ERGO

ENVIRONMENTAL LTD

Remediation Strategy

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

Prepared for:

Mr & Mrs Walton

Report Ref: 22-1214-REM
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EXECUTIVE SUMMARY	
Site Address	Land to the rear of Suncroft, Station Road, Warkworth, NE65 0XP.
Grid Reference	E424780 , N606370.
Site Area	c. 0.18 Ha.
Background	ERGO has been instructed by Mr & Mrs Walton to prepare a Remediation Strategy for the proposed development of land to the rear of Suncroft, Station Road, Warkworth. The ERGO Remediation Strategy has been produced in due consideration of previously completed reports by Intersoil (ref: 12023/amd2, dated 2013 and ref: 20003, dated 2019) and Arc Environmental (ref: 20-610, dated 2021). The proposed development area is currently unoccupied and comprises relatively flat, grassy area which steadily drops away to the north and east towards a wooded area.
Summary of Site Remediation Works	This document provides a comprehensive specification for the regeneration of the land in a manner that will negate the identified pollutants and ensure the development is suitable for the proposed end use. The salient features of the Remediation Strategy are summarised below: • Submission and approval of all documents to ensure Regulatory compliance; • Management of development to ensure no unacceptable nuisance is posed; • Identification and Management of any identified Invasive Species; • Site clearance and set up; • Importation of suitable materials as necessary; • Preparation of landscaping areas for Cover System; and, • Independent validation.
Summary of Build Phase Mitigation Works	**The developer's works will also include the completion of the following additional elements.** • Installation of appropriate pipework subject to the completion of a UKWIR assessment; • The proposed building should be constructed with appropriate ground gas mitigation measures to be compliant with the completed ground gas risk assessment; • Placement and validation of a suitable clean cover system within all proposed areas of soft landscaping; and, • Production of all-encompassing completion report for the entire development referenced within this Validation Strategy.

Table of Contents

1. INTRODUCTION 3
1.1 Background 3
1.2 Report Objectives 3
1.3 Scope of Works 3
1.4 Redevelopment Plan 3
1.5 Summary of Parties Involved 4
1.6 Site Details 4
1.7 Previous Reports 4
1.8 Limitations 4
1.9 Confidentiality 4
2. PREVIOUS REPORTS 5
3. SITE REMEDIATION WORKS 7
3.1 Remediation Technology 7
3.2 Overview of Works 7
3.3 Materials Management & Legislative Compliance 9
3.4 Post Remediation Constraints 10
4. ENVIRONMENTAL MONITORING AND VALIDATION 11
4.1 Site Management 11
4.2 Completion 11
5. GAS MITIGATION MEASURES 12
6. CHEMICAL VALIDATION OF CLEAN COVER SYSTEM 13
6.1 Placement of Chemically Suitable Cover System 13
6.2 Landscape Validation Procedure 14
7. RECORD KEEPING & VERIFICATION 15
7.1 Record Keeping 15
7.2 Verification 15
8. CONTINGENCY PLAN 16
8.1 Previously Unidentified Contaminants 16
9. CONCLUSIONS 17

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 Plan
Appendix IV ERGO Contamination Remediation / Validation Criteria

1. INTRODUCTION

1.1 Background

ERGO has been instructed by Mr and Mrs Walton to prepare a Remediation Strategy for the proposed residential development of Land to the rear of Suncroft, Station Road, Warkworth, herein referred to as 'the site'.

1.2 Report Objectives

The objectives of this report are to:

- Evaluate feasible remediation and ground engineering technologies;
- Define validation criteria to demonstrate the successful implementation of a site Remediation Works plan; and,
- Ensure the safe, cost effective and regulatory compliant redevelopment of the site.

1.3 Scope of Works

The development of the risk management strategy for the subject site includes the following tasks:

- Review of site characteristics;
- Development of remediation works objectives;
- Selection of appropriate remedial technology; and,
- Development of remedial strategy.

For the avoidance of doubt, the assessment and consideration of geotechnical risks and liabilities was beyond the scope of the works agreed.

A Ground Gas Verification Strategy has been produced separately (ref: 22-1214-r01 Gas Verification Strategy, dated May 2022) and should be read in conjunction with this report.

