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GROUND INVESTIGATION REPORT

MR & MRS WALTON

PROPOSED RESIDENTIAL DEVELOPMENT

SUNCROFT

WARKWORTH

MORPETH

NE65 0XP

Project No: 20-610

Prepared By:

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Date:

09/09/2021

Approved By:

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Date:

09/09/2021

The information and/or advice contained in this Ground Investigation Report is based solely on, and is limited to, the boundaries of the site, the immediate area around the site, and the historical use(s) unless otherwise stated. This 'Report' has been prepared in order to collate information relating to the physical, environmental and industrial setting of the site, and to highlight, where possible, the likely problems that might be encountered when considering the future development of this site for the proposed end use. All comments, opinions, diagrams, cross sections and/or sketches contained within the report, and/or any configuration of the findings is conjectural and given for guidance only and confirmation of the anticipated ground conditions should be considered before development proceeds. Agreement for the use or copying of this report by any Third Party must be obtained in writing from Arc Environmental Limited (ARC). If a change in the proposed land use is envisaged, then a reassessment of the site should be carried out.

Report Type:- Ground Investigation Report

Project:- 21-610 – Proposed Residential Development, Suncroft, Warkworth, Morpeth, NE65 0XP

Prepared For: - Mr and Mrs Walton

CONTENTS

1.0	INTRODUCTION	Page 3
2.0	SITE DETAILS	Page 3
3.0	SCOPE OF WORKS	Page 3
4.0	INVESTIGATION RATIONALE	Page 3
4.1	Contamination Related Sampling & Site Protocols	Page 4
5.0	GROUND CONDITIONS	Page 4
5.1	Soil Profile	Page 4
5.2	Groundwater & Stability	Page 5
5.3	Trenching – Quarry High Wall	Page 5
6.0	INSITU TESTING	Page 5
6.1	Insitu Standard Penetration Tests	Page 5
6.2	Insitu Dynamic Cone Penetration (DCP) Tests	Page 6
6.3	Insitu Gas and Groundwater Monitoring	Page 6
7.0	LABORATORY TESTING	Page 7
7.1	Determination of pH and SO ₄	Page 7
7.2	Determination of Liquid & Plastic Limits	Page 8
7.3	Contamination Screening/Screening Strategy	Page 8
8.0	GROUND CONTAMINATION RISK ASSESSMENT	Page 9
8.1	Methodology	Page 9
8.2	Conceptual Site Model (CSM)	Page 10
8.3	Level 1 Risk Assessment (Human Health)	Page 11
8.4	Level 1 Risk Assessment (Controlled Waters)	Page 13
8.5	Waste Classification – Screening for Off-Site Disposal	Page 15
9.0	CONCLUSIONS & RECOMMENDATIONS	Page 15
9.1	Ground Conditions	Page 15
9.2	Groundwater	Page 15
9.3	Gas Protection Measures	Page 16
9.4	Foundation Options	Page 16
9.5	Ground Contamination	Page 17
9.6	Preliminary Remediation Statement	Page 17
9.7	General Comments	Page 18
<u>Appendices</u>		
Appendix I	Location Plan, Aerial Photograph, Existing Site Layout Plan, Proposed Development Layout Plan	
Appendix II	Investigation Works Record Sheets, Borehole Record Sheets, DCP Test Results	
Appendix III	Laboratory Testing Results (Geotechnical & Ground Contamination)	
Appendix IV	Intersoil Ltd Environmental Study (Ref. 13024/amd2, 13023/ amd2 & 20003)	

1.0 Introduction

September 2021

As requested by ALCC Ltd on behalf of Mr and Mrs Walton, a programme of intrusive Investigation works have been carried out for a proposed residential development, located off Station Road, Suncroft. Warkworth. The proposed development will comprise the construction of 2 no. two-storey residential properties with associated standalone garage, car parking and areas of soft landscaping.

Previous intrusive ground investigation works have been carried out by Intersoil Ltd in June 2013 (Ref. 13024/amd2) and in December 2019 (Ref. 20003), the results of these have been used in conjunction with the production of this Ground Investigation Report.

These intrusive investigation works comprised 3 no. cable percussive boreholes (CP01 –CP03) and 6 no. manually excavated trial pits (TP01 –TP06). The positions of which can be seen on the Investigation Works Record Sheet, a copy of which can be seen in Appendix II. It should be noted that this plan should be used for orientating purposes only, as the positions shown are approximate, and the plans are not to a standard scale.

2.0 Site Details

Table 2.1

N = north, S = south, E = east, W = west

Site Name & Address:	Suncroft, Warkworth, Morpeth, NE65 0XP
OS Grid Reference:	424792, 606390 (representative for the centre of the site).
Description of Location:	The site is situated to the north of Station Road, Suncroft, Warkworth.
Site Boundaries:	N= A residential property and agricultural fields beyond, E= Wooded area with agricultural field beyond S = Suncroft Cottages with Station Road beyond, W = Residential properties.

3.0 Scope of Works

Table 3.1

Client:	Mr and Mrs Walton
Project type:	Residential.
Site Location plan:	See Appendix I.
Layout plans (existing):	See Appendix I.
Layout plans (proposed):	See Appendix I.
Laboratory Testing:	Geotechnical & Ground Contamination.
Reporting:	Factual & Interpretative including Level 1 Risk Assessment. Works carried out in accordance with the British Standards

The information contained in this report is limited to the areas of the site, as indicated on the Existing & Proposed Site Layout Plans shown in Appendix I, and to those areas accessible during the ground investigation. The depths of strata on the record sheets are recorded from current ground levels.

No topographical survey was requested or undertaken. When considering the full scope of the development any features and / or issues not specifically mentioned in this report cannot be assumed to have been covered.

4.0 Investigation Rationale

This ground investigation has been designed to provide information on the general ground and groundwater conditions around the proposed development areas and potential areas of geotechnical concern. The rationale behind the location of each exploratory hole is summarised in Table 4.1 on the following page.

4.0 Investigation Rationale (Cont'd)

Table 4.1

Potential issue	Exploratory hole
Geotechnical considerations around areas of proposed development	CP01 – CP03 & TP01 – TP06
General site wide contamination assessment	CP01 – CP03 & TP01 – TP06

4.1 Contamination Related Sampling & Site Protocols: -

All works associated with this ground contamination assessment and investigations have generally been completed in accordance with BS10175:2011 + A2:2017: British Standard Code of Practice for the Investigation of Potentially Contaminated Sites (2011) & Environment Agency (EA) Land Contamination Risk Management (LCRM), October 2020, which superseded CLR11, with the following precautions specific to this project.

4.1.1 Ground Contamination Sampling: -

Samples were recovered by a representative of ARC Environmental Ltd. during the intrusive investigation works. All samples were stored at approximately 2°C - 8°C using cool boxes and ice packs prior to delivery to a UKAS/MCERTS accredited laboratory. Sampling was carried out in accordance with 'Technical Policy Statement 63: UKAS Policy on Deviating Samples'.

4.1.2 Avoiding Cross-Contamination between Sample Locations: -

To avoid possible cross-contamination of materials between soil horizons in the boreholes, drill casing was used to seal off the made ground. In addition, disposable plastic liners were used to collect samples from the windowless sampling boreholes carried out. With regards to the trial pit, the samples were recovered manually using dedicated disposable plastic gloves, replaced between each sample recovery.

5.0 Ground Conditions

For an accurate description of the ground conditions encountered at each investigation position, reference should be made to the Investigation Works Record Sheets and Borehole Record Sheets in Appendix II. It should be noted that there is always the possibility of variation in the ground conditions around and between the investigation locations.

5.1 Soil Profile: -

A summary of the soil profile for this site can be seen in Table 5.1 below.

Table 5.1

BGL = Below ground level.

Type of Strata	Depths Recorded (BGL)	Description & General Comments
MADE GROUND:	From 0.00m up to c.2.00m to c.10.07m	Comprising either grass overlying a mixture of dark greyish brown sandy gravel with ash, brick, glass, metal & plastic within the area of former quarry. Natural reworked sandy gravelly clays were recorded outwith the area of former quarry (western site area)
SOLID GEOLOGY: (STAINMORE FORMATION)	From c.2.00m to c.10.07m up to at least c.11.04m.	Comprising very weak, moderately weak & stronger orange brown / pinkish SANDSTONE (initially recovered as sand & gravel).

5.0 Ground Conditions (Cont'd)

5.1 Soil Profile (Cont'd): -

There was no visual and / or olfactory evidence of significant ground contamination in any of the exploratory positions undertaken, however ash was noted within the made ground.

5.2 Groundwater & Stability: -

No groundwater ingress was recorded with the boreholes remaining dry during the investigation period. As a result, significant shallow groundwater ingress should not occur during construction related excavations. However, it would be prudent to allow for the introduction of groundwater control measures, to take care of any localised ingresses of groundwater which may occur during the construction period, especially during the wetter periods of the year.

Owing to the nature of the significant thicknesses of made ground, adequate lateral trench support will be required for excavations, to prevent trench wall collapse or over excavations, as well as to create a safe working environment, and any excavations on this site should remain open for as short a period as possible, since some of these materials may be susceptible to deterioration, if left open to the natural elements for any significant period of time.

Reference to CIRIA 97 'Trenching Practice' would be beneficial to establish a suitable means of support or battering of excavation sides during construction.

5.3 Trenching –Quarry High Wall: -

The inferred position of the former quarry high wall was targeted with trenches TP01 to TP06. From the results of the trenching the quarry workings were noted to be more extensive and were several metres beyond the inferred historical mapping boundary position. For an accurate description and location of the quarry high wall encountered within the western portion of the site, reference should be made to the Investigation Works Record Sheet attached in Appendix II. The majority of the proposed development is located within the area of quarry backfill, however the standalone garage is noted to be 'straddling' the western boundary of the quarry highwall where reworked clays are found to the west of the highwall and gravel backfill to the east of the highwall towards the centre of the site.

6.0 Insitu Testing

6.1 Insitu Standard Penetration Tests: -

Standard penetration tests (SPT's) were carried out with the use of a normal split spoon sampler on the made ground and natural deposits (weathered sandstone) encountered within the boreholes to determine the relative strength of the materials tested. The results are shown as 'N' values on the graphic borehole record sheets, adjacent to the appropriate sample level. A summary of the test results can be seen in Table 6.1 below;

Table 6.1

<u>Type of Strata</u>	<u>Range of SPT 'N' Values</u>	<u>Result details</u>
MADE GROUND	1 to 21	Very loose, soft, firm and stiff deposits
WEATHERED SANDSTONE	15 to 48 and 57 to 75 blows for limited penetration	Very weak, moderately weak to strong deposits

6.0 Insitu Testing (Cont'd)

6.2 Insitu Dynamic Cone Penetration (DCP) Tests: -

6 no. Dynamic Cone Penetrometer (DCP) tests (TP01 / DCP01 –TP06 / DCP06) were undertaken to determine the insitu density of the shallow soils (future sub-grade materials), to assess their suitability.

A summary of the results of the tests undertaken can be seen in Table 6.2 below, whilst the full results including a graphical representation can be seen in appendix III. The DCP uses an 8kg hammer dropping through a height of 575mm to penetrate a 60° cone (20mm Ø) in to the underlying ground.

Readings are taken following a set number of blows or change in strength / density to determine the penetration of the cone. The DCP field results are analysed using the UK DCP 3.1 software package to calculate the thickness and strength / density of differing layers. The calculated results provided comprise penetration rates (mm/blow) and CBR values (%).

Table 6.2

<u>Position</u>	<u>Soil Type</u>	<u>Depth to Base (mm)</u>	<u>Range of Penetration Indices (mm/ blow)</u>	<u>Interpolated CBR Value (%)</u>
TP01 / DCP01	MADE GROUND	950	2 to 90	6
TP02 / DCP02	MADE GROUND	990	2 to 80	5
TP03 / DCP03	MADE GROUND	990	40 to 200	2
TP04 / DCP04	MADE GROUND	525	0.25 to 60	7
TP05 / DCP05	MADE GROUND	990	50 to 90	3
TP06 / DCP06	MADE GROUND	990	20 to 165	5

A summary of the DCP tests results is as follows: -

CBR values ranging from 2% to 7% have been recorded for the initial made ground.

When considering the higher CBR values noted, it is felt that these have been influenced by the coarse nature of the materials tested and occasional presence of cobbles. Therefore, a conservative design CBR value of 2% should be taken the initial made ground deposits.

6.3 Insitu Gas & Groundwater Monitoring: -

When considering the site is underlain by the Pennine Middle Coal Measure, during the previous investigation works carried out soil gas & water monitoring standpipes were installed within BH4 & BH5 by Intersoil Ltd (Ref. 13024/amd2) primarily to check for the possible presence of hazardous ground gas migration, as well as to monitor insitu groundwater levels. Additionally, the site is underlain by significant thicknesses of made ground. The findings Intersoil's gas and groundwater monitoring have been utilised in this assessment and are discussed below.

To summarise Intersoil's findings, no concentrations of Methane (CH₄) were recorded within any of the boreholes. However, elevated levels of Carbon Dioxide (CO₂) were recorded within the boreholes, up to a maximum level of 7.4% v/v, with associated slightly depleted oxygen (O₂) concentrations (minimum 16.1% v/v). In addition, the maximum flow rate of 0.4l/hr was recorded during the monitoring visits.

No levels of CH₄ were recorded by Intersoil, the gas screening value (GSV) for CO₂ only has been calculated, using the maximum recorded value of 7.4% v/v, with a maximum flow rate of 0.4l/hr. The GSV can be calculated as follows:

$$\text{Carbon Dioxide GSV} = 0.074 (7.4\%) \times 0.4 = 0.0296 \text{ l/hr}$$

6.0 Insitu Testing (Cont'd)

6.3 Insitu Gas & Groundwater Monitoring (Cont'd): -

When considering these results, in accordance with CIRIA C665, it can be seen that the GSV for CO₂ is below the assessment GSV value of 0.07l/hr, indicating that no gas protection measures will be required for the proposed development. However, when adopting Northumberland County Councils (NCC) methodology and approach for sites in the Northumberland Coalfield potentially affected by hazardous ground gases and due to the levels of Oxygen falling below 19.0% v/v, gas protection measures will be required within the proposed development. Correspondence with NCC should be sought with regards to the level of protection required.

Additionally, since the maximum Carbon Dioxide concentration exceeds the action trigger level of 5%, the CIRIA 665 guidance recommends an increase in the characteristic situation by an order of 1 to take into account the gas concentrations recorded. As such, it is felt that an appropriate determination for this site would be to place the site within Characteristic Situation 2 (CS2) and Amber 1 (NHBC Traffic light system), Therefore, appropriate gas protection measures will need to be implemented within the building design to negate against any risks to future end users.

Appropriate gas protection measures should be selected based on the characteristic situation using the guidance contained in Section 7 of the BS8485:2015 + A1:2019 document. The designer / specifier of gas protection measures needs to be able to understand the gas risk assessment findings and the building related influences, as these govern the design options and choices to be implemented. The gas protection design, provision of detailed pre-construction design drawings and product specification should be clearly defined, and reference should be made to the solution scores in Tables 5, 6 & 7 to assist the design, in terms of meeting the requirements of the gas regime determined. There will also be a requirement for the gas protection measures to be verified in accordance with CIRIA guidance document C735.

When considering the results of the groundwater monitoring, no groundwater was recorded within the boreholes during the monitoring visits, therefore significant shallow water ingress is unlikely to be experienced during any future construction related excavations. However, it would be prudent to allow for the introduction of suitable groundwater control measures, in order to take care of any localised ingresses of groundwater which may occur during the construction period, especially during the wetter periods of the year.

7.0 Laboratory Testing

All geotechnical testing was carried out in accordance with BS1377-1:2016 unless otherwise stated, at a UKAS accredited laboratory. Ground contamination screening was undertaken by a suitably experienced and qualified laboratory (UKAS and MCERTS accredited, unless otherwise stated).

7.1 Determination of pH & SO₄: -

Representative samples (9 no.) of the made ground and natural deposits recovered during the investigation works were tested in order to determine their acidic (pH) and soluble sulphate (SO₄) levels. In addition, from the previous works carried out by Intersoil (June 2013) the results of the concrete classification screening have also been used in this assessment.

The results are shown in Table 7.1 below and are also contained within the Chemtech Environmental Limited Analytical Reports (Ref nos: 96681 & 48007), copies of which can be seen in Appendix III.

7.0 Laboratory Testing (Cont'd)

7.1 Determination of pH & SO₄(Cont'd): -

Table 7.1

Position	Depth (m)	Strata	pH	SO ₄ (mg/l)	Design SO ₄ Class	ACEC Class
CP01	4.00-4.45	Made Ground	7.3	1949	DS-3	AC-3
CP01	8.00-8.45	Natural Strata	7.9	2136	DS-3	AC-3
CP02	2.00-2.45	Made Ground	7.5	1348	DS-2	AC-2
CP02	5.00-5.45	Made Ground	8.1	214	DS-1	AC-1
CP02	9.50-9.95	Natural Strata	8.2	97	DS-1	AC-1
CP03	1.00-1.45	Made Ground	7.9	34	DS-1	AC-1
BH4	0.30-0.50	Made Ground	6.7	53	DS-1	AC-1
BH4	1.80-2.00	Made Ground	7.4	1706	DS-3	AC-3
BH5	0.80-1.00	Made Ground	8.0	92	DS-1	AC-1

ACEC = Aggressive Chemical Environment for Concrete site classification

Based on these results the made ground materials across the site and whilst taking into account the mean of the highest 20% of samples tested, the site can be given a classification of Class DS-3, in accordance with BRE Special Digest 1: 2005 (3rd Edition) and the procedures for determining Sulphate Classification for brownfield locations. When considering the pH values of the materials tested, and assuming potentially mobile groundwater, the assessment of the Aggressive Chemical Environment for Concrete (ACEC) for the made ground materials is AC-3.

