the structures covered by the report were installed with gas protection measures in accordance with Characteristic Situation 2/Amber 1 to an acceptable level of workmanship.

ERGO confirm that they visited site immediately prior to the pouring of the concrete and confirm that there were no holes or rips in the membrane prior to the pouring of the concrete.

END OF REPORT

APPENDIX I
LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between ERGO and the Client as indicated in Section 1.2.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

9. ERGO cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by ERGO is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by ERGO in this connection without their explicit written agreement there to by ERGO.

10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

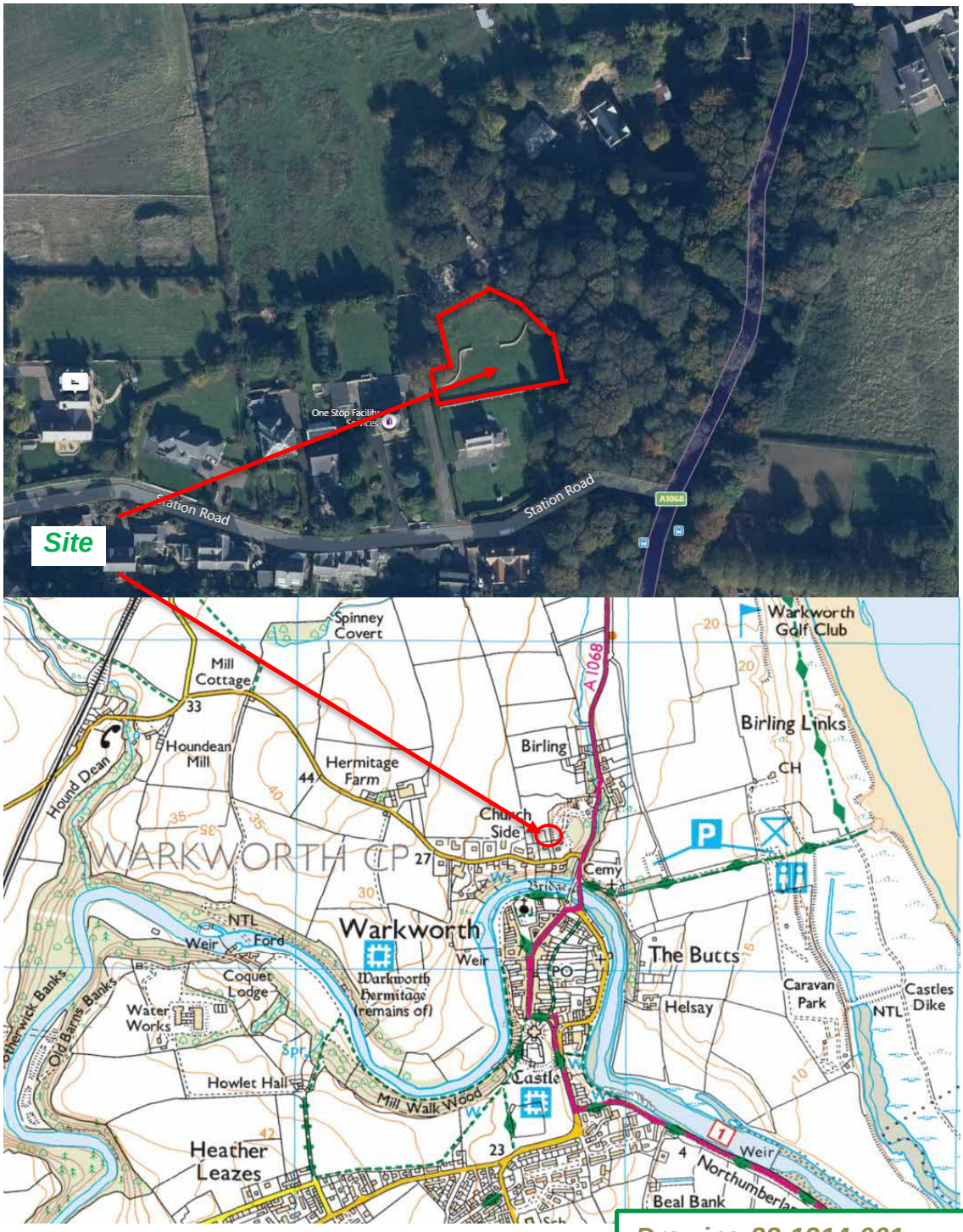
TERMS

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Poly Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
Sp.TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCs	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