1.4 Redevelopment Plan

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

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

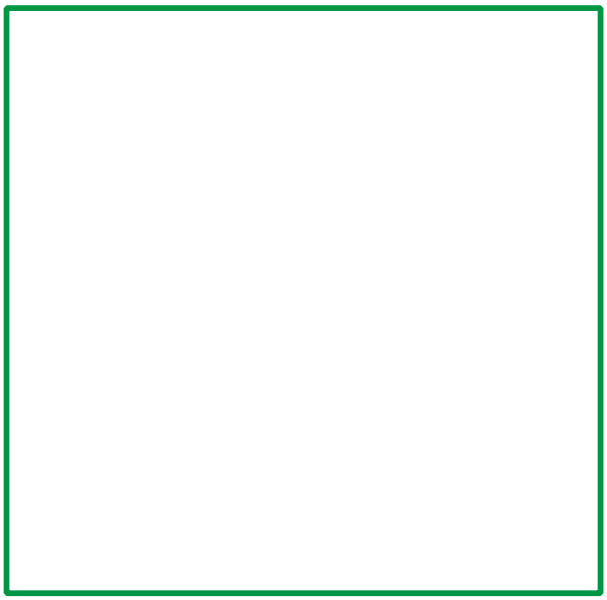


Figure 1.1 Snapshot of Proposed Development

1.5 Summary of Parties Involved

FUNCTION / INTEREST	NAME OF PARTY
Land Owner	Mr and Mrs Walton.
Environmental Consultant	ERGO.
Main Contractor	ACCL Ltd.
Remediation Contractor	DP Builders.
Regulator / Local Planning Authority	Northumberland County Council.
Controlled Waters Regulator	Environment Agency.

1.6 Site Details

Site Address	Land to the rear of Suncroft, Station Road, Warkworth, NE65 0XP.
National Grid Reference	E424780, N606370.
Site Area	c. 0.18 Ha.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing 22-1214-001.

1.7 Previous Reports

The following previously completed reports have been made available:

- Phase I report completed by Intersoil Ltd (ref: 12023/amd2 dated June 2013,)
- Phase II reports completed by Intersoil Ltd (ref: 19050 dated November 2019 and 20003 dated January 2020)
- ARC Environmental Ltd (ref: 20-610 dated May 2021)

A summary of the findings and assessments is produced in Section 2.0.

1.8 Limitations

The limitations of this report are presented in Appendix I.

1.9 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. PREVIOUS REPORTS

ERGO has reviewed previously completed reports for the site prepared by Intersoil (ref: 12023/amd2, dated 2013 and ref: 20003, dated 2019) and Arc Environmental (ref: 20-610 dated 2021). The findings of these investigations are documented within the stated reports and the pertinent findings are summarised below:

Site Setting		
Current Site Use	The site is currently unoccupied and comprises relatively flat, grassy area which steadily drops away to the north and east towards a wooded area.	
Environmental Setting	*Drift Geology*	Geological mapping records suggest no drift is present onsite.
	Bedrock Geology	Stainmore Formation - Sandstone, limestone, mudstone.
	Hydrology & Hydrogeology	The tidal River Coquet is located c.100m south of the subject site boundary and a culverted tributary to the Coquet is located 50m east of the site boundary. Given the absence of drift deposits no aquifer is noted however solid bedrock comprises a Secondary Undifferentiated Aquifer.
Site History	Historic mapping suggests the site comprised open ground and was partially occupied by a 'quarry' in c.1855 within the northeast. 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.	
Utility Locations	A formal utility survey has not been undertaken; however, relict infrastructure relating to the former builders yard may be present.	
Landfill Sites	The site is noted to have been used as a landfill by Warkworth Parish Council until 1970. License no. PA015.	
Radon	Unaffected - No special precaution required.	
Site Investigation		
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** Natural drift deposits were not encountered, clay deposits are noted to be reworked. **Solid** 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. **Groundwater** No groundwater was encountered.	