7.2 Determination of Liquid & Plastic Limits: -

Representative samples (2 no.) of the reworked clay (made ground) deposits recorded across the proposed development area were tested in order to determine their liquid and plastic limits, so these materials could be classified. The results can be seen in Table 7.2 below and also within the Professional Soils Limited Report (Ref. PSL 21/4522) in Appendix III.

Table 7.2

Position	Depth(m)	M/C(%)	LL	PL	PI	Class	% Passing 425µm Sieve
CP01	6.50-6.95	21	42	21	21	CI	93
CP03	1.00-1.45	21	31	16	15	CL	93

M/C = Moisture Content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index

From these results it can be seen that the samples tested, when plotted on the plasticity chart, fall within the low and intermediate plasticity range, and from the resulting plasticity indices, are of a low volume change potential, when taking into account the amount passing the 425µm sieve.

Therefore, the natural deposits tested are unlikely to undergo changes in volume, if large changes in their natural moisture content were to occur due to seasonal variations or the like.

7.3 Contamination Screening/Screening Strategy: -

Representative samples of the made ground recovered from across the proposed development area both in the previous investigation from Intersoil (2013) and supplementary investigation from Arc (2021) were passed onto Chemtech Environmental of Stanley, Co. Durham, so that soil contamination and leachate screening could be carried out. The samples were screened using a standard generic contamination suite (based on the historical CLEA SGV listed analytes with additions) which is used to assess typical made ground (disturbed natural strata mixed with anthropogenic debris) of an unknown source.

7.0 Laboratory Testing (Cont'd)

7.3 Contamination Screening/Screening Strategy (Cont'd): -

Evidence of ash was noted within the exploratory positions carried out. For completeness, representative samples were tested for Speciated PAH (Polycyclic Aromatic Hydrocarbons) and Speciated TPH (Total Petroleum Hydrocarbons). In addition, representative samples were also screened for WAC

The catalogue of testing results from both the previous investigation works and these recent works can be found in the Chemtech Analytical Report (Ref. 96681, 82677, 82695 & 48007), attached in Appendix III, and the total analysis carried out from both Arc Environmental's and Intersoil's site investigation is summarised below.

8 no. samples screened using a Generic Soils Suite - based on the current CLEA SGV listed analytes with historical additions and which is used to assess typical made ground, comprising disturbed natural strata mixed with anthropogenic debris, of an unknown source (suite comprises; Arsenic, Cadmium, Chromium (Total), Copper, Lead, Mercury, Nickel, Selenium, Zinc & Cyanide.

5 no. samples screened for Chromium (III) & Chromium (IV).

8 no. samples screened for Phenols.

8 no. samples screened for Speciated PAH's –based on the current USEPA 16 PAH's

6 no. samples screened for Speciated Total Petroleum Hydrocarbons (full Aliphatic & Aromatic EC split)

3 no. samples screened for BTEX (Benzene, Toluene, Ethylbenzene, m & p-Xylene & o-Xylene)

2 no. Waste Acceptance Criteria Tests (WAC).

8 no. samples screened for Asbestos.

2 no. soil samples screened for Generic Leachate Suites –(suite comprises; Arsenic, Cadmium, Lead, Mercury, Nickel).

2 no. soil samples tested for leachable speciated PAH.

1 no. soil sample tested for leachable speciated TPH (based on full Aliphatic / Aromatic Split & BTEX).

The results have been used to carry out a Level 1: Quantitative Human Health Risk & Controlled Waters Risk Assessment for the ground contamination present and are discussed and in further detail in Section 8.0 below and on the following pages.

8.0 Ground Contamination Risk Assessment

8.1 Methodology: -

Following completion of the contamination screening undertaken on various samples from this site from both the previous and recent investigation works an updated Level 1 generic quantitative ground contamination risk assessment has been undertaken, generally in accordance with Environment Agency (EA) Land Contamination Risk Management (LCRM), October 2020, which superseded CLR11: Model Procedures for the Management of Land Contamination.

This quantitative ground contamination risk assessment uses the current UK practice for assessing the risks from land contamination, which is based on the established *source-pathway-receptor* pollutant linkage methodology and 'suitable for use' approach (Part IIA, EPA 1990 - inserted through Section 57 EA 1995).

8.0 Ground Contamination Risk Assessment (Cont'd)

8.1 Methodology (Cont'd): -

Based on the Revised Conceptual Site Model (CSM) for this site (described further in Section 8.2), a site specific screening strategy for the site has been developed (see Section 7.3) and risks from potential contaminants have been assessed for human health. The results of the risk assessments can be found in Section 8.3 (Human Health) and 8.4 (Controlled Waters).

8.2 Conceptual Site Model (CSM): -

Following the results of these intrusive investigation works, a Revised Conceptual Site Model (CSM) has been developed for this site, Table 8.1 below summarises the various contaminant *sources*, plausible migration *pathways* and potentially sensitive *receptors* identified for this site, assuming no remediation, additional protection measures and/or removal of the *sources* contamination takes place.

Table 8.1

* = Not included in the Human Health & Controlled Waters Risk assessment

	<i>Sources (S)</i>		<i>Pathways (P)</i>		<i>Receptors (R)</i>
S1	Made ground comprising disturbed natural strata with anthropogenic debris	P1	Ingestion & Dermal Contact.	R1	Human health - (End users (including children) and construction workforce).
S2	Hazardous ground gases associated with infilled land on-site – elevated levels of CO₂ recorded	P2	Plant uptake and attached soils.	R2	Controlled Waters: Groundwater – within the underlying solid geology (identified as a Secondary Aquifer - A). Nearest surface water feature (tributary to River Coquet) c.50m to the east of the site).
		P3	Air-inhalation of vapours and direct contact with dust.		
		P4	Migration through existing services / permeable strata.		
		P5	Direct contact with building Materials.	R3	Adjacent sites.
		P6	Surface runoff, Infiltration & Leachate migration.	R4*	Building materials.
				R5*	Flora and fauna.

8.2.1 Sources: -

The site is covered by a layer of made ground (up to c.10.07m thick) which represents a potential source of ground contamination for this site. The majority of the made ground contains some anthropogenic debris mixed with disturbed natural strata, and these materials have been assessed using a standard generic soil suite, with the site considered as a single averaging area for these analytes.

There was no significant visual, olfactory or analytical evidence of significant heavy or gross contamination, however ash was noted within the made ground. Therefore, for completeness the potential for hydrocarbon-based contamination (PAH's & TPH's) for this site have been assessed. In addition, although no visual evidence of Asbestos (fibres or fragments) were noted, the potential for Asbestos has also been assessed.

8.2.2 Pathways: -

When considering the proposed end use, and without considering treatment, removal or protection measures, there are some potential plausible pathways available for direct contact, dermal contact, ingestion, inhalation, wind (dust / particulate), volatilization, and vertical and lateral transportation below the site, where there is no hard cover or vapour barriers present.

8.0 Ground Contamination Risk Assessment (Cont'd)

8.2 Revised Conceptual Site Model (CSM) (Cont'd): -

8.2.2 Pathways (Cont'd): -

Within the CLEA Risk Assessment Model for Human Health, there are 3 exposure mediums considered for on site receptors, comprising ingestion of soil containing contaminants, inhalation of contaminated dust/vapours and dermal contact, with up to 10 no. exposure pathways considered, as shown below.

1. *Ingestion of soil and indoor dust*
2. *Consumption of homegrown produce and attached soil*
3. *Dermal contact (indoor)*
4. *Dermal contact (outdoor)*
5. *Inhalation of dust (indoor)*
6. *Inhalation of dust (outdoor)*
7. *Inhalation of vapour (indoor)*
8. *Inhalation of vapour (outdoor)*
9. *Oral background intake*
10. *Inhalation background intake.*

Where the future site has hard cover and below new structures, a number of these pathways may not be available. In addition, when considering the potential pathways for leachate migration, where either hard cover and/or future surface water drainage systems are present, the potential effects of surface infiltration or contaminated surface water runoff will be greatly reduced. Similarly, when considering the construction work force, exposure pathways through direct contact, ingestion and dust inhalation will be available during part of the construction process, and therefore adequate PPE should be provided to protect the work force during this period

8.2.3 Receptors: -

Within the CLEA Risk Assessment Model for Human Health, the potential receptors are assessed initially on site end use, followed by a delineation of age category (i.e. child or adult), with default settings for *R esidential*, *A llotment* and *P ublic Open Space (Park)* end uses based on a child aged 0 to 6 years, *P ublic Open Space (Residential)* based on a child aged 3 to 9 and *C ommercial* end uses based upon a working exposure period of up to 49 years (i.e. 16 to 65).

Key generic assumptions for *R esidential* and *P ublic Open Space (Residential)* are based upon a typical residential property, consisting of a two-storey small terraced house, with private garden, and a *C ommercial* end use based upon a typical commercial or light industrial property, consisting of a three-storey office building (pre-1970). No buildings are anticipated for *A llotment* or *P ublic Open Space (Park)* end uses. Within the CLEA Risk Assessment Model for Human Health there are 6 no. generic end use categories presently in use, as follows;

- 1) *Residential - with home grown produce*,
- 2) *Residential - without home grown produce*,
- 3) *Allotments*,
- 4) *Commercial*
- 5) *Public Open Space-Residential*,
- 6) *Public Open Space - Park*

Therefore, for this Level 1 Risk Assessment, the best fit end use category for this site has been taken as:

- 1) *Residential - with home grown produce*

When considering the risk to Controlled Waters the primary receptor for this Risk Assessment is a tributary to the River Coquet c.50m to the east of the site and groundwater within the solid geology (Secondary A Aquifer).

8.3 Level 1 Risk Assessment (Human Health): -

8.3.1 Soil Screening: -

The generic soil screening results have been assessed by comparing the maximum values recorded for each analyte to the critical concentration values chosen for this site. The results of the analysis and risk assessment have been summarised in Table 8.2 on the following page and have identified the following:-

8.0 Ground Contamination Risk Assessment (Cont'd)

8.3 Level 1 Risk Assessment (Human Health) (Cont'd): -

8.3.1 Soil Screening (Cont'd): -

Table 8.2

Bold = Elevated concentrations

Analyte	Critical Conc. (C _c) mg/kg	No. of Samples Screened	Max. Conc. (C _M) recorded mg/kg	Does C _M exceed C _c	No. of Samples > C _c
Arsenic	37 ⁽¹⁾	8	75	YES	3
Cadmium	11 ⁽¹⁾	8	4	NO	0
Chromium III	910 ⁽¹⁾	5	91	NO	0
Chromium VI	6 ⁽¹⁾	5	<1	NO	0
Copper	2400 ⁽¹⁾	8	608	NO	0
Lead	200 ⁽²⁾	8	861	YES	5
Mercury	40 ⁽¹⁾	8	<0.5	NO	0
Nickel	130 ⁽¹⁾	8	156	YES	3
Selenium	250 ⁽¹⁾	8	2.8	NO	0
Zinc	3700 ⁽¹⁾	8	899	NO	0
Cyanide	34 ⁽³⁾	8	<2	NO	0
Phenols (Total)	200 ⁽¹⁾	8	<0.5	NO	0
Acenaphthylene	920 ⁽¹⁾	8	0.19	NO	0
Anthracene	11000 ⁽¹⁾	8	3.34	NO	0
Benzo(a)anthracene	13 ⁽¹⁾	8	6.39	NO	0
Benzo(a)pyrene	3.0 ⁽¹⁾	8	5.34	YES	2
Benzo(b)fluoranthene	3.7 ⁽¹⁾	8	7.28	YES	2
Benzo(ghi)perylene	350 ⁽¹⁾	8	2.90	NO	0
Benzo(k)fluoranthene	100 ⁽¹⁾	8	2.89	NO	0
Chrysene	27 ⁽¹⁾	8	6.38	NO	0
Dibenz(a,h)anthracene	0.3 ⁽¹⁾	8	1.0	YES	2
Fluoranthene	890 ⁽¹⁾	8	14.49	NO	0
Fluorene	860 ⁽¹⁾	8	0.65	NO	0
Indeno(123cd)pyrene	41 ⁽¹⁾	8	3.55	NO	0
Naphthalene	13 ⁽¹⁾	8	0.07	NO	0
Phenanthrene	440 ⁽¹⁾	8	7.26	NO	0
Pyrene	2000 ⁽¹⁾	8	11.08	NO	0
Benzene	0.37 ⁽¹⁾	2	<0.01*	NO	0
Toluene	660 ⁽¹⁾	2	<0.01*	NO	0
Ethylbenzene	260 ⁽¹⁾	2	<0.01*	NO	0
m & p-Xylene	320 ⁽¹⁾	2	<0.02*	NO	0
o-Xylene	310 ⁽¹⁾	2	<0.01*	NO	0
VPH Aliphatic (>C5-C6)	330 ⁽¹⁾	6	<0.1*	NO	0
VPH Aliphatic (>C6-C8)	160 ⁽¹⁾	6	<0.1*	NO	0
VPH Aliphatic (>C8-C10)	530 ⁽¹⁾	6	<0.1*	NO	0
EPH Aliphatic (>C10-C12)	150 ⁽¹⁾	6	<4*	NO	0
EPH Aliphatic (>C12-C16)	760 ⁽¹⁾	6	10	NO	0
EPH Aliphatic (>C16-C35)	4300 ⁽¹⁾	6	491	NO	0
EPH Aliphatic (>C35-C44)	110000 ⁽¹⁾	6	137	NO	0
VPH Aromatic (>EC5-EC7)	110000 ⁽¹⁾	6	<0.01*	NO	0
VPH Aromatic (>EC7-EC8)	300 ⁽¹⁾	6	<0.01*	NO	0
VPH Aromatic (>EC8-EC10)	660 ⁽¹⁾	6	<0.01*	NO	0
EPH Aromatic (>EC10-EC12)	190 ⁽¹⁾	6	<1*	NO	0
EPH Aromatic (>EC12-EC16)	380 ⁽¹⁾	6	2	NO	0
EPH Aromatic (>EC16-EC21)	660 ⁽¹⁾	6	40	NO	0
EPH Aromatic (>EC21-EC35)	930 ⁽¹⁾	6	37	NO	0
EPH Aromatic (>EC35-EC44)	1700 ⁽¹⁾	6	5	NO	0

⁽¹⁾ = LQM CIEH Suitable 4 Use Levels (S4UL Nov 2014 (Revised August 2015)) –Residential with homegrown produce, ⁽²⁾ = C4SL Values (Residential with homegrown produce), ⁽³⁾ = ATRISK_{SOIL} SSV. * = Site Value (C_M) less than analytical detection limit

8.0 Ground Contamination Risk Assessment (Cont'd)

8.3 Level 1 Risk Assessment (Human Health) (Cont'd): -

The results of the analysis and risk assessment have identified the following: -

The maximum concentration (CM) values for Arsenic, Lead, Nickel Benzo(a)pyrene, Benzo(b)fluoranthene & Dibenzo(a,h)anthracene exceed the chosen Critical Concentration (CC) values for this site.

None of the maximum concentration (CM) values for any of the remaining analytes listed in Table 8.2 exceed the chosen Critical Concentration (CC) values for this site.

When considering these results, the made ground below the site represents a potential risk to the end users and therefore either treatment, removal, protection measures and / or further detailed quantitative risk assessment will be required.

8.3.2 Human Health -Asbestos Screening: -

Representative samples of the soils recovered during the previous investigation works undertaken by Intersoil have been screened for Asbestos, to determine whether any unidentified asbestos was present within these materials. The results are summarised in Table 8.3 below and have identified the following:

Table 8.3

NAD = No Asbestos Detected.

Position	Depth (m)	Chrysotile (white)	Amosite (brown)	Crocidolite (blue)	Anthophyllite	Actinolite	Tremolite
A1	0.50-0.80	NAD	NAD	NAD	NAD	NAD	NAD
A2	0.30-0.60	NAD	NAD	NAD	NAD	NAD	NAD
A3	0.30-0.60	NAD	NAD	NAD	NAD	NAD	NAD
A4	0.00-0.30	NAD	NAD	NAD	NAD	NAD	NAD
A4	1.20-1.50	NAD	NAD	NAD	NAD	NAD	NAD
A5	0.30-0.60	NAD	NAD	NAD	NAD	NAD	NAD
A6	0.00-0.30	NAD	NAD	NAD	NAD	NAD	NAD
A6	0.70-1.00	NAD	NAD	NAD	NAD	NAD	NAD

When considering these results, no asbestos fibres were detected and therefore the made ground is not felt to represent a risk with regards to asbestos.

8.4 Level 1 Risk Assessment (Controlled Waters): -

During the previous investigation works carried out by Intersoil based on the results of the soil screening, leachate screening has been carried out on 2 no. soil samples. The results have been used to complete a Level 1 Risk Assessment for the potential impact on Controlled Waters and adjacent sites, and the results have been summarised in Table 8.4 below and continue on the following page.