UNITS

m	Metres
km	Kilometres
%	Percent
%v/v	Percent volume in air
mb	Milli Bars (atmospheric pressure)
l/hr	Litres per hour
µg/l	Micrograms per Litre (parts per billion)
ppb	Parts Per Billion
mg/kg	Milligrams per kilogram (parts per million)
ppm	Parts Per Million
mg/m^3	Milligram per metre cubed
m bgl	Metres Below Ground Level
m bcl	Metre Below Cover Level
mAOD	Metres Above Ordnance Datum (sea level)
kN/m^2	Kilo Newtons per metre squared
µm	Micro metre

APPENDIX III
DRAWINGS



Drawing 22-1214-001
Site Location Plan

ERGO

Key:

Notes:

P1	-	05.06.2022	DRAFT	RB	JN
Phase	Revision	Date	Issue	Drawn	Authorised

Client:	Job No:	Date:
Andy Laurie, ALCC Limited	22-1214	05.06.2022
	Drawing No: 002	Scale: NTS
Job Title: Suncroft, Warkworth	Drawing Title: Proposed Development Plan	

ERGO
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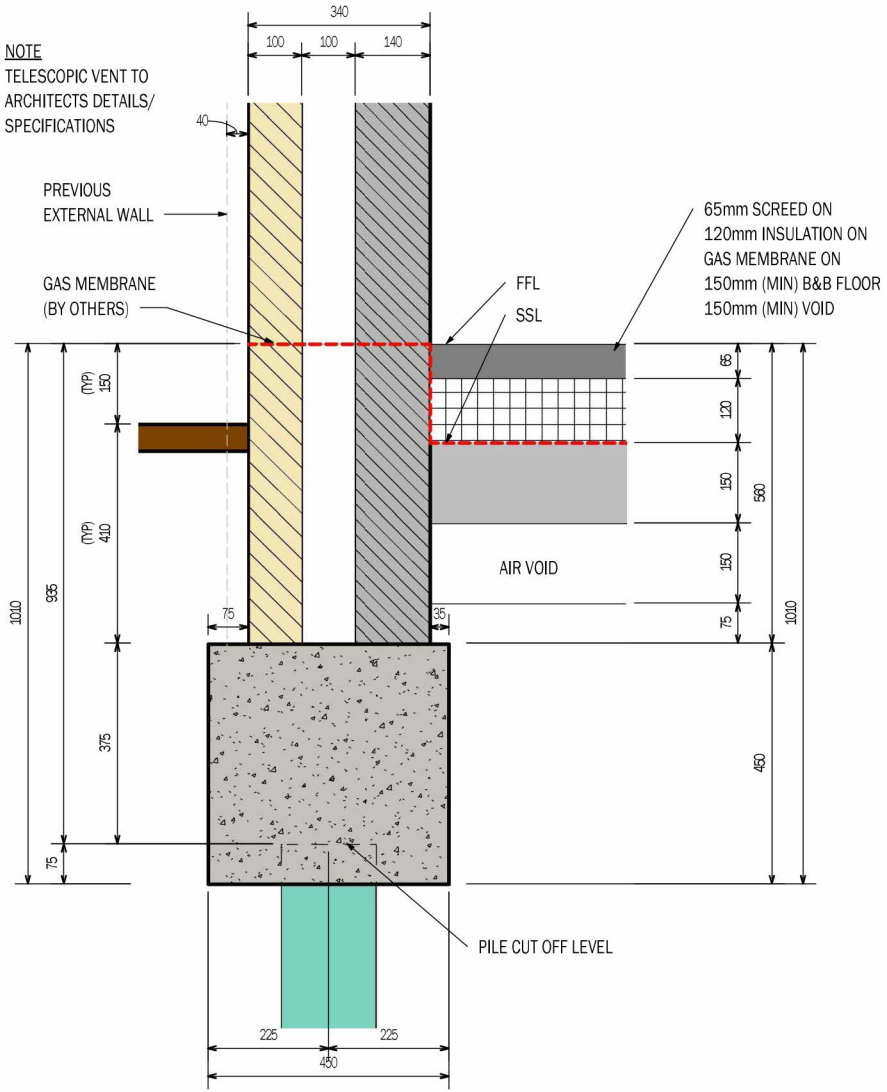
Tel: 0191 389 6200
Website: www.ergoenvironmental.com
Email: info@ergoenvironmental.com