Contamination Risk Assessment	
Human Health	The Tier I Human Health Risk Assessment completed by Intersoil and ARC identified the presence of Lead, Arsenic, Benzo(b) fluoranthene, Benzo(a) pyrene and Dibenzo(a,h) anthracene. A 600mm clean cover system was recommended within proposed gardens and areas of soft landscaping to remove the pollutant source-receptor pathways. The report recommended that site won topsoil and subsoil was tested to confirm suitability prior to reuse.
Controlled Waters	The Controlled Waters risk assessment completed by Intersoil confirmed that elevated concentrations of inorganic and TPH and PAH determinands were identified within 1no. sample of leachate. Though considered to be of low mobility and magnitude and therefore of reduced risk. Furthermore, given the site is underlain by low permeability predominantly cohesive deposits and the absence of groundwater abstraction within the vicinity of the, the risks to the underlying aquifer is considered low. Risks to surface waters are considered low given the distance to the receptor, the River Coquet is c.100m from the site.
Ground Gas	A ground gas risk assessment completed by Arc suggested the site was to be classified as Gas Characteristic Situation 2/Amber 1 due to the identified presence of elevated carbon dioxide levels (>5%) and depleted oxygen concentrations (<19%). Appropriate ground gas mitigation measures were recommended to be incorporated in to designs.

3. SITE REMEDIATION WORKS

3.1 Remediation Technology

Taking into account the site-specific conditions including the nature of the identified impacts, the geology and the objectives of the remediation, the most appropriate soil remedial technologies are considered to be:

- Management of all soils impacted by heavy metals and PAH contamination;
- Construction of a suitable cover system within gardens and landscaped areas where unsuitable Made ground remains at formation level;
- Provision of appropriate potable water supply infrastructure in line with UKWIR assessment and,
- Installation of appropriate ground gas mitigation measures with independent validation.

It is considered that these technologies and methodologies will address the identified active pollutant linkages in the following manner:

Contaminants of Concern (CoC)

Heavy Metals and Non-volatile PAH contaminants

Elevated levels of Lead, Arsenic, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(a,h)anthracene have been identified at greater than GAC values for residential use, across 4no. locations within the Intersoil Site Investigations at depths of between 0.30-1.70mbgl throughout the site.

Given the contamination is spread across and historic site usage, hotspot delineation is not considered a viable remedial option.

It is considered that impacted soils should be placed within low sensitivity areas where they have no unacceptable future risk in accordance with the ERGO validation method.

Should off-site disposal be required then additional testing of soils may be required and waste classification testing should be undertaken to ensure that it is classified correctly and disposed at a suitably licenced facility.

3.2 Overview of Works

Prior to the commencement of works on-site, the contractor must establish all necessary plant, equipment and site welfare facilities as is necessary to complete the contract within the agreed timescales to the rationale as outlined in Table 3.1 (below).

Table 3.1 Site Works

Works Schedule	
RE-1	**Pre-Commencement Regulatory Compliance** Prior to commencement of any works onsite, all reports relating to the assessment of risk to contaminated land should be submitted to the regulatory authorities to gain written approval. All relevant Standard Rules Permits and notifications should be registered with the EA and Regulators prior to establishment of equipment onsite. Appropriate regulatory permitting should be put in place for the reuse and importation of materials as required. At this stage it is not anticipated that there will be any requirement to treat any materials onsite (such as hydrocarbon impacted soils or groundwater), however should any requirement be subsequently identified, the contractor must either notify the EA of their intention to complete a minor works operation or arrange for the deployment of the appropriate Environmental Permit for the specified operation.

RE-2	**Environment & Nuisance Control** A Construction and Environmental Management Plan will be required to be developed to enable the management of all works so as to ensure that no environmental nuisance is created through dust emissions, noise or vibration levels. In the event that a complaint is made in respect of dust emissions, noise or vibration levels, remedial measures and a programme of ongoing monitoring should be agreed with the local authority and implemented on site.
RE-3	**Identification, Isolation and Treatment of Invasive Plants** Whilst not identified within surveys completed to date, the Remediation Contractor shall employ a suitably qualified expert to investigate the potential presence of invasive plant species on or adjacent to the site. Where invasive plant species are identified onsite or adjacent to the site, appropriate treatment and validation should be outlined and completed documenting all identified invasive plant species treated in accordance with the Environment Agency Code of practise and in accordance with an approved method statement. Where materials are removed from site all Waste Transfer Notes / Duty of Care certificates should be included within the validation statement.
RE-4	**Site Clearance Operations** General site clearance & provision of welfare, offices and site security as per the contract requirements. The site comprises a maintained grassed area, with mature trees noted around the boundaries. Any tress or other shrub vegetation will need to be removed in a controlled manner with full compliance with any ecological mitigation measures required for the works. Any such measures are outside the scope of this report. All vegetation should either be stockpiled at a pre-agreed location or alternatively removed from site in accordance with Waste Permitting Regulations. All material stockpiles recorded onsite prior to the development are considered waste and should be disposed of appropriate as part of the site clearance works.
RE-5	**Importation of Bulk Fill** Where there is a net shortfall of suitable material required to achieve the proposed enabling works levels, it will be necessary to import or win from the wider land holding, natural inert soils and aggregate as per the engineering requirements (Section 6). If recycled aggregates are imported laboratory testing should be completed to demonstrate compliance with the WRAP Protocol. Where inert soils are imported laboratory testing should be completed in accordance with the requirements of the pertinent Environmental Permit (i.e. U1 Standard Rules) or CL:AIRE MMP for the re-use of clean naturally occurring soils.