Table 8.4

Bold = result exceeds Target concentration

Analyte	Target Conc. C _T (µg/l)	No. of Samples Screened	Max. Conc. (µg/l)	No. of Samples > C _T
Arsenic	10 ⁽¹⁾	2	0.64	0
Calcium	5 ⁽¹⁾	2	<0.07	0
Lead	10 ⁽¹⁾	2	<0.2	0
Mercury	1 ⁽¹⁾	2	<0.008	0
Nickel	20 ⁽¹⁾	2	0.8	0
Zinc	3000	1	0.092	0

⁽¹⁾ = UK Drinking Standard, ⁽²⁾ = EQS Freshwater, ⁽³⁾ = WHO Health.

8.0 Ground Contamination Risk Assessment (Cont'd)

8.4 Level 1 Risk Assessment (Controlled Waters) (Cont'd): -

Table 8.4 (Cont'd)

Bold = result exceeds Target concentration

Analyte	Target Conc. C _T (µg/l)	No. of Samples Screened	Max. Conc. (µg/l / mg/l)	No. of Samples > C _T
Acenaphthylene	0.1 ⁽¹⁾	2	<0.1	0
Acenaphthene	0.1⁽¹⁾	2	4.6	1(A1)
Anthracene	0.1⁽¹⁾	2	1.5	1(A1)
Benzo(a)anthracene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(a)pyrene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(b)fluoranthene	0.1 ⁽¹⁾	2	0.1	0
Benzo(ghi)perylene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(k)fluoranthene	0.1 ⁽¹⁾	2	<0.1	0
Chrysene	0.1 ⁽¹⁾	2	<0.1	0
Dibenz(ah)anthracene	0.1 ⁽¹⁾	2	<0.1	0
Fluoranthene	0.1⁽¹⁾	2	2.3	1(A1)
Fluorene	0.1⁽¹⁾	2	2.0	1(A1)
Indeno(123cd)pyrene	0.1 ⁽¹⁾	2	<0.1	0
Naphthalene	10 ⁽¹⁾	2	<0.1	0
Phenanthrene	0.1⁽¹⁾	2	9.2	1(A1)
Pyrene	0.1⁽¹⁾	2	1.3	1(A1)
Benzene	1.0 ⁽¹⁾	1	<1	0
Toluene	50 ⁽²⁾	1	<1	0
Ethylbenzene	300 ⁽³⁾	1	<1	0
mep-Xylene	30 ⁽²⁾	1	<1	0
o-Xylene	30 ⁽²⁾	1	<1	0
VPH Aliphatic (>C5-C6)	10 ⁽¹⁾	1	<1	0
VPH Aliphatic (>C6-C8)	10 ⁽¹⁾	1	<1	0
VPH Aliphatic (>C8-C10)	10 ⁽¹⁾	1	<1	0
EPH Aliphatic (>C10-C12)	10 ⁽¹⁾	1	18	1(A1)
EPH Aliphatic (>C12-C16)	10 ⁽¹⁾	1	32	1(A1)
EPH Aliphatic (>C16-C35)	10⁽¹⁾	1	66	1(A1)
EPH Aliphatic (>C35-C44)	10 ⁽¹⁾	1	3	0
VPH Aromatic (>EC5-EC7)	10 ⁽¹⁾	1	<1	0
VPH Aromatic (>EC7-EC8)	10 ⁽¹⁾	1	<1	0
VPH Aromatic (>EC8-EC10)	10 ⁽¹⁾	1	<1	0
EPH Aromatic (>EC10-EC12)	10 ⁽¹⁾	1	<1	0
EPH Aromatic (>EC12-EC16)	10 ⁽¹⁾	1	7	0
EPH Aromatic (>EC16-EC21)	10 ⁽¹⁾	1	21	1(A1)
EPH Aromatic (>EC21-EC35)	10 ⁽¹⁾	1	4	0
EPH Aromatic (>EC35-EC44)	10 ⁽¹⁾	1	<1	0

⁽¹⁾ = EQS Freshwater, ⁽²⁾ = UK Drinking Standard, ⁽³⁾ = WHO Health.

The following hydrogeological and hydrological issues have been taken into consideration when assessing the risks towards the Controlled Waters;

- A continuous groundwater surface (water table) is not anticipated at depth within the solid deposits.
- The site is not within a Source Protection Zones (SPZs).
- The closest Water Abstraction is recorded c.875m to the south west.
- The nearest surface water feature is c.50m to the east of the site.
- No groundwater was recorded during the exploratory period of the site.

8.0 Ground Contamination Risk Assessment (Cont'd)

8.3 Level 1 Risk Assessment (Controlled Waters) (Cont'd): -

Although elevated levels of Fluoranthene, Fluorene, Phenanthrene, Pyrene, EPH Aliphatic (>C10-C12), EPH Aliphatic (>C12-C16), EPH Aliphatic (>C16-C35), EPH Aromatic (>EC16-EC21) have been recorded, when considering the above, the risks to Controlled Waters is deemed to be negligible and therefore no further risk assessment is required in this regard.

8.5 Screening for Off-Site Disposal:-

Based on the results of the Waste Acceptance Criteria (WAC) screening undertaken (See Chemtech Environmental Limited Analytical Report (ref. no.: 96681-1) on representative samples of the made ground, levels of Sulphate, Total Dissolved Solid TPH & Total Organic Carbon above the BS EN 12457-3 limit values for inert waste have been recorded.

As a result, the made ground will not meet the criteria for disposal at an inert landfill. If any made ground is likely to be removed from site as a waste, the contamination screening results from both the previous investigation works and these recent investigation works should be forwarded on to the chosen landfill for their assessment and confirmation of waste classification.

9.0 Conclusions & Recommendations

9.1 Ground Conditions: -

From the information gained during these intrusive ground investigation works, made ground was generally recorded to depths of between c.2.00m to c.10.07m below current ground level (bcgl) generally comprising initial site surfacing of grass overlying a mixture of dark greyish brown sandy gravel with ash, brick, glass, metal & plastic and natural reworked sandy gravelly clays. The underlying solid geological deposits comprised very weak to moderately weak & stronger orange brown / pinkish SANDSTONE (initially recovered as sand & gravel), recorded to a depth of a least c.11.04m bcgl.

The majority of the site is within the area of a former quarry with the 'high wall' identified within TP01 in the western portion of the site, this has been plotted on the Investigation Works Record Sheets attached in Appendix II. Beyond the potential western boundary quarry 'high wall', made ground comprising reworked buff to brown sandy gravelly clay recorded to between depths of c.2.00m to c.3.00m bcgl.

Within the area of historic quarry feature up to c.10.07m of made ground backfill material comprising initial site surfacing of grass overlying a mixture of dark greyish brown sandy gravel with ash, brick, glass, metal & plastic and natural reworked sandy gravelly clays was recorded. Additionally, evidence of ash was noted within the made ground.

9.2 Groundwater: -

No ingresses of water were recorded with the exploration locations remaining dry during their creation. As a result, shallow water ingress is unlikely to occur within construction related excavations. However, it would be prudent to allow for the introduction of suitable groundwater control measures, in order to take care of any ingresses of groundwater which may occur, especially during the wetter periods of the year.

9.0 Conclusions & Recommendations (Cont'd)

9.3 Gas Protection Measures: -

From the results of the gas monitoring completed by Intersoi, the maximum Carbon Dioxide concentration exceeds the typical maximum concentration of 5% action trigger level and the CIRIA 665 guidance recommends an increase in the characteristic situation by an order of 1 to take into account the gas concentrations recorded. Additionally, when adopting Northumberland County Councils (NCC) methodology and approach for sites in the Northumberland Coalfield potentially affected by hazardous ground gases, due to the levels of Oxygen falling below 19.0% v/v, gas protection measures will be required within the proposed development.

Therefore, it is felt that an appropriate determination for this site would be to place the site within Characteristic Situation 2 (CS2) / Amber 1 (NHBC Traffic light system). Further reference can be made to BS8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings and BRE414:2001: Protective measures on gas contaminated land for further design specifications and details of the protective measures required and correspondence with NCC should be sought confirming the level of protection required.

9.4 Foundation Options: -

Variability has been noted in the depths and composition of the made ground materials underlying the area of the proposed buildings and subsequently the depths to a suitable founding strata. Due to the inherent inconsistencies within the made ground it is considered unsuitable as a foundation medium.

Therefore, to remove the risk of future differential settlement and structural damage / excessive tilting for the proposed dwellings, the most definitive option would be to consider a piled foundation solution, based within the natural solid geological deposits.

As settlement creep occurs in the backfill materials, an additional load will be imposed onto the pile (negative skin friction) from the surrounding soil as it settles around the pile dragging it down. The piles need to be designed to resist the additional load from negative skin friction due to the creeping fill.

A conservative design approach would be to consider the end bearing only for the individual piles or pile groups in pile design. Piles should be constructed through the full depth of the made ground and founded on competent strata at the base and constructed at diameters such that these accommodate the additional loading caused by negative skin friction.

In this case, due to the numerous types of piles and installation methods available, it is recommended to seek advice from a specialist piling contractor so they can provide a suitable pile design. It should be noted that a variation in pile lengths will be required across the site particularly in the area of the 'high wall' encountered to the west of the site. Driven piles are not recommended in localities where the pile toe cannot be socketed in to competent strata i.e. along the quarry 'high wall' as these can drift out of plumb during driving.

Where new access roads and areas of hardstanding are to be considered, based upon the findings of the DCP tests completed a design CBR value of 2.0% is recommended for the where the made ground is to be used as an undisturbed subgrade. It is recommended that the sub-grade materials are 'proof rolled' to identify any potential 'soft spots', and these can be dealt with introducing an increased thickness of compacted sub-base and/or a geotextile reinforcement. In addition, it may also be prudent to allow for an Engineer to attend site during the development works, to confirm the design CBR value of the materials to be utilised prior to construction.

9.0 Conclusions & Recommendations (Cont'd)

9.4 Foundation Options (Cont'd): -

When considering the results of the pH and soluble sulphate testing, the made ground materials across the site can be given a classification of DS-3, in accordance with BRE Special Digest 1: 2005 (3rd Edition) and the procedures for determining Sulphate Classification for brownfield locations. When considering the pH values of the materials tested, and assuming potentially mobile groundwater, the assessment of the Aggressive Chemical Environment for Concrete (ACEC) for the made ground materials is AC-3.

9.5 Ground Contamination: -

9.5.1 –Human Health

From the results of the contamination screening carried out from both the previous ground investigation works and the supplementary works, elevated levels of Arsenic, Lead, Nickel and several PAH's have been recorded in the made ground at several locations that represent a potential risk to future end users, where exposure pathways are available. As a result it is recommended that treatment, removal, protection measures and / or further detailed quantitative risk assessment is required, potential remedial measures available are discussed further in Section 9.6.

When considering the risks to the construction workforce, standard PPE should prove adequate protection against the levels of potential contaminants recorded during these investigation works. Similarly, the results can also be used by the Main Contractor / Project Coordinator, when devising an adequate Site Health & Safety Plan, in accordance with current CDM Regulations. For further guidance reference should be made to the Health and Safety Executive (HSE) document EH40/2005 Workplace exposure limits.

9.5.2 –Controlled Waters

When considering the results of the leachate screening, although elevated levels several Speciated PAHs and TPHs have been recorded, when considering environmental setting with the site not being within a Source Protection zone and the closest Water Abstraction recorded c.875m to the south west of the site, the risks to Controlled Waters is deemed to be negligible with no further risk assessment deemed necessary.

9.6 Preliminary Remediation Statement: -

From the results of the Level 1 Risk Assessment, it can be seen that elevated levels of Arsenic, Lead, Nickel and several PAH's have been recorded within the made ground that represents a potential risk to the proposed end users.

When considering the elevated levels of contamination, where buildings and areas of hardstanding are proposed/present then the *source-pathway-receptor* model will not exist and there is not considered to be a health risk to the future end users. However, in areas of soft landscaping there is the potential for dermal contact, plant uptake and inhalation of dust. Taking into account the nature of the proposed development it is felt that the most suitable remedial option available is the installation of a clean cover system within any areas of soft landscaping / private gardens, at this stage an estimated minimum 600mm thick cover is envisaged.

Where remedial works are completed across the site, confirmatory validation testing and photographic evidence of the chosen remediation strategy would be required by the Local Authorities.

9.0 Conclusions & Recommendations (Cont'd)

9.6 Preliminary Remediation Statement (Cont'd): -

Prior to any remedial works being undertaken, a remediation strategy may need to be prepared, this should be agreed with the LA, and once implemented, the remediation work should be validated by a suitably qualified Geo-environmental Engineer to ensure that all works are being completed in strict accordance with the agreed Remediation Strategy.

Additionally, based on the results of the hazardous ground gas monitoring undertaken by Intersoil, and when considering the conclusions of the hazardous ground gas risk assessment, it will be necessary to incorporate appropriate hazardous ground gas protection measures within the proposed dwellings to negate against any risks to future end users, and these should be designed in accordance with BS8485:2015:+A1:2009 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. It is likely that the implementation of gas protection measures to meet a CS2 and Amber 1 design specification will be required as discussed previously in section 6.3.

9.7 General Comments: -

If during future redevelopment works, any excavated materials are to be discarded and removed from this site as a waste to landfill, these materials will need to be classified in accordance with the 'Guidance on the Classification and Assessment of Waste (1st Edition 2015) –Technical Guidance WM3'. Where possible, removal of materials from site as a 'waste' should be kept to a minimum and ideally excavated materials should all be reused on site.

However, if excavated materials have to be discarded to accommodate finished ground levels etc., it should be noted that additional analysis and screening may be required once each specific waste stream has been identified and the volume of material to be disposed of has been calculated, since the amount of screening required, including any pre-disposal WAC screening, will be dependent upon the final volume of material to be disposed of.

With regard to asbestos in soil, where we have sampled and tested for asbestos this is discussed in the report. Whilst we would target any asbestos sampling and testing in accordance with a Conceptual Site Model and site findings, there is always the possibility, along with other contamination, that undiscovered asbestos exists between sample locations and the possibility of unknown asbestos exists on all sites, particularly brownfield sites where previous buildings have been demolished.

For future site works, adequate lateral trench support will be required for excavations, in order to prevent trench wall collapse or over excavations, as well as to create a safe working environment below a depth of 1.20m, and any excavations on this site should remain open for as short a period as possible, since some of these materials may be susceptible to deterioration, if left open to the natural elements for any significant period of time.

It is also recommended for any new developments, adequate surface drainage should be designed and installed by a competent contractor, in order to prevent surface water 'ponding' or collection, during and post construction, particularly where the existing surface drainage system is disrupted or damaged.

In addition, for deeper excavations, drainage, service runs or the like that may pass close to or beneath any proposed new foundations, these should be undertaken with care and completed prior to the preparation of any new foundations, so as not to allow any loose or granular material to move or 'flow', thus causing settlement to occur to any new foundations based at a higher level.

9.0 Conclusions & Recommendations (Cont'd)

9.7 General Comments (Cont'd): -

Following consultation with the Coal Authority Online Viewer, the site is shown to be within a defined 'Coal Mining Reporting Area' but outwith a 'Development High Risk Area' or area of past probable shallow coal workings. Therefore, the site is not considered to be at risk from shallow coal mining activities. In addition, the site is not located within an area that requires radon protective measures within proposed new developments.

An "observational technique" can be applied to the design and construction of this site, and where ground conditions seem to vary from that indicated from the conceptual ground model derived from works to date, then advice from a suitably qualified Engineering Geologist/Geotechnical Engineer should be sought.