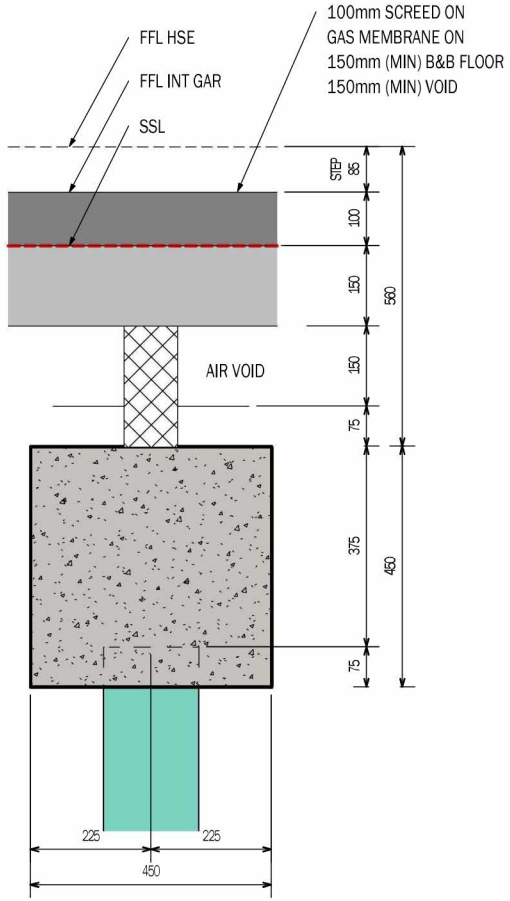
DWG STATUS CONSTRUCTION ISSUE

REV 4 - CONSTRUCTION ISSUE 04-04-22. GROUND BEAM LEVEL RAISED 40mm. GARAGE SCREED DEPTH INCREASED TO 100mm.



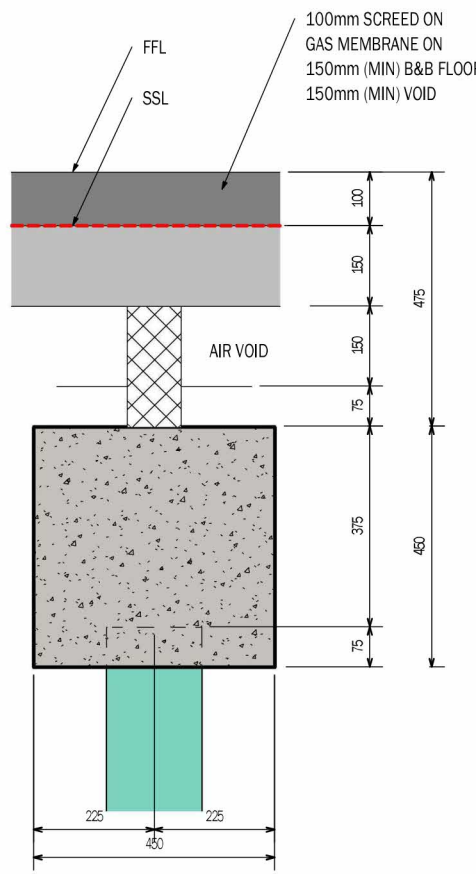
1 PERIMETER DETAIL HSE 1

1 : 10



2 INTERNAL SECTION INTEGRAL GARAGE

1 : 10



3 INTERNAL SECTION DETATCHED GARAGE

1 : 10

Heddon Structures Ltd

CLIENT: ALCC

PROJECT: SUNCROFT WARKWORTH

TITLE: FOUNDATION SECTIONS

SCALE @ A3:	DRAWN	CHECKED	DATE	JOB NO	DWG NO	REV
1 : 10	MH	SC	25/02/22	0458	0458-DR-S-004	4

APPENDIX IV
DATA SHEETS

Technical support: +44 (0) 333 202 6800

Date Published: 11/09/2020

Visqueen Gas Barrier

Features and benefits

- BBA certified - third party accreditation
- Complies with BS 8485:2015 + A1:2019 - industry standard for methane and carbon dioxide protection
- Flexible - easy to detail and install on site
- Multi functional - also acts as a radon and damp proof membrane
- Dual jointing methods - lap joints can be taped or heat welded

Product description

Visqueen Gas Barrier is a multi-layer reinforced polyethylene gas barrier with a 20 micron aluminium foil. The barrier is coloured blue on the upper surface and silver on the reverse. The product is supplied in single wound rolls (not folded), 2m x 50m.