RE-6	**Preparation of landscaping areas for Cover System** As part of the land remediation works, all areas of proposed landscaping will be prepared in a manner that will facilitate the placement of a clean cover system during the development phase of the woks. The preparation of the areas requiring clean cover is critical in ensuring delivery of the site in a manner that will ensure no risk to the proposed end users. As Made Ground deposits have been deemed to be chemically and texturally unsuitable for retention in a POS, the areas will be subject to a reduced level dig to remove unsuitable material to a minimum depth of 600mm below finished landscaping level or verified natural stratum (whichever is the shallower).
RE-7	**Provision of Subsoil and Topsoil** Should a requirement for the importation of subsoil and/or topsoil be identified, the identified imported strata will require testing in accordance with the schedule present within Section 6.0 and Table 6.1. All gardens and landscaped areas will require depth validation in order to demonstrate that the appropriate thickness has been provided as a suitable clean cover system/ suitable growing medium.
RE-8	**Removal of Excess soil** The contractor will remove all spoil deemed to be 'excess' from site in strict accordance with UK Management Legislation. Processed aggregate will not be deemed waste / excess and as such all material will be retained onsite by the developer. The contractor must not remove any materials deemed aggregate without the prior written consent of the client. The contractor will manage all spoil in such a manner to ensure all material deemed excess is classified as inert. The contractor will supply all Waste transfer Records and corresponding Environmental Permit for the waste receiver site.
RE-9	**Independent Validation – Watching Brief** Given the site history and potential for unforeseen contamination, it is considered necessary to instigate the site wide Remediation works under the supervision of a suitably qualified and independent specialist. The specialist is required to attend site as and when appropriate to monitor works, record ground conditions and fully investigate all potential sources of as yet unidentified contamination.
RE-10	**Remedial Verification Report** Collation of all information relating to site clearance, chemical testing, remedial works, remedial verification, material movements and waste transfer documentation where appropriate. Complete remedial validation reported in line with regulatory guidance. This will include a detailed risk assessment. The report will be submitted to the Local Authority for approval following completion.

3.3 Materials Management & Legislative Compliance

The processing of recycled aggregates will be completed using LAPC Part B Licensed Plant with the appropriate deployment notification to the Local Authority prior to commencement of works. All materials that are recovered as recycled aggregate will be compliant with the requirements of the WRAP protocol and the ERGO validation testing requirements and as such would not be deemed to be a waste material.

A U1 Standard Rules Permit will be registered for the site which allows the re-use of up to 3000m^3 of material within construction with up to 12,000m^3 of material permissible to be re-used in the construction of roads.

A T5 Standard Rules permit allows the screening and recovery of up to 3000m^3 of material for sub-sequent re-use in construction will also be registered.

All materials that are recovered under the WRAP Protocol, U1 or T5 exemptions must be analysed to demonstrate that they are both chemically and structurally suitable for use within the context of the development.

The relevant LAPC, U1, T5 and WRAP Licenses, Exemption and Protocols provides the legislative framework for material compliance during the site remediation works to be completed by the specialist contractor under the supervision or ERGO.

Given the proposed development comprises significant cut/fill enabling works, the site will likely be subject to regulation using the appropriate Environmental Permit, Standard Rules Exemption and 'Materials Management Plan' (MMP) to be created in accordance with Version 2 of the CL:AIRE Definition of Waste - Industry Code of Practice. The MMP will be created with due consideration to all proposed remediation works operations prescribed within this document and will be undertaken by a Qualified Person and a signed declaration submitted to the EA prior to re-use of materials on the site.