END OF REPORT

APPENDIX I

Location Plan

Aerial Photograph

Existing and Proposed Site Layout Plan

Proposed Development Layout Plan



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rev.	date	amendments	drawn chkd

Client: **JASPER KERR CONSULTING ENGINEERS**

Project Title:
Proposed Residential Development, Suncroft, Warkworth

Drawing Title:
Location Plan

Scale at A3: | Date: 09/09/2021 | Drawn by: | Approved by:

Job Ref: 20-610 | Drg no: | Rev:



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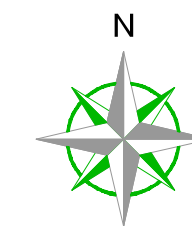
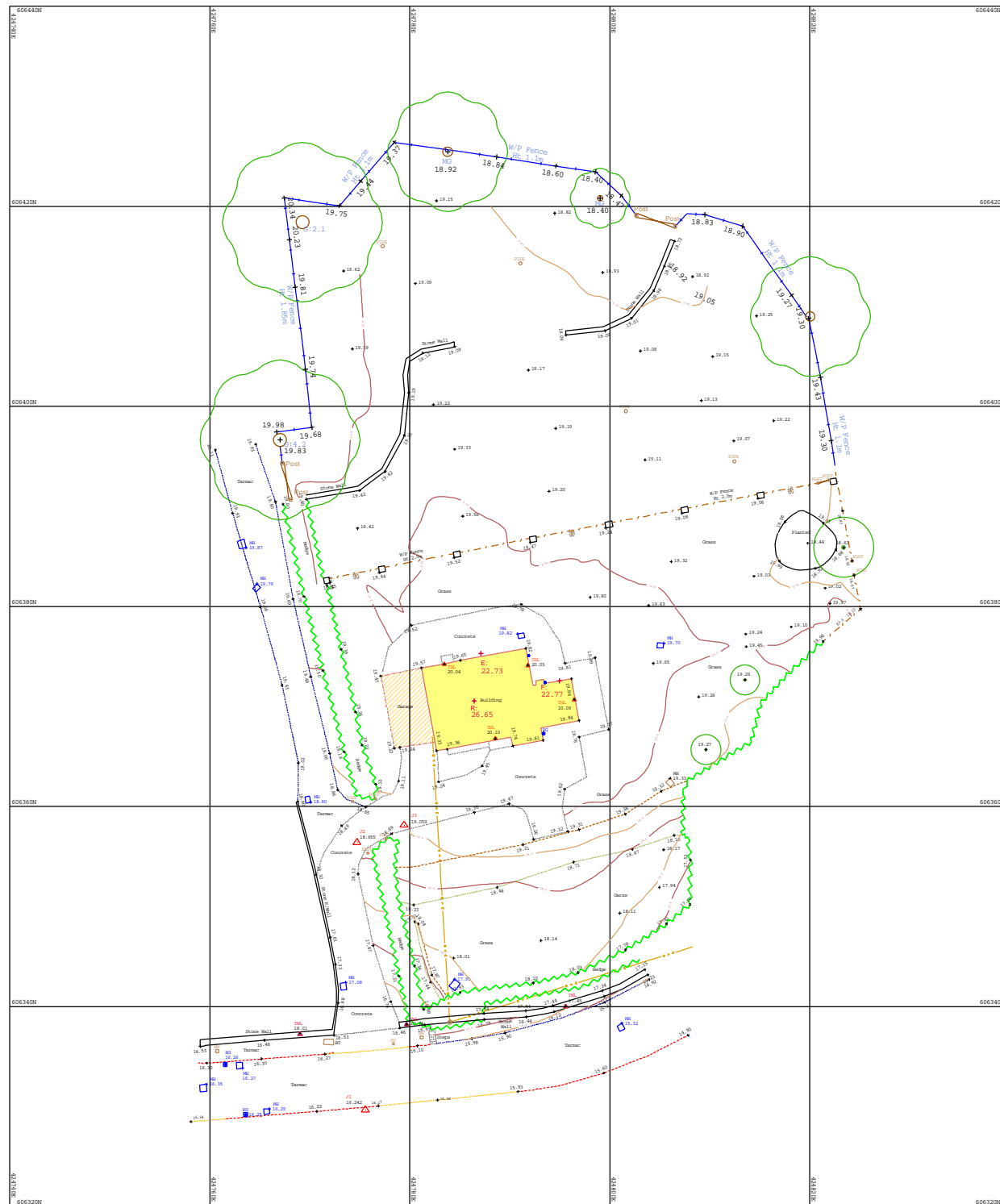
Client: **Align JASPER KERR CONSULTING ENGINEERS**

Project Title:
Proposed Residential Development, Suncroft, Warkworth

Drawing Title:
Aerial Photograph

Scale at A3: | Date: 09/09/2021 | Drawn by: | Approved by:

Job Ref: 20-610 | Drg no: | Rev:



JT Jon Tweddell Planning Limited	
CLIENT	ALCC
PROJECT	Suncroft Warkworth
TITLE	Topographical Survey
SCALE A3@ 1:500	DATE 17/03/20
DRAWN KA	Revision 0



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Client: **JASPER KERR
CONSULTING ENGINEERS**

Project Title:
**Proposed Residential
Development, Suncroft, Warkworth**

Drawing Title:
Existing Site Layout Plan

Scale at A3: | Date: 09/09/2021 | Drawn by: | Approved by:

Job Ref: **20-610** | Drg no: | Rev:

Proposed development layout plan with overlay of position of former quarry as transposed from 1960 Ordnance Survey (OS) Plan. The actual position of the high wall (where present) and ground conditions were confirmed during trenching works on site



Disused Quarry



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rev.	date	amendments	drawn	chkd

Client: **JASPER KERR CONSULTING ENGINEERS**

Project Title:
 Proposed Residential Development
 Suncroft
 Warkworth

Drawing Title:
 Proposed Development Layout Plan
 Showing Historic Quarry Detail

Scale of A3: NTS @ A3 | Date: 04.06.21 | Drawn by: P.D | Approved by: A.B

Job Ref: 20-610 | Drg no: - | Rev: -

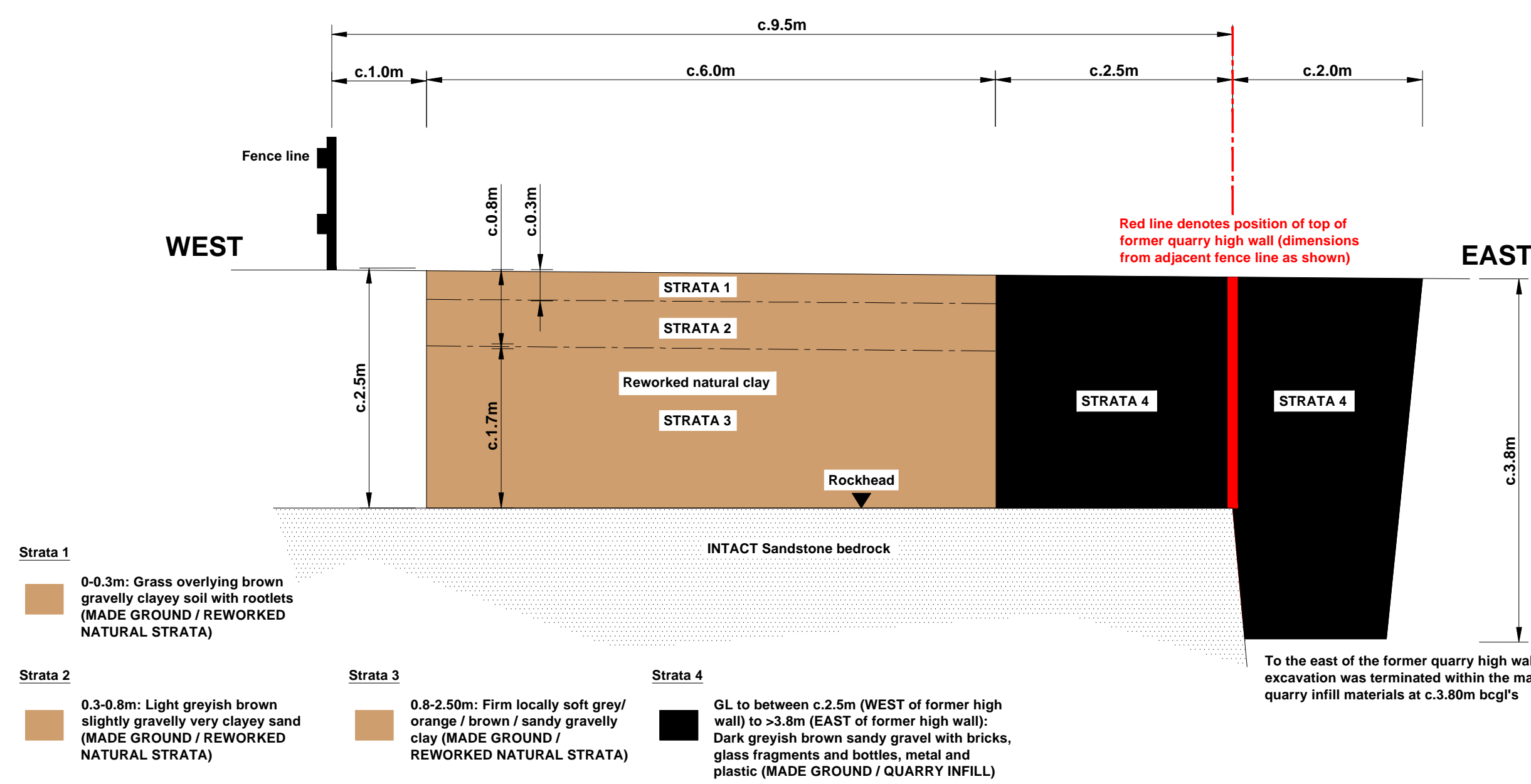
APPENDIX II

Investigation Works Record Sheets

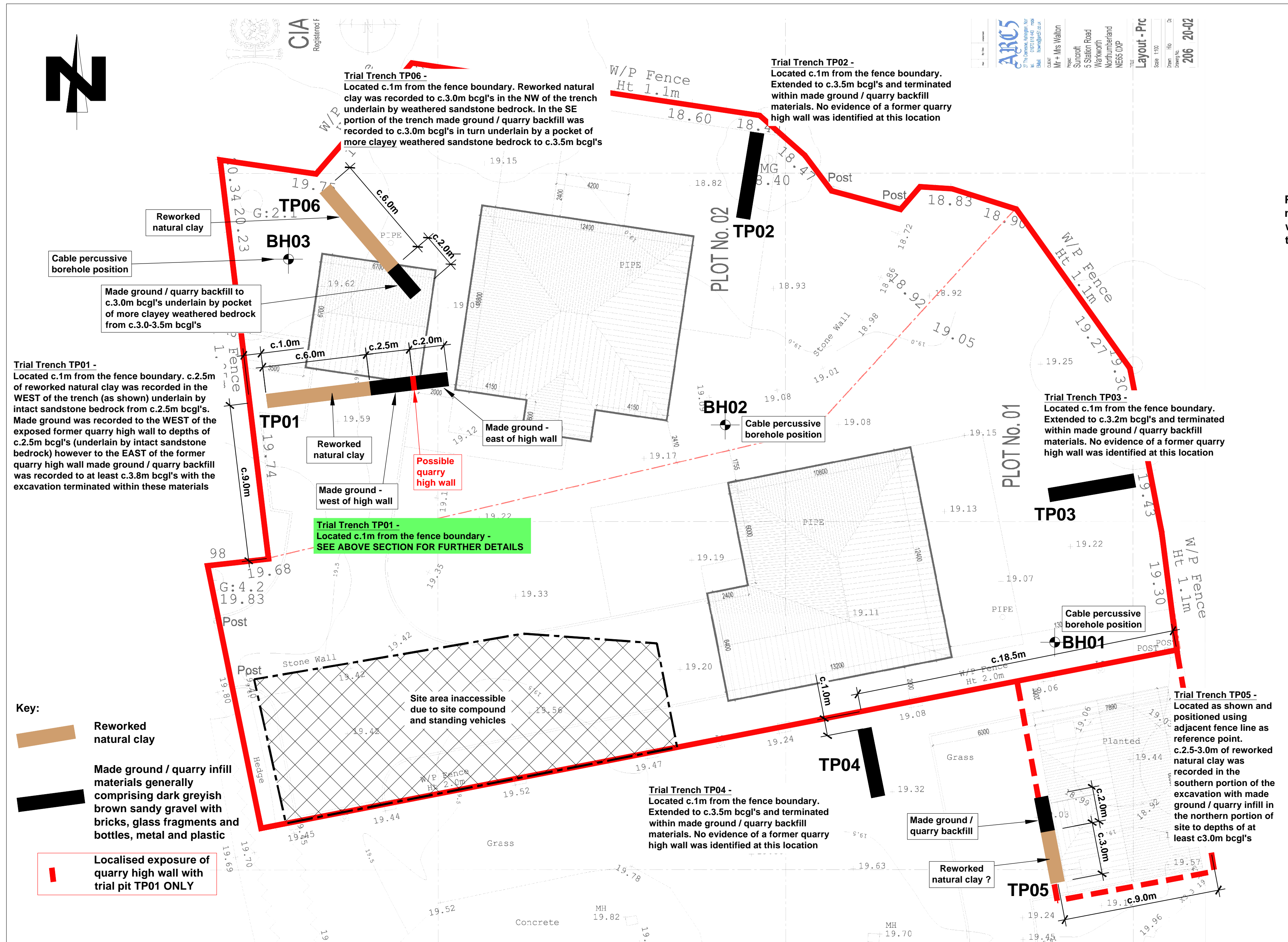
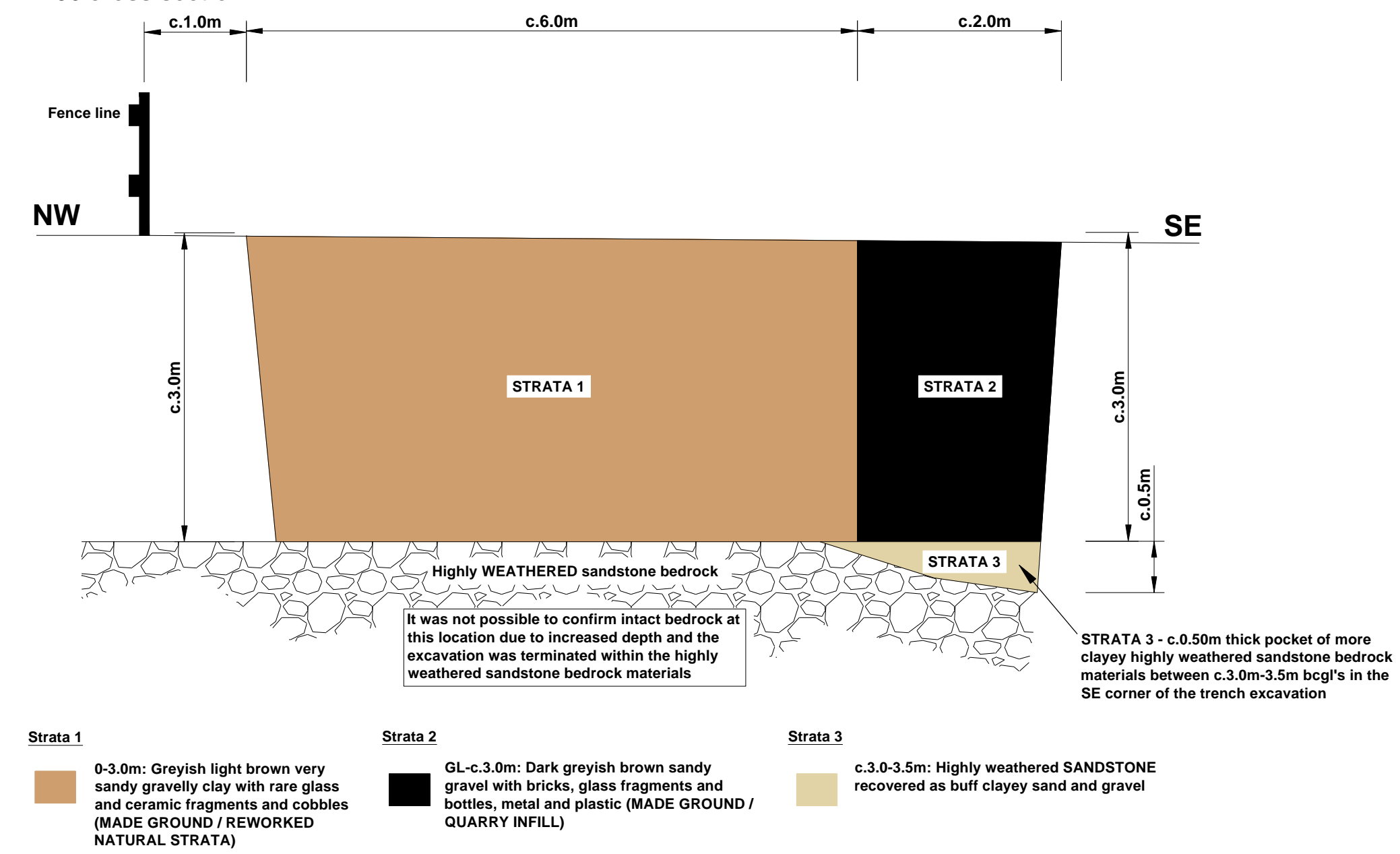
Borehole Record Sheets

DCP Test Results

Trial trench TP01 cross section



Trial trench TP06 cross section



Photographic record of former quarry high wall exposure within trial trench TP01



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Client: **JASPER KERR CONSULTING ENGINEERS**

Project Title: Proposed Residential Development
Suncroft
Workworth

Drawing Title: Investigation Works Record Sheet

Scale: as A1: As Shown | Date: 02.06.21 | Drawn by: P.D. | Approved by: D.M.

Job Ref: 20-610 | Dwg no: | Rev: -



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BOREHOLE LOG

Project Suncroft, Warkworth				BOREHOLE No CP01	
Job No 20-610	Date 12-05-21 13-05-21	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00-1.45 1.00-1.45 1.00-1.45	B D SPT	N=3				Grass overlying dark greyish brown sandy gravel with ash, brick, glass, metal and plastic fragments (MADE GROUND)			
2.00-2.45 2.00-2.45 2.00-2.45	B D SPT	N=3			(5.00)				
3.00-3.45 3.00-3.45 3.00-3.45	B D SPT	N=2							
4.00-4.45 4.00-4.45 4.00-4.45	B D SPT	N=7			5.00				
5.00-5.45 5.00-5.45 5.00-5.45	B D SPT	N=7				Firm locally soft brown sandy gravelly clay with frequent sandstone subangular sandstone cobbles. Gravels comprise fine to coarse subangular sandstone. Possibly reworked (MADE GROUND)			
6.50-6.95 6.50-6.95 6.50-6.95	B D SPT	N=15			(5.70)				
8.00-8.45 8.00-8.45 8.00-8.45	B D SPT	N=21							
9.50-9.95	U	29 Blows			10.70				
11.00-11.04 11.00-11.04 11.00-11.04	D SPT	75 Blows			11.04	Moderately weak to strong orange brown SANDSTONE recovered as sand & gravel (STAINMORE FORMATION) Borehole terminated at c.11.04m due to refusal of sampling equipment.			