Approvals and standards

- Third party accreditation (BBA 13/5069)
- Conforms to the specification requirements of BS 8485:2015 + A1:2019
- Suitable for all Characteristic Gas Situation (CS) ground gas regimes
- Conforms to the specification requirements of NHBC Amber 1 and Amber 2 applications
- Conforms to the specification requirements of BR 211:2015
- CE Mark EN 13967:2017
- Quality Management System ISO 9001:2015
- Occupational Health and Safety System ISO 18001:2007
- Environmental Management System ISO 14001:2015

Usage

Visqueen Gas Barrier is suitable for use in all types of buildings to prevent the ingress of harmful levels of ground gases e.g.methane, carbon dioxide and radon.

The barrier can be positioned above or below a solid concrete ground floor slab or above a precast suspended segmental ground floor system, e.g. beam and block floor.

The barrier can also be used as a high performance radon membrane and/or damp proof membrane.

The product is not intended for use where there is a risk of hydrostatic pressure.

System components

- VisqueenPro Double Sided Jointing Tape, 50mm x 10m
- Visqueen Gas Resistant Foil Lap Tape, 75mm x 50m
- Visqueen Ultimate GR Lap Tape, 150mm x 10m
- Visqueen Ultimate Top Hat Units
- Visqueen Preformed Units
- VisqueenPro Detailing Strip, 300mm x 10m, 500mm x 10m
- Visqueen TreadGUARD 300, 2m x 75m
- Visqueen TreadGUARD 1500, 1m x 2m

Find your local stockist

Heanor Gate Road, Heanor, Derbyshire, DE75 7RG
+44 (0) 333 202 6800 I enquiries@visqueen.com I www.visqueen.com

Technical support: +44 (0) 333 202 6800

Date Published: 11/09/2020

Visqueen Gas Barrier

Storage and handling

Visqueen Gas Barrier should be stored horizontally, under cover in its original packaging.

Care should be taken when handling the product in line with current manual handling regulations.

Preparation

Visqueen Gas Barrier should be installed on a smooth continuous surface e.g. grouted beam and block floor, a compacted blinding layer e.g. 50mm thick sand blinding, or smooth concrete blinding. The substrate should be free from irregularities such as voids or protrusions.

The barrier can be cut with a sharp retractable safety knife or robust scissors.

Installation

Visqueen Gas Barrier should be loose laid on the substrate with the blue side up so as to avoid sunlight glare.

The barrier should be clean and dry at the time of jointing. It should be overlapped by at least 150mm, bonded with Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Foil Lap Tape. In demanding site conditions seal lap joints with Visqueen Ultimate GR Lap Tape.

Alternatively lap joints can be heat welded to achieve an effective seal. Welded lap joints can be less than 150mm provided the joint integrity is not compromised.

Airtight seals should be formed around all service entry points. Visqueen Preformed Top Hat Units should be used for sealing service entry pipes. The base of the top hat and the upstand should be bonded using Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Foil Lap Tape. The upstand should be secured with the supplied jubilee clip.

Forming an effective barrier to gases may give rise to complex three-dimensional detailing where, it is recommended Visqueen Preformed Units are used e.g. corners. Alternatively Visqueen Pro Detailing Strip can be used to seal awkward junctions.

If the barrier is punctured or perforated a patch of the same material should be lapped at least 150mm beyond the limits of the puncture and bonded with Visqueen Pro Double Sided Jointing Tape and sealed with Visqueen Foil Lap Tape. Alternatively a patch can be formed using Visqueen Pro Detailing Strip and lapped at least 150mm beyond the extents of the puncture.

The barrier should be covered by a protective layer as soon as possible after installation to prevent damage e.g. from following trades. Care should be taken to ensure that the membrane is not punctured, stretched or displaced when applying a screed or final floor covering. A minimum thickness of 50mm screed is recommended. When reinforced concrete is to be laid over the barrier the wire reinforcements and spacers must be prevented from puncturing the barrier. Where there is a high risk of potential damage, the barrier should be covered with Visqueen TreadGuard protection, screed, or other approved protection material before positioning the reinforcement.

Usable temperature range

It is recommended that Visqueen Gas Barrier and all associated system components should not be installed below 5°C.