3.4 Post Remediation Constraints

Post remediation constraints for the site will include:

- 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.

4. ENVIRONMENTAL MONITORING AND VALIDATION

4.1 Site Management

The tracking of materials will be based on the following hierarchy:

- The Principal Contractor will have the responsibility for setting out areas of the site on the basis of the contract specification;
- Operatives will have instructions only to excavate and to emplace materials in specified areas as assigned by the Site Manager / Foreman;
- The Site Manager (employed by the Principal Contractor) will issue daily instructions to drivers regarding the placement of materials sourced from specific stockpiles or areas, ensuring that appropriate documentary evidence is collected that details which materials are going where and why;
- The strategy for each day's work will be agreed with the ERGO Consultant, who will be in attendance as required, prior to the commencement of the works. ERGO will:
  - Inspect the excavation areas and certify that the correct materials are being excavated;
  - Conduct spot checks on loaded vehicles to ensure compliance with this Remediation Strategy;
  - Ensure that any loads which fail visual, olfactory or spot checks either remain on the vehicle or if unloaded are excavated and set aside. This material will be treated according to the recommendations of the ERGO site engineer.
- All material imported and removed from site will have Duty of Care / Consignment Notes, copies of which will be retained on-site by the Site Manager; and,
- Materials directly reusable will be incorporated into the earthworks, subject to operational conditions and phasing of excavations, in which case they will be stockpiled prior to final placement.

4.2 Completion

Following the completion of the remediation works a report will be compiled by the Environmental Consultant detailing all site enabling works undertaken, waste consignment notes, and all site investigations, laboratory test certificates, and validation testing undertaken.

A certificate of completion of earthworks should be included within the report which should then be issued to The Local Authority for their approval.

ERGO considers that with the adoption of the above best practices the site can be safely redeveloped. The site enabling works process and presence of any residual contamination (if this is the case) should be recorded for future reference by landowners /occupiers. Future development at the site where this may result in penetration of new areas of hard-standing should be subject to no less stringent measures with respect to assessment, and, where appropriate, monitoring than those set out above.

5. GAS MITIGATION MEASURES

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.

A Ground Gas Verification Strategy has been produced separately (ref: 22-1214-r01 Gas Verification Strategy, dated May 2022) and should be read in conjunction with this report.

6. CHEMICAL VALIDATION OF CLEAN COVER SYSTEM

The Remediation Strategy for the site, with respect to human health of the future site users outlines the required installation of a chemically suitable clean cover system within all landscaped and garden areas where Made Ground remains present at formation level. Where required, the construction of the clean cover / placement of clean material shall consist of:

- 450mm subsoil; and,
- 150mm topsoil.

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be re-used or imported onsite to confirm no unacceptable risks are posed to human health receptors or the wider environ from the proposed development.

Subsoil and topsoil shall be free of any deleterious materials, such as buildings materials, timber, plastics etc and conform to the requirements of BS 3882:2007.

Topsoil and subsoil will be imported (as required) from a known source prior to stockpiling onsite in a controlled manner to facilitate the appropriate validation testing to demonstrate that the material is suitable for use within the context of the proposed development.

The agreed sampling frequency for these materials is presented in Table 6.1 and is in accordance with the guidance provided by YALPAG.

Table 6.1 Specification of Materials Validation Laboratory Analysis

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site Generated (Brownfield)		
Site generated Subsoil & Topsoil	Min 6no. then 1no. per 100m³	A / B / C / D
Site Generated Bulk Fill	Min 6no. then 1no. per 1000m³	A / B / C / D
Imported		
Subsoil & Topsoil Greenfield Source	Min 3no. then 1no. per 250m³	A / B / C / D
Subsoil & Topsoil Brownfield Source	Min 6no. then 1no. per 100m³	A / B / C / D
Imported Bulk Fill	Min 6no. then 1no. per 1000m³	A / B / C / D

Notes:
Suites of Analysis -
A) Speciated PAH
B) Banded TPH (C5-C35)
C) Asbestos (ID)
D) CLEA Inorganic

All analysis prescribed above to be completed by UKAS accredited laboratory.