AGS3 UK BH 20-610 SUNCROFT LOGS.GPJ AGS3 ALL.GDT 3/6/21

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
13-05-21	00.00		11.04	150mm		10.7	11.00	0.50hr			WATER: Borehole remained dry during exploratory period.

All dimensions in metres Scale 1:75	Client ALCC Limited	Method/ Plant Used Cable Percussive	Logged By AB
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Solum House, Unit 1 Elliott Court
 St Johns Road, Meadowfield
 Durham, DH7 8PN
 Telephone: 01913786380

BOREHOLE LOG

Project Suncroft, Warkworth				BOREHOLE No CP02	
Job No 20-610	Date 12-05-21 12-05-21	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Ltd				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
1.00-1.45 1.00-1.45 1.00-1.45	B D SPT	N=1				Grass overlying dark greyish brown sandy gravel with ash, brick, glass, metal and plastic fragments (MADE GROUND)			
2.00-2.45 2.00-2.45 2.00-2.45	B D SPT	N=3			(4.80)				
3.00-3.45 3.00-3.45 3.00-3.45	B D SPT	N=4							
4.00-4.45 4.00-4.45 4.00-4.45	B D SPT	N=10			4.80				
5.00-5.45 5.00-5.45 5.00-5.45	B D SPT	N=26				Firm locally soft brown sandy gravelly clay with frequent sandstone subangular sandstone cobbles. Gravels comprise fine to coarse subangular sandstone. Possibly reworked (MADE GROUND)			
6.50-6.95 6.50-6.95 6.50-6.95	B D SPT	N=36			(4.70)				
8.00-8.45 8.00-8.45 8.00-8.45	B D SPT	N=19							
9.50-9.95 9.50-9.95 9.50-9.95	B D SPT	N=15			9.50	Moderately weak to strong pinkish purple SANDSTONE recovered as sand & gravel (STAINMORE FORMATION)			
10.00-10.05 10.00-10.05 10.00-10.05	B D SPT	75 Blows			10.05	Borehole terminated at c.10.05m due to refusal of sampling equipment.			

AGS3 UK BH 20-610 SUNCROFT LOGS.GPJ AGS3 ALL.GDT 3/6/21

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
12-05-21	00.00		10.05	150mm		9.5	10.00	1hr			WATER: Borehole remained dry during exploratory period.
All dimensions in metres Scale 1:75						Method/ Plant Used Cable Percussive			Logged By AB		

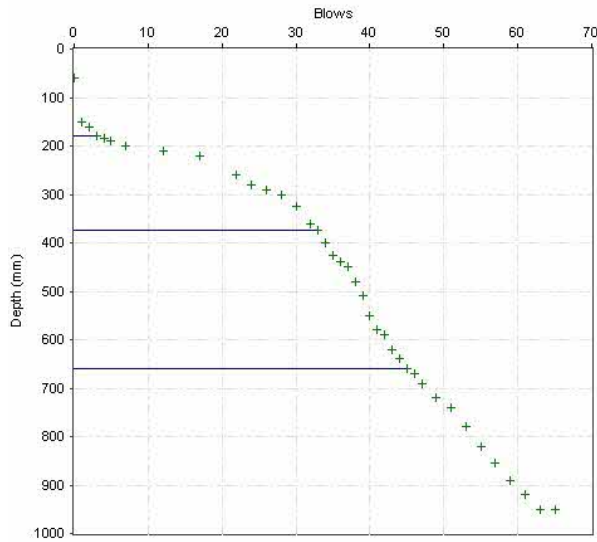
DCP Layer Strength Analysis Report

Project Name: 20-610 DCPs

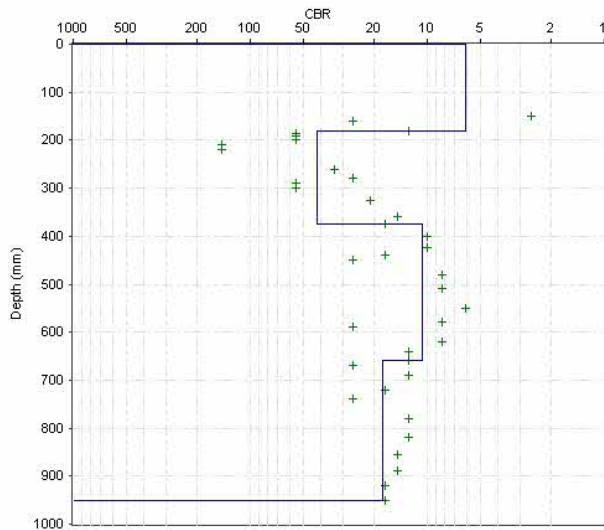
Chainage (km): DCP01
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 1.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	40.00	6	180	180
2	6.50	42	195	375
3	23.75	11	285	660
4	14.50	18	290	950

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: 20-610 DCPs

Chainage (km): DCP01
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	60	0.00	26	1	43	620	30.00
2	1	1	150	90.00	27	1	44	640	20.00
3	1	2	160	10.00	28	1	45	660	20.00
4	1	3	180	20.00	29	1	46	670	10.00
5	1	4	185	5.00	30	1	47	690	20.00
6	1	5	190	5.00	31	2	49	720	15.00
7	2	7	200	5.00	32	2	51	740	10.00
8	5	12	210	2.00	33	2	53	780	20.00
9	5	17	220	2.00	34	2	55	820	20.00
10	5	22	260	8.00	35	2	57	855	17.50
11	2	24	280	10.00	36	2	59	890	17.50
12	2	26	290	5.00	37	2	61	920	15.00
13	2	28	300	5.00	38	2	63	950	15.00
14	2	30	325	12.50	39	2	65	950	0.00
15	2	32	360	17.50					
16	1	33	375	15.00					
17	1	34	400	25.00					
18	1	35	425	25.00					
19	1	36	440	15.00					
20	1	37	450	10.00					
21	1	38	480	30.00					
22	1	39	510	30.00					
23	1	40	550	40.00					
24	1	41	580	30.00					
25	1	42	590	10.00					

Remarks: DCP01

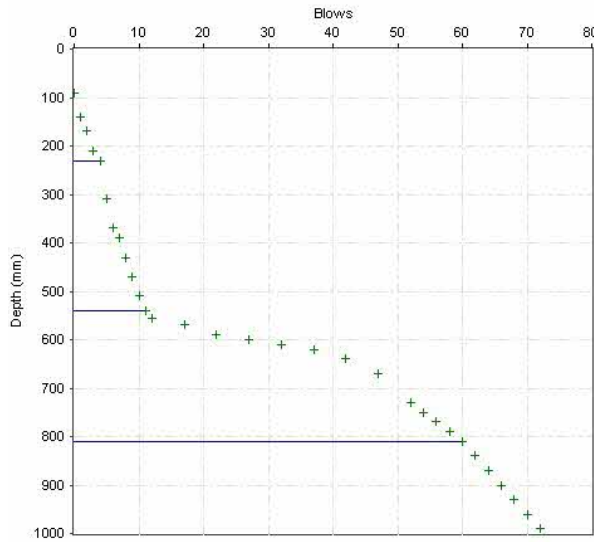
DCP Layer Strength Analysis Report

Project Name: 20-610 DCPs

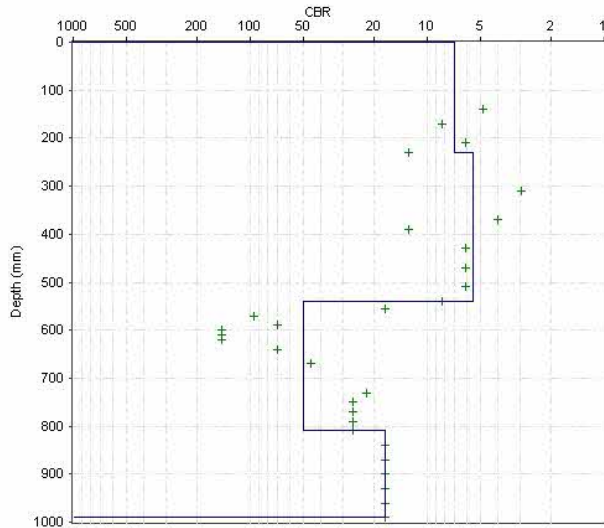
Chainage (km): DCP02
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 2.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	35.00	7	230	230
2	44.29	5	310	540
3	5.51	50	270	810
4	15.00	17	180	990

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: 20-610 DCPs

Chainage (km): DCP02
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	90	0.00	26	2	62	840	15.00
2	1	1	140	50.00	27	2	64	870	15.00
3	1	2	170	30.00	28	2	66	900	15.00
4	1	3	210	40.00	29	2	68	930	15.00
5	1	4	230	20.00	30	2	70	960	15.00
6	1	5	310	80.00	31	2	72	990	15.00
7	1	6	370	60.00					
8	1	7	390	20.00					
9	1	8	430	40.00					
10	1	9	470	40.00					
11	1	10	510	40.00					
12	1	11	540	30.00					
13	1	12	555	15.00					
14	5	17	570	3.00					
15	5	22	590	4.00					
16	5	27	600	2.00					
17	5	32	610	2.00					
18	5	37	620	2.00					
19	5	42	640	4.00					
20	5	47	670	6.00					
21	5	52	730	12.00					
22	2	54	750	10.00					
23	2	56	770	10.00					
24	2	58	790	10.00					
25	2	60	810	10.00					

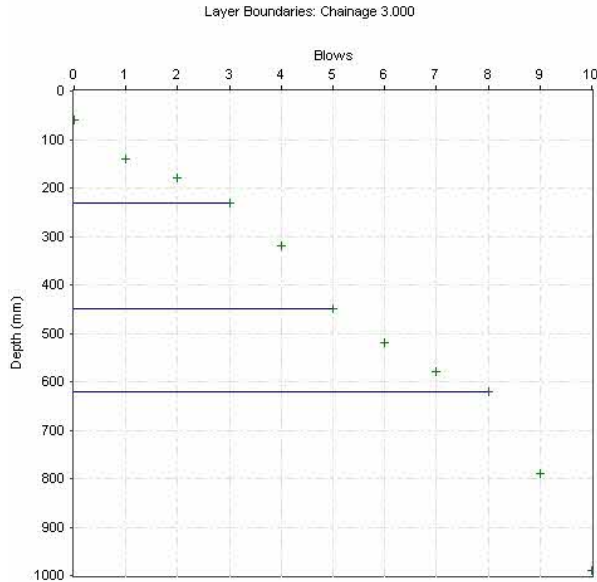
Remarks: DCP02

DCP Layer Strength Analysis Report

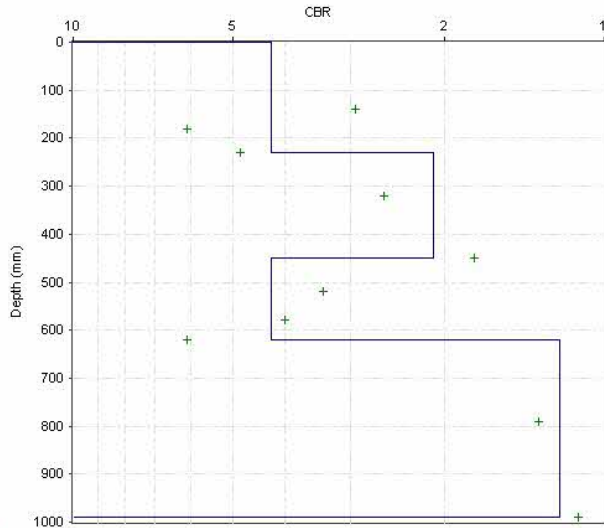
Project Name: 20-610 DCPs

Chainage (km): DCP03
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	56.67	4	230	230
2	110.00	2	220	450
3	56.67	4	170	620
4	185.00	1	370	990

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

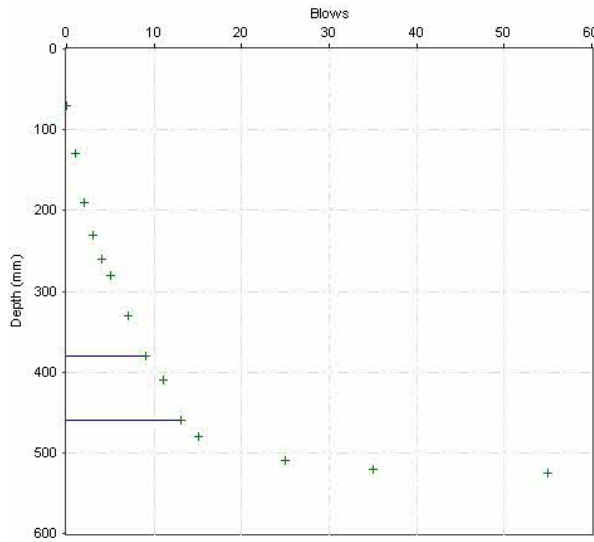
DCP Layer Strength Analysis Report

Project Name: 20-610 DCPs

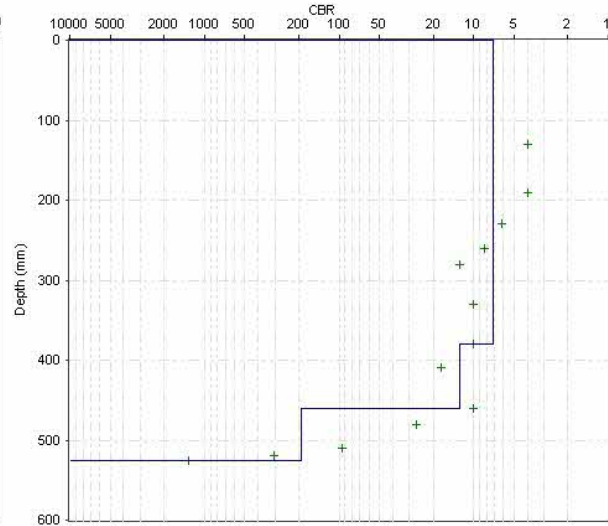
Chainage (km): DCP04
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 4.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	34.44	7	380	380
2	20.00	13	80	460
3	1.55	190	65	525

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

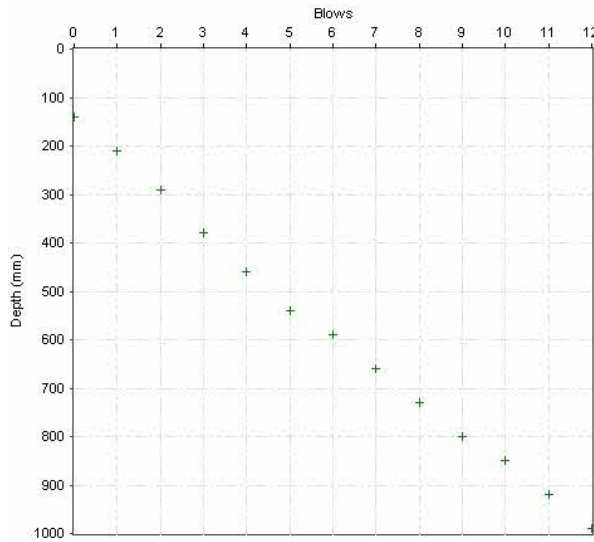
DCP Layer Strength Analysis Report

Project Name: 20-610 DCPs

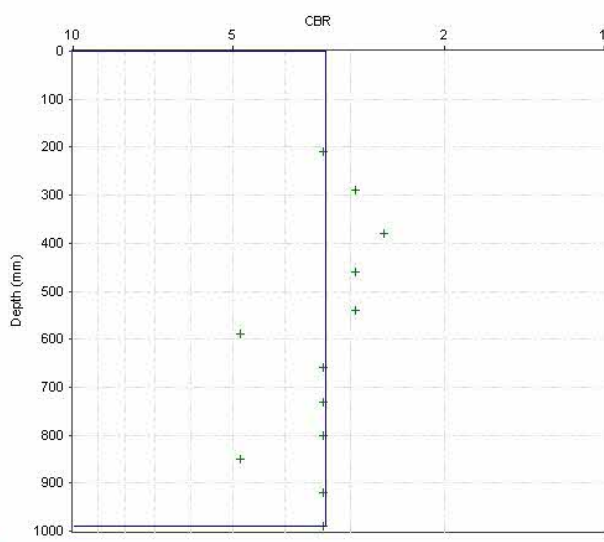
Chainage (km): DCP05
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 5.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	70.83	3	990	990