Additional information

When used in accordance BS8485:2015 + A1:2019 a subfloor ventilation system or pressure relief maybe required
Where hydrocarbon or VOC contamination is present use Visqueen Ultimate VOC or HC Blok gas protection systems
To assist build sequencing, Visqueen GR DPC is available for gas protection through the wall constructions
For suspended beam and block floor detailing see GB-01
Visqueen Preformed Top Hat Units should be used at service pipe penetrations see GB-51
For internal and external corners Visqueen Ultimate Preformed Units should be used see PFU-553
To seal around steel columns use Visqueen Pro Detailing Strip see GB-52
For additional detailing information, contact Visqueen Technical Services +44 (0) 333 202 6800

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Visqueen Gas Barrier

Property	Test method	Units	Compliance criteria	Result
Dimensions	EN 1848-2	m		2 x 50
Overall thickness including scrim mesh	EN 1849-2	mm		0.66
Effective thickness in between scrim mesh	EN 9863-1	mm		0.4
Mass	EN 1849-2	g/m²	-0%/+5%	400
Tensile strength - MD	EN 12311	N	MLV	350
Tensile strength - CD	EN 12311	N	MLV	350
Tensile elongation - MD	EN 12311	%	MLV	20
Tensile elongation - CD	EN 12311	%	MLV	21
Joint strength	EN 12317-2	N	MLV	332
Watertightness 2kPa	EN 1928	-	Pass/Fail	Pass
Resistance to impact	EN 12691	mm	MLV	200
Dart impact	BS 2782	g	MDV	731
Low temperature flexibility	EN 495-5	℃	MDV	-40
Durability against ageing	EN 1296 and EN 1928	-	Pass/Fail	Pass
Durability chemical resistance	EN 1847	-	Pass/Fail	Pass
Resistance to tearing (nail shank) CD	EN 12310-1	N	MDV	358
Resistance to tearing (nail shank) MD	EN 12310-1	N	MDV	368
Resistance to static loading	EN 12730	kg	MLV	20
Water vapour transmission - resistance	EN 1931	MNs/g	MDV	7000
Water vapour transmission - permeability	EN 1931	g/m²/d	MDV	0.03
Visible defects	EN 1850 -2	-	Pass/Fail	Pass
Reaction to fire	EN 13501-1	Class	MDV	F
BS 8485:2015 + A1:2019 testing requirements				
Mass	EN 1849-2	g/m²	Average >370	400
Methane permeability	ISO 15105-1	mls/m²/d/atm	Pass/Fail	<0.15
Puncture CBR	BS EN ISO 12236	N	MDV	1114
Impact resistance	EN 12691	mm	MDV	1000
Tensiles yield strength MD	ASTM D4885-01	kN/m	MDV	12.5
Tensiles yield strength CD	ASTM D4885-02	kN/m	MDV	7.3
Resistance to static loading	EN 12730	kg	>MLV	20
Yield elongation CD	ASTM D4885-04	%	MDV	19
Tear resistance - trouser method A - MD	BS ISO 34-1	kN/m	MDV	48.2
Tear resistance - trouser method A - CD	BS ISO 34-1	kN/m	MDV	44.8
Tear resistance - angle method B - MD	BS ISO 34-1	N	MDV	53.5
Tear resistance - angle method B - CD	BS ISO 34-1	N	MDV	60.6

Health and safety information

Refer to the Visqueen Gas Barrier material safety datasheet (MSDS).

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Visqueen Gas Barrier

About Visqueen

The Visqueen name has long been recognised as one of the leading manufacturers of high quality advanced membrane technologies and design based solutions by specifiers, distributors, builders merchants and contractors throughout the UK and Europe.

For further guidance on the Visqueen services shown below, please refer to the relevant section of the Visqueen website (www.visqueen.com) or contact Visqueen Technical Services on +44 (0) 333 202 6800 or enquiries@visqueen.com

Complete Range, Complete Solution

Visqueen Technical Support

Visqueen combine an extensive product portfolio with industry leading levels of service and support which includes guidance over the phone, bespoke CAD drawings to help with complex detailing, electronic NBS specifications and access to a dedicated team of highly knowledgeable and experienced field based Technical Support Managers.

Visqueen Technical Support is available to all our customers including architects, specifiers, distributors, builders merchants, contractors and end users. All of our technical team have been awarded the industry recognised qualification Certificated Surveyor in Structural Waterproofing (CSSW).