All materials are required to comply with the screening values outlined in Appendix IV. Validation testing certificates of imported and site won materials shall be provided within the subsequent Validation report.

6.1 Placement of Chemically Suitable Cover System

Proposed landscaped areas within the development require a chemically suitable cover system in order to break the exposure pathway between the end user and the contaminants.

Procedure for Placement:

- *If proposed utilities are to be overlain by a cover system, the clean cover should be placed prior to installation of these utilities;*

- *All chemically unsuitable soils in the upper 600mm of the landscaped areas will have been excavated during the Remediation Works;*
- *Landscaped areas need to be backfilled with 450mm chemically validated subsoil, with 150mm topsoil overlaying this.* ***Subsoil and Topsoil are required to be confirmed as chemically suitable prior to installation of the cover system.***

6.2 Landscape Validation Procedure

The placement of subsoil, topsoil and corresponding validation will be documented within the the Validation Report (to be issued on the completion of all remedial activities).

Where unsuitable Made Ground remains present at formation level, all landscaping will have a 450mm thickness of subsoil and minimum 150mm thickness of topsoil (to constitute 600mm clean cover), each area will be independently validated on an approximately 50m^2 frequency with photographic evidence to confirm that a suitable cover system has been installed within all areas of soft landscaping and gardens.

The procedure outlined overleaf documents the protocol for the validation of landscape cover systems not placed during the Remediation Works Phase.

PROCEDURE	METHOD
Chemical Validation	Subsoil and topsoil utilised within the cover system are required to be confirmed as chemically suitable prior to installation of the cover system. Materials should be stockpiled in a dedicated lay down area pending inspection by ERGO and chemical analysis.
Trial Holes	The trial holes within landscaped areas must be excavated to the full depth of the cover system.
Validation	ERGO will attend site and measure the thickness of the cover system, providing an assessment to the site manager whilst on site. Photographic evidence will be taken of the cover system, demonstrating the depth and materials which make up the cover system and the location of the trial hole in relation to the development.
Validation Certificate	ERGO will issue a specific validation certificate to demonstrate that the required subsoil and topsoil has been placed in each area of landscaping, along with the chemical analysis.
Completion Report	Upon completion of all landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Photographs 1 and 2: Examples of validation photographs demonstrating clean cover.

7. RECORD KEEPING & VERIFICATION

7.1 Record Keeping

During the course of the remediation and site enabling works, the Principal Contractor will undertake the following record keeping protocols:

- Detailed daily site diary including material movements;
- Sampling register, testing results, photographs, details of unforeseen contamination, details of consignment notes that is required to be disposed of off-site; and,
- Detailed surveys (volumes).

Record keeping onsite, in particular movements and analysis of specific material types, will be in the form of site diaries and a remediation excavation record. This record will remain onsite and will be completed by the ERGO onsite engineer during the course of the remediation works.

7.2 Verification

The records listed above will then be compiled into a Validation Report produced by ERGO on completion of the remediation and site enabling works, clearly referencing the origin of the materials used and testing carried out to confirm its suitability for use, where required.

The Validation Report will include the following:

- Remediation Strategy (including copies of confirmation from regulatory authorities agreeing criteria);
- Surveys of all excavations and production of ‘as built’ drawings for the earthworks;
- Copy of Consignment Notes relating to the movement of wastes to a licensed waste management facility;
- Detailed drawings showing all sampling locations for both chemical testing;
- Chemical test results;
- Details of material reuse (CL:AIRE MMP or otherwise); and,
- Monitoring results if undertaken (i.e. asbestos in air, gas water etc.).

8. CONTINGENCY PLAN

8.1 Previously Unidentified Contaminants

Should evidence of significant significantly impacted material be encountered during the development, then it will be excavated and stockpiled on an impermeable material and sampled and tested for an appropriate range of determinants.

Once the laboratory analysis of the material is available an assessment will be undertaken to determine whether it can be retained onsite or whether it should be disposed off-site.

Depending on the nature of any such impact it may be necessary to produce an addendum to this report documenting the specific remediation requirements, furthermore it may be considered necessary to undertake validation testing of the excavation faces in order to demonstrate that no contaminated materials are left in-situ.

9. CONCLUSIONS

Subject to the adequate undertaking of the outlined remediation works and the subsequent validation of these items it is considered that the site will be rendered suitable for the proposed residential development.