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

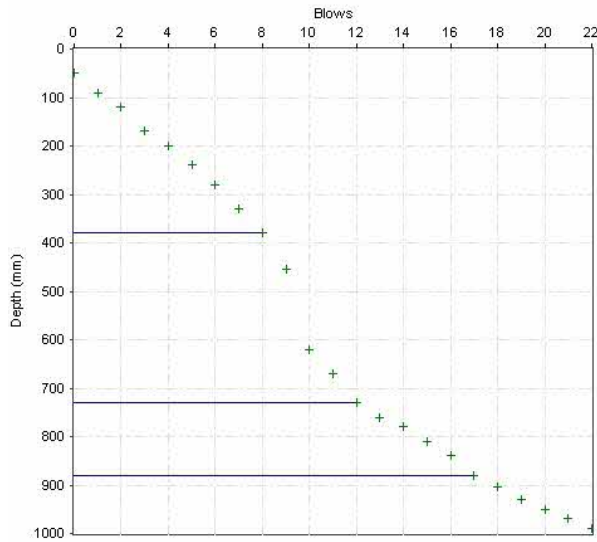
DCP Layer Strength Analysis Report

Project Name: 20-610 DCPs

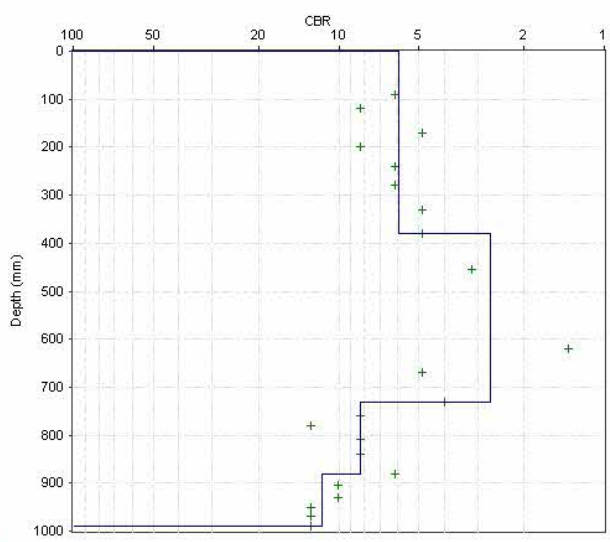
Chainage (km): DCP06
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 6.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	41.25	6	380	380
2	87.50	3	350	730
3	30.00	8	150	880
4	22.00	12	110	990

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: 20-610 DCPs

Chainage (km): DCP06
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 10/05/2021

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Unknown
 Moisture adjustment factor: Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	50	0.00					
2	1	1	90	40.00					
3	1	2	120	30.00					
4	1	3	170	50.00					
5	1	4	200	30.00					
6	1	5	240	40.00					
7	1	6	280	40.00					
8	1	7	330	50.00					
9	1	8	380	50.00					
10	1	9	455	75.00					
11	1	10	620	165.00					
12	1	11	670	50.00					
13	1	12	730	60.00					
14	1	13	760	30.00					
15	1	14	780	20.00					
16	1	15	810	30.00					
17	1	16	840	30.00					
18	1	17	880	40.00					
19	1	18	905	25.00					
20	1	19	930	25.00					
21	1	20	950	20.00					
22	1	21	970	20.00					
23	1	22	990	20.00					

Remarks: DCP06

APPENDIX III

Laboratory Testing Results (Geotechnical & Ground Contamination)



LABORATORY REPORT



4043

Contract Number: PSL21/4522

Report Date: 13 July 2021
Client's Reference: 20-610
Client Name: Arc Environmental
Solum House
Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham
DH7 8PN

For the attention of: Alexander Brown

Contract Title: Suncroft, Warkworth
Date Received: 3/6/2021
Date Commenced: 3/6/2021
Date Completed: 13/7/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

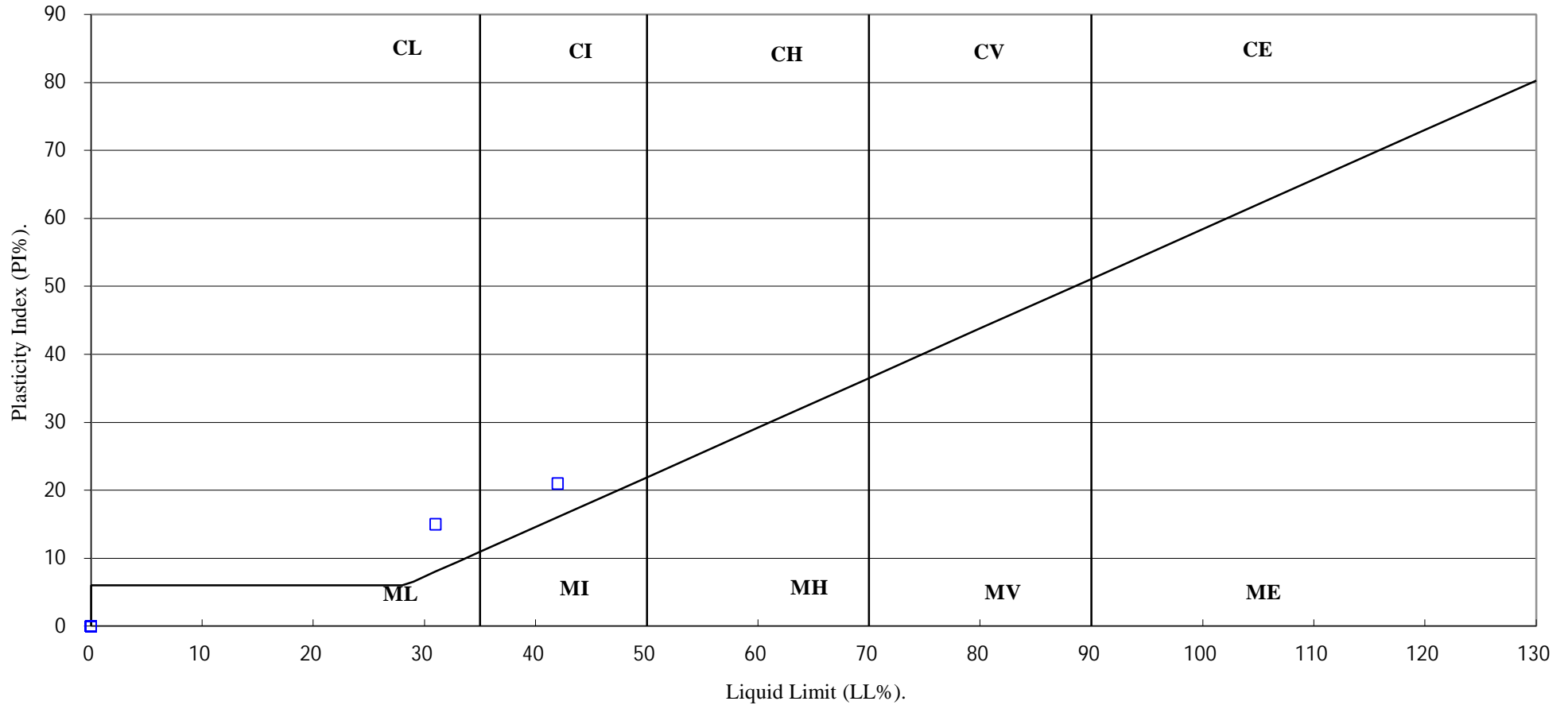
S Eyre
(Senior Technician)


M Fennell
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
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tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Suncroft, Warkworth

Contract No:

PSL21/4522

Client Ref:

20-610



ANALYTICAL TEST REPORT

Contract no: 96681
Contract name: Suncroft, Warkworth
Client reference: 20-610
Clients name: ARC Environmental
Clients address: Solum House, Unit 1 Elliott Court
St Johns Road
Meadowfield
DH7 8PN
Samples received: 26 May 2021
Analysis started: 26 May 2021
Analysis completed: 03 June 2021
Report issued: 03 June 2021

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed. BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:



John Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
96681-1	CP01	1.00-1.45	Clayey Sand with Gravel	-	-	25.4
96681-2	CP01	2.00-2.45	Clayey Sand with Gravel	-	-	25.2
96681-3	CP01	4.00-4.45	Sand with Gravel	-	-	19.9
96681-4	CP01	8.00-8.45	Clay	-	-	20.4
96681-5	CP02	1.00-1.45	Sand with Gravel	-	-	24.4
96681-6	CP02	2.00-2.45	Sand with Gravel	-	-	29.4
96681-7	CP02	4.00-4.45	Clayey Sand	-	-	12.8
96681-8	CP02	5.00-5.45	Sandy Clay	-	-	17.4
96681-9	CP02	9.50-9.95	Sandy Clay	-	-	21.5
96681-10	CP03	1.00-1.45	Sandy Clay	-	-	18.8

Chemtech Environmental Limited

SOILS

Lab number			96681-1	96681-2	96681-3	96681-4	96681-5	96681-6
Sample id			CP01	CP01	CP01	CP01	CP02	CP02
Depth (m)			1.00-1.45	2.00-2.45	4.00-4.45	8.00-8.45	1.00-1.45	2.00-2.45
Date sampled			12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021	12/05/2021
Test	Method	Units						
Chromium (total)	CE127 ^M	mg/kg Cr	74	66	-	-	91	-
Chromium (III)	CE208	mg/kg CrIII	74	66	-	-	91	-
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	-	-	<1	-
pH	CE004 ^M	units	-	-	7.3	7.9	-	7.5
Sulphate (2:1 water soluble)	CE061	mg/l SO ₄	-	-	1949	2136	-	1348
BTEX & TPH								
Benzene	CE192 ^U	mg/kg	<0.01	-	-	-	<0.01	-
Toluene	CE192 ^U	mg/kg	<0.01	-	-	-	<0.01	-
Ethylbenzene	CE192 ^U	mg/kg	<0.01	-	-	-	<0.01	-
m & p-Xylene	CE192 ^U	mg/kg	<0.02	-	-	-	<0.02	-
o-Xylene	CE192 ^U	mg/kg	<0.01	-	-	-	<0.01	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	-	-	-	<0.1	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	-	-	-	<0.1	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	-	-	-	<0.1	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	-	-	-	<4	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	-	-	-	6	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	155	-	-	-	385	-
EPH Aliphatic (>C35-C44)	CE068	mg/kg	44	-	-	-	58	-
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	-	-	-	<0.01	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	-	-	-	<0.01	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	-	-	-	<0.01	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	-	-	-	<1	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	-	-	-	<1	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	3	-	-	-	40	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	4	-	-	-	37	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	-	-	-	5	-

Chemtech Environmental Limited

SOILS

Lab number			96681-7	96681-8	96681-9	96681-10
Sample id			CP02	CP02	CP02	CP03
Depth (m)			4.00-4.45	5.00-5.45	9.50-9.95	1.00-1.45
Date sampled			12/05/2021	12/05/2021	12/05/2021	12/05/2021
Test	Method	Units				
Chromium (total)	CE127 ^M	mg/kg Cr	86	-	-	79
Chromium (III)	CE208	mg/kg CrIII	86	-	-	79
Chromium (VI)	CE146	mg/kg CrVI	<1	-	-	<1
pH	CE004 ^M	units	-	8.1	8.2	7.9
Sulphate (2:1 water soluble)	CE061	mg/l SO ₄	-	214	97	34
BTEX & TPH						
Benzene	CE192 ^U	mg/kg	-	-	-	-
Toluene	CE192 ^U	mg/kg	-	-	-	-
Ethylbenzene	CE192 ^U	mg/kg	-	-	-	-
m & p-Xylene	CE192 ^U	mg/kg	-	-	-	-
o-Xylene	CE192 ^U	mg/kg	-	-	-	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	-	-	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	-	-	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	-	-	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	-	-	-	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	-	-	-	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	-	-	-	-
EPH Aliphatic (>C35-C44)	CE068	mg/kg	-	-	-	-
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	-	-	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	-	-	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	-	-	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	-	-	-	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	-	-	-	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	-	-	-	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	-	-	-	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	-	-	-	-

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE208	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry		10	mg/l SO ₄
CE192	Benzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	Toluene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	Ethylbenzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	m & p-Xylene	Headspace GC-FID	As received	U	0.02	mg/kg
CE192	o-Xylene	Headspace GC-FID	As received	U	0.01	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
96681-1	CP01	1.00-1.45	N	
96681-2	CP01	2.00-2.45	N	
96681-3	CP01	4.00-4.45	N	
96681-4	CP01	8.00-8.45	N	
96681-5	CP02	1.00-1.45	N	
96681-6	CP02	2.00-2.45	N	
96681-7	CP02	4.00-4.45	N	
96681-8	CP02	5.00-5.45	N	
96681-9	CP02	9.50-9.95	N	
96681-10	CP03	1.00-1.45	N	

Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Suncroft, Warkworth
 Lab Number 96681-1
 Sample ID CP01 1.00-1.45m
 Date Sampled 12 May 2021
 Date Received 26 May 2021
 Particle Size (<4mm) -
 Method of size reduction N/A
 Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.235
 Mass of Dried Test Portion (MD) kg 0.175
 Moisture Content Ratio (MC) % 34.03
 Dry Matter Content Ratio (DR) % 74.61
 Leachant Volume (1) (L2) Litre 0.290
 Leachant Volume (2) (L8) Litre 1.400
 Eluate Volume (1) (VE1) Litre 0.220
 Eluate Volume (2) (VE2) Litre 1.250

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.1	8.3
Temperature (°C)	20	20
Conductivity (µS/cm)	741	334
Antimony (µg/l Sb)	0.8	1.1
Arsenic (µg/l As)	0.66	0.72
Barium (µg/l Ba)	68.4	57.0
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	<0.2	<0.2
Copper (µg/l Cu)	3.2	2.6
Lead (µg/l Pb)	<0.2	<0.2
Mercury (µg/l Hg)	0.013	<0.008
Molybdenum (µg/l Mo)	0.7	2.0
Nickel (µg/l Ni)	2.0	0.8
Selenium (µg/l Se)	4.08	1.29
Zinc (µg/l Zn)	18	2
Chloride (mg/l Cl)	6.3	1.2
Fluoride (mg/l F)	<0.1	<0.1
Sulphate (mg/l SO ₄)	230	61
Total Dissolved Solids (mg/l TDS)	565	255
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	26	20

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.002	0.011	0.06	0.7	5
0.001	0.007	0.5	2	25
0.137	0.584	20	100	300
<0.0002	<0.0007	0.04	1	5
<0.0004	<0.002	0.5	10	70
0.006	0.027	2	50	100
<0.0004	<0.002	0.5	10	50
0.00003	<0.00009	0.01	0.2	2
0.001	0.019	0.5	10	30
0.004	0.009	0.4	10	40
0.008	0.016	0.1	0.5	7
0.036	0.038	4	50	200
13	18	800	15000	25000
<0.2	<1	10	150	500
461	822	1000	20000	50000
1130	2940	4000	60000	100000
<0.02	<0.1	1		
53	212	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	13.3	3%	5%	6%
Loss on Ignition	% w/w	19.1			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	0.059	1		
TPH (C10 - C40)	mg/kg	305	500		
PAH (total)	mg/kg	4.38	100		
pH	pH units	8.0		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.16		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.04		To be evaluated	

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are provided for guidance only.
 Chemtech Environmental Ltd does not take responsibility for any errors or omissions. Data is correct as of 01/09/2005.
 Samples will be disposed of 6 weeks from initial receipt unless written instructions are received and further storage is agreed.
 Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

Comments

Authorised by:



Name:

John Campbell

Report date:

3 June 2021

Position:

Director

Unit 6 Parkhead, Greencroft Industrial Park, Stanley, County Durham, DH9 7YB
 Tel 01207 528578 Email customerservices@chemtech-env.co.uk
 Vat Reg No. 772 5703 18 Registered in England number 4284013

Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Suncroft, Warkworth
 Lab Number 96681-5
 Sample ID CP02 1.00-1.45m
 Date Sampled 12 May 2021
 Date Received 26 May 2021
 Particle Size (<4mm) -
 Method of size reduction N/A
 Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.232
 Mass of Dried Test Portion (MD) kg 0.175
 Moisture Content Ratio (MC) % 32.31
 Dry Matter Content Ratio (DR) % 75.58
 Leachant Volume (1) (L2) Litre 0.293
 Leachant Volume (2) (L8) Litre 1.400
 Eluate Volume (1) (VE1) Litre 0.240
 Eluate Volume (2) (VE2) Litre 1.310

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.0	7.9
Temperature (°C)	20	20
Conductivity (µS/cm)	2090	1031
Antimony (µg/l Sb)	4.8	34.5
Arsenic (µg/l As)	2.96	0.34
Barium (µg/l Ba)	168.1	42.5
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	0.3	0.5
Copper (µg/l Cu)	11.3	3.1
Lead (µg/l Pb)	0.5	<0.2
Mercury (µg/l Hg)	0.016	<0.008
Molybdenum (µg/l Mo)	18.7	2.9
Nickel (µg/l Ni)	3.7	2.4
Selenium (µg/l Se)	2.60	0.69
Zinc (µg/l Zn)	7	2
Chloride (mg/l Cl)	25	4.4
Fluoride (mg/l F)	1.0	0.9
Sulphate (mg/l SO ₄)	435	90
Total Dissolved Solids (mg/l TDS)	1590	785
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	45	10

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.010	0.304	0.06	0.7	5
0.006	0.007	0.5	2	25
0.336	0.597	20	100	300
<0.0002	<0.0007	0.04	1	5
0.001	0.005	0.5	10	70
0.023	0.042	2	50	100
0.0009	<0.003	0.5	10	50
0.00003	<0.00009	0.01	0.2	2
0.037	0.051	0.5	10	30
0.007	0.026	0.4	10	40
0.005	0.009	0.1	0.5	7
0.013	0.030	4	50	200
51	73	800	15000	25000
2.1	9.1	10	150	500
871	1378	1000	20000	50000
3180	8954	4000	60000	100000
<0.02	<0.1	1		
90	152	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	6.6	3%	5%	6%
Loss on Ignition	% w/w	10.3			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	561	500		
PAH (total)	mg/kg	81.0	100		
pH	pH units	7.9		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.16		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.04		To be evaluated	

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 Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

Comments

Authorised by:



Name:

John Campbell

Report date:

3 June 2021

Position:

Director

Unit 6 Parkhead, Greencroft Industrial Park, Stanley, County Durham, DH9 7YB
 Tel 01207 528578 Email customerservices@chemtech-env.co.uk
 Vat Reg No. 772 5703 18 Registered in England number 4284013