Visqueen CPD Seminars

The Visqueen Continuing Professional Development (CPD) Seminars provide up-to-date information on changes within Building Regulations/Building Standards and nationally recognised industry guidance affecting damp proofing, water vapour control, hazardous ground gas protection and below ground structural waterproofing.

The one hour seminars have been produced for design specialists within the construction sector and are delivered by our team of Technical Support Managers.

Visqueen PI designs and special projects

From initial design to the completed project, Visqueen are with you every step of the way. Whether it be hazardous ground gas protection and/or below ground waterproofing protection employing barrier, structurally integral or drained systems, Visqueen can offer professional indemnity (PI) insurance for bespoke Visqueen design solutions.

Visqueen Technical Support Managers work with all stakeholders to provide cost effective Visqueen solutions offering complete peace of mind throughout the construction phase and beyond.

Visqueen Training Academy

Based at our manufacturing facility in Derbyshire, the Visqueen Training Academy is available to support Visqueen customers throughout the UK by providing a wide range of both theory and practical skills related training.

Courses include one day product awareness training for our distributors and builders merchants to help them in their day-to-day jobs, through to intensive three day courses giving detailed hands-on training in the practical skills required for safe and robust product installation.

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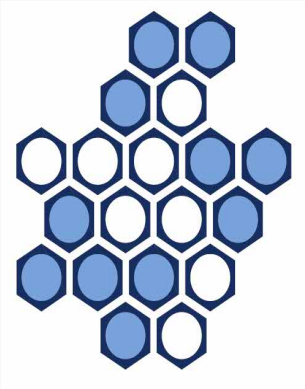
FiloSeal+HD Duct Seal

Duct sealing system FiloSeal+HD is an eginnered universal solution for sealing larger heavy cables and pipes in ducts, boreholes or transit frames.

Up to 2 bar Pressure Resistance
100Kg pulling Force on the cables when sealed
10xd at 45º, with 1 bar pressure bending test



Features

- Flexible, one component, adhesive and sealing compound in a cartridge - (310ml)
- Kits are complete with backing and mastic to fill an empty duct of the quoted kit size
- High levels of Gas and Water tightness
- Excellent adhesion, applicable to all common building materials
- Shows Fire resistance properties
- Resistant against Water, Alkaline, Chemical agents
- Resistant to termites (Mastotermes Darwiniensis) Northern Australian termites
- Resistant to Rats
- Resistant to Hydrogen Sulphide / Methane and many other Gases (NedLab)
- Non-corrosive
- Solvent-free
- Shock absorbing
- Non-toxic, neutral and almost odourless
- Also suitable for limiting the EX-zones during transitions (observe chemical resistance)
- Complies with 2011 NEC Articles 225.27, 230.8, 300.5(G), 300.7 (A) on Raceway Seals, and 501.15 (B)(2)
- Suitable for any shaped duct/borehole/opening
- WIMES Compliant (3.02 2013 6.4.3.2 b)
- Quick and easy installation
- A complete kit
- Seals all know materials, PVC & PE sheathed cables, PILC, (HD) PE pipes
- Engineering duct sealing solution
- Suitable for renovations, can be installed retrospectively
- Over 25 years of operational experience

More info

Download: FiloSeal+ disclaimer

View this product at: https://www.filoform.co.uk/filoseal-hd-re-enterable-duct-sealing

FiloSeal+HD Duct Seal

Products

Art.nr.	Product Name	Duct diameter min.-max. (mm)	Order unit
280010	FiloSeal+HD - 75mm > 110mm	Ø 110 max.	per piece
280020	FiloSeal+HD - 125mm > 160mm	Ø 160 max.	per piece
280030	FiloSeal+HD - 180mm	Ø 180 max.	per piece
280040	FiloSeal+HD - 200mm	Ø 200 max.	per piece
280050	FiloSeal+HD - 225mm	Ø 225 max.	per piece
280060	FiloSeal+HD - 250mm	Ø 250 max.	per piece

APPENDIX V
GAS VERIFICATION SHEET

ERGO 22-1214 SUNCROFT, WARKWORTH Gas Protection Validation Site Record

One record sheet to be completed per plot. To be completed by the ERGO Professional Inspecting

Site:	SUNCROFT	**Plot no:**	PLOT 2 GARAGE	**Inspection date/time:**	24/02/23
Inspection by:	K. FLANNIGAN	**Installers:**	DP BUILDERS LTD	**Photographed:**	✓ ×