Following the incorporation and subsequent validation of the outlined build phase remediation items the site will be considered remediated and considered to pose no unacceptable level of risk to potential site end users.

It is considered that a suitably detailed validation report will be required to confirm the installation of these protection measures and facilitate the discharge of contaminated land planning conditions.

END OF REPORT

APPENDIX I
LIMITATIONS

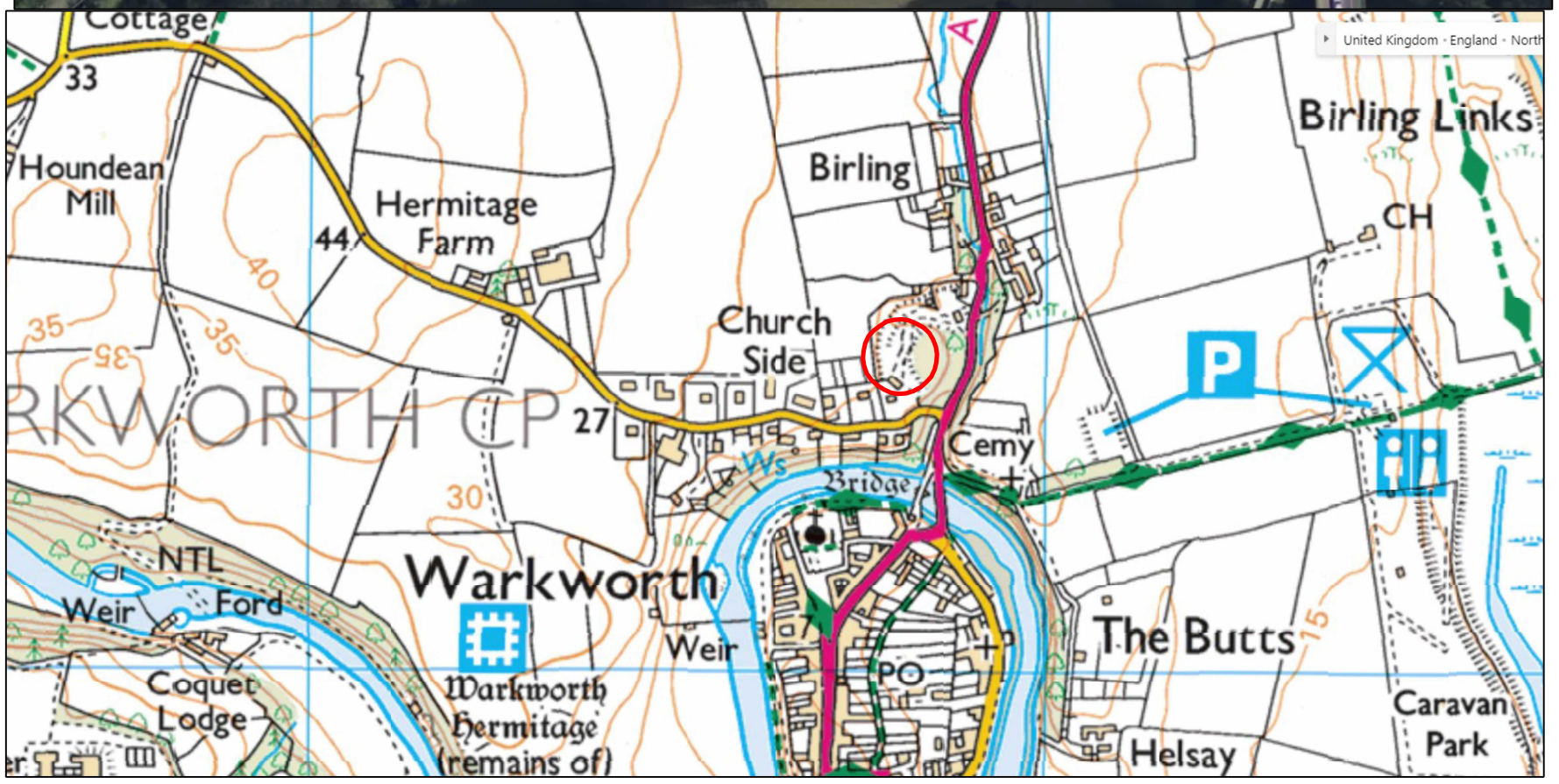
1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between ERGO and the Client as indicated in Section 1.2.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily 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.