ANALYTICAL TEST REPORT

Contract no: 82677
Contract name: Warkworth
Client reference: 19049
Clients name: Intersoil
Clients address: Suite 30
58 Low Friar Street
Newcastle Upon Tyne
NE1 5UE

Samples received: 25 November 2019
Analysis started: 25 November 2019
Analysis completed: 02 December 2019
Report issued: 02 December 2019

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by: 
Dave Bowerbank
Customer Support Hero

Chemtech Environmental Limited

SOILS

Lab number			82677-1	82677-2	82677-3	82677-4	82677-5	82677-6
Sample id			A1	A2	A3	A4	A4	A5
Depth (m)			0.50-0.80	0.30-0.60	0.30-0.60	0.00-0.30	1.20-1.50	0.30-0.60
Date sampled			-	-	-	-	-	-
Test	Method	Units						
Subcontracted analysis								
Asbestos (qualitative)	\$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			82677-7	82677-8
Sample id			A6	A6
Depth (m)			0.00-0.30	0.70-1.00
Date sampled			-	-
Test	Method	Units		
Subcontracted analysis				
Asbestos (qualitative)	\$	-	NAD	NAD

Chemtech Environmental Limited

SOLIDS

Lab number			82677-7	82677-8
Sample id			A7	A8
Date sampled			-	-
Test	Method	Units		
Subcontracted analysis				
Asbestos (qualitative)	\$	-	NAD	NAD

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOLIDS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-



ANALYTICAL TEST REPORT

Contract no: 82695
Contract name: Warkworth
Client reference: 19049
Clients name: Intersoil
Clients address: Suite 30
58 Low Friar Street
Newcastle Upon Tyne
NE1 5UE

Samples received: 25 November 2019
Analysis started: 02 December 2019
Analysis completed: 09 December 2019
Report issued: 09 December 2019

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed. BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:



Dave Bowerbank
Customer Support Hero

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
82695-1	A1	0.30-0.70	Clayey Sand with Gravel	-	-	24.1
82695-2	A1	1.30-1.70	Clayey Sand with Gravel	-	-	20.2
82695-3	A3	1.20-1.50	Clay with Gravel	-	-	17.9
82695-4	A4	0.90-1.20	Sandy Clay with Gravel	-	-	14.6
82695-5	A5	0.30-0.60	Sandy Clay with Gravel	-	-	15.1

Chemtech Environmental Limited

SOILS

Lab number			82695-1	82695-2	82695-3	82695-4	82695-5
Sample id			A1	A1	A3	A4	A5
Depth (m)			0.30-0.70	1.30-1.70	1.20-1.50	0.90-1.20	0.30-0.60
Date sampled			21/11/2019	21/11/2019	21/11/2019	21/11/2019	21/11/2019
Test	Method	Units					
Arsenic (total)	CE127 ^M	mg/kg As	30	30	8.0	7.2	9.6
Cadmium (total)	CE127 ^M	mg/kg Cd	1.3	4.0	0.2	0.2	0.2
Chromium (total)	CE127 ^M	mg/kg Cr	62	63	73	44	56
Copper (total)	CE127 ^M	mg/kg Cu	142	104	26	63	33
Lead (total)	CE127 ^M	mg/kg Pb	365	399	34	142	90
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 ^M	mg/kg Ni	95	69	52	35	35
Selenium (total)	CE127 ^M	mg/kg Se	2.8	1.4	1.1	0.9	1.0
Zinc (total)	CE127 ^M	mg/kg Zn	353	357	76	155	97
pH	CE004 ^M	units	7.4	7.9	8.1	7.6	8.0
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	641	270	192	122	51
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 ^M	% w/w C	17.3	14.5	0.8	6.4	1.9
PAH							
Naphthalene	CE087 ^M	mg/kg	<0.02	0.07	<0.02	<0.02	<0.02
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	0.19
Acenaphthene	CE087 ^M	mg/kg	<0.02	0.46	<0.02	<0.02	0.48
Fluorene	CE087 ^U	mg/kg	0.02	0.53	<0.02	<0.02	0.65
Phenanthrene	CE087 ^M	mg/kg	0.48	6.57	<0.02	0.21	7.26
Anthracene	CE087 ^U	mg/kg	0.18	2.59	<0.02	0.11	3.34
Fluoranthene	CE087 ^M	mg/kg	0.71	13.16	<0.02	0.81	14.49
Pyrene	CE087 ^M	mg/kg	0.60	10.56	<0.02	0.70	11.08
Benzo(a)anthracene	CE087 ^U	mg/kg	0.27	6.37	<0.02	0.45	6.39
Chrysene	CE087 ^M	mg/kg	0.27	6.05	<0.03	0.37	6.38
Benzo(b)fluoranthene	CE087 ^M	mg/kg	0.40	6.65	<0.02	0.65	7.28
Benzo(k)fluoranthene	CE087 ^M	mg/kg	0.11	2.89	<0.03	0.18	2.88
Benzo(a)pyrene	CE087 ^U	mg/kg	0.29	5.01	<0.02	0.46	5.34
Indeno(123cd)pyrene	CE087 ^M	mg/kg	<0.02	3.24	<0.02	0.17	3.55
Dibenz(ah)anthracene	CE087 ^M	mg/kg	<0.02	0.87	<0.02	<0.02	1.00
Benzo(ghi)perylene	CE087 ^M	mg/kg	<0.02	2.61	<0.02	0.04	2.90
PAH (total of USEPA 16)	CE087	mg/kg	3.33	67.6	<0.34	4.15	73.2
TPH							
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	<0.01	-	-	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	<0.01	-	-	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	<0.01	-	-	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	-	<1	-	-	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	-	2	-	-	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	-	38	-	-	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	-	36	-	-	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	-	5	-	-	-

Chemtech Environmental Limited

SOILS

Lab number			82695-1	82695-2	82695-3	82695-4	82695-5
Sample id			A1	A1	A3	A4	A5
Depth (m)			0.30-0.70	1.30-1.70	1.20-1.50	0.90-1.20	0.30-0.60
Date sampled			21/11/2019	21/11/2019	21/11/2019	21/11/2019	21/11/2019
Test	Method	Units					
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	<0.1	-	-	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	<0.1	-	-	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	<0.1	-	-	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	-	<4	-	-	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	-	10	-	-	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	-	491	-	-	-
EPH Aliphatic (>C35-C44)	CE068	mg/kg	-	137	-	-	-
EPH (>C10-C40)	CE033 ^M	mg/kg	303	589	16	56	428

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PREPARED LEACHATES

Lab number			82695-2L
Sample id			A1
Depth (m)			1.30-1.70
Test	Method	Units	
Arsenic (dissolved)	CE128 ^u	µg/l As	0.64
Cadmium (dissolved)	CE128 ^u	µg/l Cd	<0.07
Lead (dissolved)	CE128 ^u	µg/l Pb	<0.2
Mercury (dissolved)	CE128 ^u	µg/l Hg	<0.008
Nickel (dissolved)	CE128 ^u	µg/l Ni	0.8
PAH			
Naphthalene	CE051	µg/l	<0.1
Acenaphthylene	CE051	µg/l	<0.1
Acenaphthene	CE051	µg/l	4.6
Fluorene	CE051	µg/l	2.0
Phenanthrene	CE051	µg/l	9.2
Anthracene	CE051	µg/l	1.5
Fluoranthene	CE051	µg/l	2.3
Pyrene	CE051	µg/l	1.3
Benzo(a)anthracene	CE051	µg/l	<0.1
Chrysene	CE051	µg/l	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1
PAH (total of USEPA 16)	CE051	µg/l	21.0
BTEX & TPH			
Benzene	CE057 ^u	µg/l	<1
Toluene	CE057 ^u	µg/l	<1
Ethylbenzene	CE057 ^u	µg/l	<1
m & p-Xylene	CE057 ^u	µg/l	<1
o-Xylene	CE057 ^u	µg/l	<1
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	7
EPH Aromatic (>EC16-EC21)	CE161	µg/l	21
EPH Aromatic (>EC21-EC35)	CE161	µg/l	4
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1
VPH Aliphatic (>C5-C6)	CE175	µg/l	<1
VPH Aliphatic (>C6-C8)	CE175	µg/l	<1
VPH Aliphatic (>C8-C10)	CE175	µg/l	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	18
EPH Aliphatic (>C12-C16)	CE161	µg/l	32

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			82695-2L
Sample id			A1
Depth (m)			1.30-1.70
Test	Method	Units	
EPH Aliphatic (>C16-C35)	CE161	µg/l	66
EPH Aliphatic (>C35-C44)	CE161	µg/l	3

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	As received		0.5	mg/kg PhOH
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		4	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg

Chemtech Environmental Limited

METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE002	Leachate preparation (EA)	L:S 10:1		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE051	Naphthalene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluorene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Phenanthrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Chrysene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(b)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(k)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Indeno(123cd)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Dibenz(ah)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(ghi)perylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE057	Benzene	Headspace GC-FID	U	1	µg/l
CE057	Toluene	Headspace GC-FID	U	1	µg/l
CE057	Ethylbenzene	Headspace GC-FID	U	1	µg/l
CE057	m & p-Xylene	Headspace GC-FID	U	2	µg/l
CE057	o-Xylene	Headspace GC-FID	U	1	µg/l
CE175	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE161	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID		1	µg/l
CE175	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE161	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID		1	µg/l

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
82695-1	A1	0.30-0.70	N	
82695-2	A1	1.30-1.70	N	
82695-3	A3	1.20-1.50	N	
82695-4	A4	0.90-1.20	N	
82695-5	A5	0.30-0.60	N	



2531



ANALYTICAL TEST REPORT

Contract no: 48007
Contract name: Suncroft, Warkworth
Client reference: -
Clients name: Intersoil
Clients address: Suite 30
58 Low Friar Street
Newcastle Upon Tyne
NE1 5UE

Samples received: 29 April 2013

Analysis started: 29 April 2013

Analysis completed 07 May 2013

Report issued: 07 May 2013

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:


Karan Campbell
Director

John Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are exclusive of stones.

Lab ref	Sample id	Depth (m)	Soil description passing 2mm sieve	Description of material retained on 2mm sieve	% Retained on 2mm sieve	Moisture (%)
48007-1	BH 4	0.30-0.50	Loamy Sandy Clay	Stones, Slag, Gravel & Glass	49.4	26.6
48007-2	BH 4	1.80-2.00	Loamy Sandy Clay	Slag & Gravel	36.8	23.0
48007-3	BH 5	0.80-1.00	Loamy Sandy Clay	Stones, Glass & Gravel	55.5	18.5

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SOILS

Lab number			48007-1	48007-2	48007-3
Sample id			BH 4	BH 4	BH 5
Depth (m)			0.30-0.50	1.80-2.00	0.80-1.00
Date sampled			24/04/2013	24/04/2013	24/04/2013
Test	Method	Units			
Antimony (total)	CE058	mg/kg Sb	15	14	17
Arsenic (total)	CE054 ^M	mg/kg As	52	75	58
Cadmium (total)	CE054 ^M	mg/kg Cd	<0.2	<0.2	0.4
Chromium (total)	CE054 ^M	mg/kg Cr	54	48	58
Chromium (VI)	CE050	mg/kg CrVI	<1	<1	<1
Copper (total)	CE054 ^M	mg/kg Cu	187	608	249
Iron (total)	CE054 ^M	mg/kg Fe	126500	150200	179800
Lead (total)	CE054 ^M	mg/kg Pb	861	393	251
Mercury (total)	CE054	mg/kg Hg	<0.5	<0.5	<0.5
Nickel (total)	CE054 ^M	mg/kg Ni	135	135	156
Zinc (total)	CE054 ^M	mg/kg Zn	346	899	382
pH	CE004 ^M	units	6.7	7.4	8.0
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	53	1706	92
Sulphide	CE079	mg/kg S ²⁻	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<2	<2	<2
Cyanide (total)	CE077	mg/kg CN	<2	<2	<2
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5
Organic matter content (OMC)	CE005 ^M	% w/w	5.72	3.27	4.80
PAH					
Naphthalene	CE087	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	CE087	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	CE087	mg/kg	<0.1	<0.1	<0.1
Fluorene	CE087	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	CE087	mg/kg	0.4	<0.1	0.2
Anthracene	CE087	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	CE087	mg/kg	0.4	<0.1	0.2
Pyrene	CE087	mg/kg	0.4	<0.1	0.2
Benzo(a)anthracene	CE087	mg/kg	<0.1	<0.1	<0.1
Chrysene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE087	mg/kg	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE087	mg/kg	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE087	mg/kg	<0.1	<0.1	<0.1
PAH (total)	CE087	mg/kg	<5	<5	<5
TPH					
TPH Aromatic EC5-EC7	CE068	mg/kg	<0.01	<0.01	<0.01
TPH Aromatic EC7-EC8	CE068	mg/kg	<0.01	<0.01	<0.01
TPH Aromatic EC8-EC10	CE068	mg/kg	<0.01	<0.01	<0.01
TPH Aromatic EC10-EC12	CE068	mg/kg	<1	<1	<1

48007

Suncroft, Warkworth

Chemtech Environmental Limited

SOILS

Lab number			48007-1	48007-2	48007-3
Sample id			BH 4	BH 4	BH 5
Depth (m)			0.30-0.50	1.80-2.00	0.80-1.00
Date sampled			24/04/2013	24/04/2013	24/04/2013
Test	Method	Units			
TPH Aromatic EC12-EC16	CE068	mg/kg	<1	<1	<1
TPH Aromatic EC16-EC21	CE068	mg/kg	1	<1	<1
TPH Aromatic EC21-EC35	CE068	mg/kg	<1	<1	<1
TPH Aromatic EC35-EC44	CE068	mg/kg	<1	<1	<1
TPH Aliphatic EC5-EC6	CE068	mg/kg	<0.1	<0.1	<0.1
TPH Aliphatic EC6-EC8	CE068	mg/kg	<0.1	<0.1	<0.1
TPH Aliphatic EC8-EC10	CE068	mg/kg	0.2	0.1	0.2
TPH Aliphatic EC10-EC12	CE068	mg/kg	2	3	<1
TPH Aliphatic EC12-EC16	CE068	mg/kg	6	4	5
TPH Aliphatic EC16-EC35	CE068	mg/kg	185	52	40
TPH Aliphatic EC35-EC44	CE068	mg/kg	21	9	6

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LEACHATES

Lab number			48007-2L
Sample id			BH 4
Depth (m)			1.80-2.00
Test	Method	Units	
Aluminium (dissolved)	CE055 ^u	mg/l Al	<0.03
Antimony (dissolved)	CE058	mg/l Sb	<0.001
Arsenic (dissolved)	CE055	mg/l As	<0.001
Cadmium (dissolved)	CE055 ^u	mg/l Cd	<0.001
Chromium (dissolved)	CE055 ^u	mg/l Cr	<0.003
Copper (dissolved)	CE055 ^u	mg/l Cu	<0.004
Lead (dissolved)	CE055 ^u	mg/l Pb	<0.009
Mercury (dissolved)	CE055	mg/l Hg	<0.001
Nickel (dissolved)	CE055 ^u	mg/l Ni	0.045
Zinc (dissolved)	CE055 ^u	mg/l Zn	0.092
PAHs			
Naphthalene	CE087	mg/l	<0.0001
Acenaphthylene	CE087	mg/l	<0.0001
Acenaphthene	CE087	mg/l	<0.0001
Fluorene	CE087	mg/l	<0.0001
Phenanthrene	CE087	mg/l	<0.0001
Anthracene	CE087	mg/l	<0.0001
Fluoranthene	CE087	mg/l	<0.0001
Pyrene	CE087	mg/l	<0.0001
Benzo(a)anthracene	CE087	mg/l	<0.0001
Chrysene	CE087	mg/l	<0.0001
Benzo(b)fluoranthene	CE087	mg/l	<0.0001
Benzo(k)fluoranthene	CE087	mg/l	<0.0001
Benzo(a)pyrene	CE087	mg/l	<0.0001
Indeno(1,2,3cd)pyrene	CE087	mg/l	<0.0001
Dibenz(ah)anthracene	CE087	mg/l	<0.0001
Benzo(ghi)perylene	CE087	mg/l	<0.0001
PAH (total)	CE087	mg/l	<0.0001

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE058	Antimony (total)	Aqua regia digest, ICP-OES	Dry		1	mg/kg Sb
CE054	Arsenic (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg As
CE054	Cadmium (total)	Aqua regia digest, ICP-OES	Dry	M	0.2	mg/kg Cd
CE054	Chromium (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cr
CE050	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE054	Copper (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cu
CE054	Iron (total)	Aqua regia digest, ICP-OES	Dry	M	20	mg/kg Fe
CE054	Lead (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Pb
CE054	Mercury (total)	Aqua regia digest, ICP-OES	Dry		0.5	mg/kg Hg
CE054	Nickel (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Ni
CE054	Zinc (total)	Aqua regia digest, ICP-OES	Dry	M	3	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄
CE079	Sulphide	Extraction, Continuous Flow Colorimetry	Wet		10	mg/kg S ²⁻
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		2	mg/kg CN
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	Wet		2	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	Wet		0.5	mg/kg PhOH
CE005	Organic matter content (OMC)	Based on BS 1377, Colorimetry	Dry	M	0.01	% w/w
CE087	PAH (speciated)	Solvent extraction, GC-MS	Wet		0.1	mg/kg
CE087	PAH (total)	Solvent extraction, GC-MS	Wet		5	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C5-C10)	Headspace GC-FID	Wet		0.01-0.1	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C10-C44)	Solvent extraction, GC-FID	Wet		1	mg/kg