	Membrane Type	**Laps and joins**	**Membrane Condition (inc. underside)**	**Extent of coverage**
Complete ✓ ×	VISQUEEN MEMBRANE	ADEQUATE	ADEQUATE	GOOD
Remarks inc. any repairs	MINOR REPAIRS, RECTIFIED.	**Please select:** [Taped] Hand welded Auto welded Other (please state)		

	Service Entries	**Damp Proof Course**	**Test Type**
Complete ✓ ×	ADEQUATE	N/A	
Remarks inc. any repairs	**Pre-formed**: y /(n)		[Pick Test] Air Lance

This Plot has [PASSED] FAILED* inspection. (Any proposed remedial works will be noted in the "Remarks" column on this form).

An additional inspection visit IS/[IS NOT]* required for this Plot.

Inspection by: K. FLANNIGAN ..... Signed: [redacted]

Gas Protection Validation Site Record

Plot No: 2

Inspection date/time:	10/10/22	Inspected by:	JM	Photographed:	✓/x Yes

	✓/x	Notes/recommendations
Membrane Type Correct	✓	Visqueen as required
Extent of Coverage Correct	✓	Full coverage and bridging of cavity
Underside of Membrane	✓	Swept clear no penetrating items
Slab / membrane condition	✓	Adequate no evidence of penetrations
Laps and joints	✓	Adequate. Photographed
Damp-proof course	✓	Adequate and tied in
Service entries	✓	Adequately sealed
Folded Membrane Joint Taped & inspected	✓	Joint correctly sealed and bnp tape present adequate l-p

This Plot has **PASSED/FAILED*** inspection. (Any proposed remedial works will be noted in the "Remarks" column on this form).

An additional inspection visit IS/IS NOT* required for this Plot.

Inspection by: S Malby Signed: [redacted]

One record sheet to be completed for each plot – To be completed by ERGO Professional Inspecting.

Gas Protection Validation Site Record

One record sheet to be completed per plot. To be completed by the ERGO Professional Inspecting

Site:	Suncroft	**Plot no:**	Plot 1	**Inspection date/time:**	9/11/22
Inspection by:	JM	**Installers:**	DP	**Photographed:**	✓/x

	Membrane Type	Laps and joins	Membrane Condition (inc. underside)	Extent of coverage
Complete ✓/x	Correct	Adequate and sealed	Swept prior to laying	Full, Adequate
Remarks inc. any repairs	Minor pinpricks identified and completed under supervision	**Please select:** Taped ~~Hand welded~~ Auto welded Other (please state)		

	Service Entries	Damp Proof Course	Test Type
Complete ✓/x	Adequately sealed	Correct	
Remarks inc. any repairs	**Pre-formed**: y / n		Pick Test /Air Lance

This Plot has **PASSED/FAILED*** inspection. (Any proposed remedial works will be noted in the "Remarks" column on this form).

An additional inspection visit IS/IS NOT* required for this Plot.

Inspection by: J Malley ..... Signed: [redacted] .....

Ergo Environmental Limited
Registered in England No: **11162116** Registered Office: 172-174 Albert Road, Jarrow, Tyne and Wear, Jarrow NE32 5JA

Gas Protection Validation Site Record

One record sheet to be completed per plot. To be completed by the ERGO Professional Inspecting

Site:	SUNCROFT WARKWORTH	**Plot no:**	1 & 2	**Inspection date/time:**	10/6/22 2:30
Inspection by:	JC	**Installers:**	DP Builders	**Photographed:**	✓/×

	Membrane Type	**Laps and joins**	**Membrane Condition (inc. underside)**	**Extent of coverage**
Complete ✓/×	VISQUEEN GAS	As required	✓	✓
Remarks inc. any repairs	externals only - preformed corner units	**Please select:** (Taped) Hand welded Auto welded Other (please state)	good	As required at this stage.

	Service Entries	**Damp Proof Course**	**Test Type**
Complete ✓/×	✓	X	✓
Remarks inc. any repairs	**Pre-formed:** (y) / n those complete at this stage are good	not yet complete externals only	(Pick Test) /Air Lance

This Plot has (PASSED)/FAILED* inspection. (Any proposed remedial works will be noted in the "Remarks" column on this form).

An additional inspection visit (IS)/IS NOT* required for this Plot.

Inspection by: J. CAMPBELL Signed: [redacted]

No further visit required following installation of internal areas.