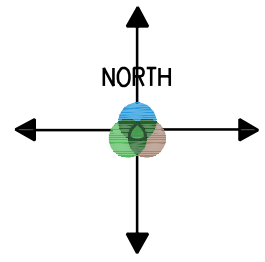
APPENDIX II
GLOSSARY

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





Key:

Approximate Site Boundary

Notes:

P1	-	17.05.2022	DRAFT	RB	JN
Phase	Revision	Date	Issue	Drawn	Authorised

Client: ALCC Limited

Job No: 22-1214

Date: 17.05.2022

Drawing No: 001

Scale: NTS

Job Title: Suncroft, Warkworth

Drawing Title: Site Location

Ergo Environmental Ltd
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Email: info@ergoenvironmental.com

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 IV
ERGO REMEDIATION
&
VALIDATION CRITERIA

Remediation Validation Target Values

Determinand	Units	Within 600mm Cover System	Pathway
Arsenic	mg/kg	37	1
Cadmium	mg/kg	11	1
Chromium (Hexavalent)	mg/kg	6.1	1
Lead	mg/kg	200	1
Elemental Mercury	mg/kg	40	2
Nickel	mg/kg	130	1
Selenium (New SGV)	mg/kg	250	1
Copper	mg/kg	2400	1
Zinc	mg/kg	3700	1
Naphthalene	mg/kg	2.3	2
Acenaphthylene	mg/kg	170	3
Acenaphthene	mg/kg	210	1
Fluorene	mg/kg	170	1
Phenanthrene	mg/kg	95	3
Anthracene	mg/kg	2400	3
Fluoranthene	mg/kg	280	3
Pyrene	mg/kg	620	3
Benzo(a)Anthracene	mg/kg	7.2	3
Chrysene	mg/kg	15	3
Benzo(b)Fluoranthene	mg/kg	2.6	3
Benzo(k)Fluoranthene	mg/kg	77	3
Benzo(a)Pyrene	mg/kg	2.2	3
Indeno(123-cd)Pyrene	mg/kg	27	3
Dibenzo(a,h)Anthracene	mg/kg	0.24	3
Benzo(ghi)Perylene	mg/kg	320	3
TPH C_5-C_6 (aliphatic)	mg/kg	42	2
TPH C_6-C_8 (aliphatic)	mg/kg	100	2
TPH C_8-C_{10} (aliphatic)	mg/kg	27	2
TPH C_{10}-C_{12} (aromatic)	mg/kg	74	2
TPH C_{12}-C_{16} (aromatic)	mg/kg	140	1
TPH C_{16}-C_{21} (aromatic)	mg/kg	260	1
TPH C_{21}-C_{35} (aromatic)	mg/kg	1100	1

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; NA – Not Applicable (no exceedance of assessment criteria); Loc of MC = Location of Exceedances

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).

Constituent	***Origin of Risk Assessment Value***
Arsenic	PC4SL
Cadmium	P4CSL
Chromium	LQM CIEH 2nd Edition 2009
Lead	PC4SL
Mercury	2009 SGV for Inorganic Mercury as it can be reasonably assumed Elemental and Methylmercury will not be present within the environment
Nickel	2009 SGV + 2015 S4UL revision
Selenium	Soil guideline value, DEFRA/Environment Agency
Copper	LQM CIEH 2nd Edition 2009
Zinc	LQM CIEH 2nd Edition 2009
Naphthalene	S4ULs – 2015- General Assessment Criteria (GAC) developed by CIEH / LQM the using CLEA 1-06 with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene	
Benzo(a)Pyrene	PC4SL
Indeno(123-cd)Pyrene	S4ULs – 2015- General Assessment Criteria (GAC) developed by CIEH / LQM the using CLEA 1-06 with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C_5-C_6 (aliphatic)	
TPH C_6-C_8 (aliphatic)	
TPH C_8-C_{10} (aliphatic)	
TPH C_{10}-C_{12} (aliphatic)	
TPH C_{12}-C_{16} (aromatic)	
TPH C_{16}-C_{21} (aromatic)	
TPH C_{21}-C_{35} (aromatic)	