Chemtech Environmental Limited

METHOD DETAILS

METHOD	LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE055	Aluminium (dissolved)	ICP-OES	U	0.03	mg/l Al
CE058	Antimony (dissolved)	ICP-OES		0.001	mg/l Sb
CE055	Arsenic (dissolved)	ICP-OES		0.001	mg/l As
CE055	Cadmium (dissolved)	ICP-OES	U	0.001	mg/l Cd
CE055	Chromium (dissolved)	ICP-OES	U	0.003	mg/l Cr
CE055	Copper (dissolved)	ICP-OES	U	0.004	mg/l Cu
CE055	Lead (dissolved)	ICP-OES	U	0.009	mg/l Pb
CE055	Mercury (dissolved)	ICP-OES		0.001	mg/l Hg
CE055	Nickel (dissolved)	ICP-OES	U	0.003	mg/l Ni
CE055	Zinc (dissolved)	ICP-OES	U	0.020	mg/l Zn
CE087	PAH (speciated)	Solvent extraction, GC-MS		0.0001	mg/l
CE087	PAH (total)	Solvent extraction, GC-MS		0.0001	mg/l

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

- N No (not deviating sample)
- Y Yes (deviating sample)
- A Sampling date not provided
- B Sampling time not provided (waters only)
- C Sample exceeded holding time(s)
- D Sample not received in appropriate containers
- E Headspace present in sample container
- F Sample not chemically fixed (where appropriate)
- G Sample not cooled
- H Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
48007-1	BH 4	0.30-0.50	Y	TPH C5-C10 (D,E)
48007-2	BH 4	1.80-2.00	Y	TPH C5-C10 (D,E)
48007-3	BH 5	0.80-1.00	Y	TPH C5-C10 (D,E)

APPENDIX IV

Intersoil Ltd Environmental Study (Ref. 13024/amd2, 13023/amd2 & 20003)



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LAND AT SUNCROFT, STATION ROAD, WARKWORTH ENVIRONMENTAL SOILS INVESTIGATION REPORT

Report Ref 20003 issue 16th January 2020



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CONTENTS

1	Commission & Purpose.....	4
2	Scope, Reliance & Constraints	4
3	Site Description	4
4	Desk Based Summary	4
5	Fieldwork	5
6	Installations	6
7	Ground Conditions	6
8	Malodours and Visually Impacted Soils	6
9	Obstructions	6
10.	Excavation and Borehole Stability.....	7
11.	Field Shear Vane Tests.....	7
12.	In Situ Tests – Standard Penetration Tests (SPT's)	7
13	Groundwater during Fieldwork.....	7
14	Soil Gas & Volatile Organic Compounds	7
15	Groundwater during monitoring.....	9
16	Soils: Chemical Analysis	9
17	Leaching Tests	10
18	Groundwater Quality	10
19	Underground Potable Water	10
20	Subsurface Concrete	10
21	Soil Gas Measures	10
22	Remedial Measures	11
23	Garden Soils and Offsite Removal of Made Ground.....	11
24	Protection of Groundworkers and Construction Staff.....	11
25	Summary	12

APPENDICES

Site Location, Site Plan, Proposed layout, Exploratory Locations, Exploratory Logs,
Results of Analysis and Testing

Issued Draft 16th January 2020



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EXECUTIVE SUMMARY

Intersoil were commissioned to undertake an environmental soils investigation on a plot of land off Station Road, Warkworth. Two houses are planned.

The site was formerly a quarry and later a builders yard. It forms part of a previously licenced landfill site. An earlier very limited investigation was undertaken by Intersoil in 2013. That investigation reported thick and loose or very loose ashy and clinker rich made ground and rubble, the presence of some heavy metals (lead) above residential thresholds and up to 7% carbon dioxide. Since 2013 old outbuildings have been demolished and the area has been landscaped.

Following a desk based study undertaken in November 2019, fieldwork comprising 6 hand augered holes to a maximum of 1.7m depth, two surface samples and 5 boreholes extending to a maximum of 5m were undertaken. A number of samples were taken, a series of in-situ standard penetration tests completed and a number of gas monitoring standpipes installed. Ten samples were submitted for asbestos testing and five for contamination analyses. Five soil gas and groundwater surveys have been undertaken over the past 10 weeks.

No asbestos was detected in any of the samples. Made ground was found to contain slightly elevated lead and polyaromatic hydrocarbons when compared to residential Tier 1 threshold concentrations. Remedial works should comprise the importation and placement of clean subsoil and topsoil for garden and soft landscaped areas.

No groundwater was detected in the deeper installations and no groundwater analysis has been undertaken to date. A leaching test confirms low levels of leachability from PAH compounds.

Soil gas has remained low. No methane was detected and carbon dioxide levels did not exceed 5.1% in this investigation. A previously recorded high of 7% has been used to make recommendations regarding the level of gas measures required. Gas measures are recommended.

Low levels of petroleum hydrocarbons are present within the made ground. However, volatile organic compounds measured from standpipes were negligible and speciation of hydrocarbons indicate mid and heavy aliphatics make up the majority of this group of organic determinants. Barrier pipework for potable water is recommended together with consultation with the Water Authority.

From a geotechnical perspective, further work will be necessary to enable any buried quarry walls or substantial hard spots to be identified and to enable foundations to be designed. This may be expected to comprise a geophysical survey with probing and rotary coring. Trial Pitting would also be beneficial in order to expose larger sections of the made ground and to assess excavation stability. Soil gas monitoring should be continued in accordance with CIRIA guidance. Preparation of a remedial statement should add detail as to how remedial measures will marry with the design and construction process.



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Our Ref No. 20003
Date: 16 January 2020

Mr W Walton
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Preston Road North
North Shields
NE29 9PX

LAND AT SUNCROFT, STATION ROAD, WARKWORTH ENVIRONMENTAL SOILS INVESTIGATION REPORT

1. Commission & Purpose

Intersoil were commissioned by Mr Walton (the Client) to undertake an exploratory environmental soils investigation to provide information on ground conditions in support of a proposed residential development. The purpose of the work was to provide an environmental overview of ground conditions at shallow depth via a borehole investigation.

2. Scope, Reliance & Constraints

This report is the second stage of a soil investigation. A phased approach was agreed following an invitation to tender for investigation work and a submission by Intersoil. This report has been prepared solely for use by the Client. It should not be relied upon by third parties. It is valid for 12 months from the date of issue. It should be noted that there may be conditions elsewhere that are different to those reported in this investigation.

3. Site Description

The study area is located at Postcode NE65 0XP and centred on Ordnance Survey Grid Coordinates 424799E, 606404N. It has an area of around 1900m². The site comprises a plot of ground at the rear (north) of Suncroft north of Station Road. The ground is grassed, mossy and generally flat lying. The ground around the north and east boundary drops away steadily to wooded ground. There are a number of well established trees around the boundary. There is a low dwarf wall cutting part way across the plot.

4. Desk Based Summary

Desk Based Study

A previous desk based study was undertaken by Intersoil. The report is dated November 2019. The following conclusions were made:

- The published geology suggests drift is absent in the immediate area. The map shows that the site is set within a wider area of Till. This overlies sandstones, limestones and mudstones of the Stainmore Formation.
- Historical maps suggest that around 90% of the plot has been exposed to quarrying and made ground may be expected below the majority of the plot.



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- The site was operated as a landfill site by Warkworth Parish Council. It closed in 1970. The nature of the waste is not recorded. The operation of the site pre-dates waste licencing.
- A previous investigation undertaken by Intersoil in 2013 proved ashy made ground extending to 4.8m. It comprised ashy gravel, clinker, brick rubble, glass, slate and a little plastic. Three samples were taken for analysis. They were found to contain slightly elevated arsenic, lead and other heavy metals. The presence of polyaromatic and petroleum hydrocarbons were, however, low and not of concern. Zinc and nickel were found to be slightly leachable. Carbon dioxide levels reached a maximum of 7.4% (recorded in May 2013). No methane was recorded. Oxygen levels were slightly depleted with a minimum concentration of 16.1%.
- Shallow coal mining or mine entries are not considered a potential risk to the development. Radon is not considered a risk to the development, although where drift is absent or thin it is good practice to consider radon or similar gas measures within new foundations.
- The solid geology is classed as a 'Secondary' Aquifer and a local source of groundwater. There are no groundwater abstractions in the area. A tributary of the coquet is present and partly culverted 50m east of the site and flows into the River Coquet, 100m to the south.
- There are no permitted or licenced heavy industrial land uses in the area.
- A preliminary assessment of perceived risk suggests that, in terms of soil contamination, the site is perceived as 'low' or 'medium' risk. Development of the site for housing raises a number of geotechnical issues which will require consideration.

5. Fieldwork

Fieldwork was undertaken in two stages:

Initially in order to expedite the work, a number of hand augered holes (A1-A6) were undertaken (21st November). The auger diameter was 70mm. Augered holes extended to between 0.6m to 1.7m depth. A number of disturbed samples were taken and placed in smoke glass jars. Short gas monitoring pipes were installed in a number of augered holes.

The above work was supplemented by five light percussion mini rig holes. The work was undertaken on the 2nd December. Boreholes extended to between 1.7m and 5m depth. Drillers were instructed to hand dig to clear for services prior to boring. A number of disturbed samples were taken from the boreholes. In-situ Standard Penetration Tests (SPT's) were undertaken within the mini-rig boreholes. Shallow made ground taken from the boreholes were placed in plastic bags and any suspect samples and made ground placed in smoked glass bottles. Details of the exploratory locations and logs are presented in the Appendices.



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6. Installations

Monitoring standpipes were installed as follows:

Location	Pipe Length	Diameter	Plain	Slotted
A1	1.5m	32mm	0.3m	1.2m
A2	0.8m	32mm	0.3m	0.5m
A3	1.5m	32mm	0.3m	1.2m
A4	1.2m	32mm	0.3m	0.9m
A6	1.0m	32mm	0.3m	0.7m
WS1	1.5m	50mm	1.0m	0.5m
WS2	4m	50mm	1.0m	3m
WS3	4m	50mm	1.0m	3m
WS4	4m	50mm	1.0m	3m

Notes : No pipework installed in WS5.

Monitoring pipes were surrounded by pea gravel with the top-0.1-0.3m sealed by bentonite pellets. The top of the pipes were fitted with a bung or screw cap and tap. Borehole WS5 was backfilled and sealed upon completion.

7. Ground Conditions

Made Ground

Made ground was encountered in all locations. It extended to the base of all 5 boreholes. It also extended to the base of all of the augered holes except A3. It generally comprised dark grey black and occasionally purple brown and ochre brown clinker and ashy gravel, with a smaller proportion of stone gravel and cobbles, some brick, coal, concrete, glass and pottery, slate and a trace of cloth and polythene. The made ground extended to at least 5m (where boreholes extended to this depth). In A3 it extended to 0.6m

Clay Drift

The made ground was underlain in A3 by a firm and firm to stiff chocolate brown slightly silty clay with rare fine and medium gravel of sandstone and coal. This extended to 1.5m below ground surface.

8. Malodours & Visually Impacted Soils

No malodours were reported during fieldwork.

9. Obstructions

Augered holes A2 and A5 terminated early at 0.6m. Borehole WS1 terminated early at 1.7m, again on a obstruction.



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10. Excavation and Borehole Stability

No machine dug trial pits have been dug to date. However, some collapse in the boreholes was noted at depth. The borehole sides collapsed at 4m in WS5 (very loose deposits).

11. Field Shear Vane Tests

No clay was encountered within the boreholes and no shear vane tests were undertaken.

12. In Situ Tests – Standard Penetration Tests (SPT's)

A number of SPT tests were undertaken within each of the cable percussion boreholes. The results recorded were as follows:

<i>Depth</i>	<i>WS1</i>	<i>WS2</i>	<i>WS3</i>	<i>WS4</i>	<i>WS5</i>
1.2-1.45m	N7	N6	N4	N5	N3
2-2.45m	-	N2	N3	N4	N4
3-3.45m	-	N3	N4	N4	N2
4-4.45m	-	N3	N3	N4	-
<i>Base</i>	<i>1.7m</i>	<i>5m</i>	<i>5m</i>	<i>5m</i>	<i>4m</i>

Notes: Results below N5 are classed as 'very loose' (red). Results from N5 to N9 (purple) are considered 'loose'.

Results indicate generally very loose and, rarely, loose conditions across the site.

13. Groundwater during Fieldwork

No groundwater was noted in any of the exploratory holes during fieldwork.

14. Soil Gas Monitoring & Volatile Organic Compounds

Five soil gas surveys have been undertaken to date. Monitoring was undertaken using a Geotech 5000 or Gasdata GFM and was used to measure flow rates, oxygen, methane and carbon dioxide concentrations. The latter two gases can be encountered in made ground and organic soils (including peat). The results are presented below:

Survey 1 – 22nd November 2019

Atmospheric Pressure start 995 millibars - End 995/994 millibars

Location	Flow (l/hr)	Methane(%)	Carbon dioxide(%)	Oxygen(%)	Groundwater
A1	-	-	2.3	18.4	-
A2	-	-	0.3	20.6	-
A3	-	-	0.3	20.3	-
A4	-	-	1.2	19.1	-
A6	-	-	0.8	19.4	-

Notes: Maximum methane and carbon dioxide; minimum oxygen shown.

- = zero / not detected.



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Survey 2 – 27th November 2019 - Conditions cloudy dry:

Atmospheric Pressure start 985 millibars - End 985 millibars

Location	Flow (l/hr)	Methane(%)	Carbon dioxide(%)	Oxygen(%)	Groundwater
A1	-	-	2.1	17.0	-
A2	0-0.1	-	0.2	20.1	0.45m
A3	-	-	0.2	20.1	1.40m
A4	-	-	2.2	16.5	-
A6	-	-	4.4	12.1	-

Notes: Maximum methane and carbon dioxide; minimum oxygen shown.

- = zero / not detected.

Survey 3 – 2nd December 2019 - Conditions damp misty cool

Atmospheric Pressure start 1032 millibars - End 1032 millibars

Location	Flow (l/hr)	Methane(%)	Carbon dioxide(%)	Oxygen(%)	Groundwater
A1	-	-	-	18.8	-
A2	-	-	0.8	18.6	-
A3	-	-	0.1	19.8	1.2m
A4	*	*	*	*	*
A6	-	-	-	20.9	-

Notes: Maximum methane and carbon dioxide; minimum oxygen shown.

- = zero / not detected. * = not measured

Survey 4 – 23rd December 2019:- Conditions dry cool clear

Atmospheric Pressure start 998 millibars - End 998 millibars

Location	Flow (l/hr)	Methane(%)	Carbon dioxide(%)	Oxygen(%)	Groundwater
A1	-	-	0.4	20.1	-
WS1-	-	-	0.2	20.2	-
A2	-	-	1.1	19.3	-
A3	-	-	0.3	20.4	-
WS2	-	-	0.2	20.4	-

Notes: Maximum methane and carbon dioxide; minimum oxygen shown.

- = zero / not detected. * = not measured

Survey 5 – 15 January 2020:- Conditions dry cool clear. V windy

Atmospheric Pressure start 996 millibars - End 996 millibars

Location	Flow (l/hr)	Methane(%)	Carbon dioxide(%)	Oxygen(%)	Groundwater
A1	-	-	0.4	20.5	*
A2	-	-	1.6	20.9	*
A3	-	-	0.4	21.5	*
WS1-	-	-	0.1	21.2	-
WS2-	-	-	-	21.2	-
WS3	0.1	-	0.5	21.1	-
WS4-	-	-	5.1	17.2	damp at base

Notes: Maximum methane and carbon dioxide; minimum oxygen shown.

- = zero / not detected. * = not measured. A1 & A2 removed after survey.

Elevated levels of methane and carbon dioxide and low levels of oxygen can be potential risks to both construction workers, the development and the ultimate users of the site. No methane was detected over 5 surveys (or in previous surveys in 2013). Carbon dioxide levels did not exceed 5.1%. Oxygen levels were a little depleted at times. Flow was negligible.



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Volatiles

Volatile Organic Compounds were measured from the shallow standpipes using a GasAlert 5 portable meter. Volatiles did not exceed 3 parts per million.

15. Groundwater during Monitoring

Groundwater level monitoring was measured during 5 surveys. Water was generally absent in the installations. However, perched water was noted at 1.4m and 1.2m in A3 and once at 0.45m in A2.

16. Soils - Chemical Analysis

Rationale

A very limited investigation undertaken by Intersoil in 2013 revealed that samples of made ground and tested contained slightly elevated arsenic, lead and other heavy metals. The presence of polyaromatic and petroleum hydrocarbons were, however, low and not of concern. Zinc and nickel were found to be slightly leachable. Significant mobile organic contamination was therefore considered unlikely and as a result a number of samples from the augered holes were submitted for analysis for heavy metals, sulphates, pH, total cyanide, total phenols, a group of priority polyaromatic hydrocarbons (PAH), petroleum hydrocarbons (EPH), total organic compounds (TOC) and soil pH. The sample with the highest EPH result was further speciated for a range of aromatic and aliphatic hydrocarbons. The results are reported in the appended laboratory certificates as follows:

<i>Certificate</i>	<i>Date Reported</i>	<i>Locations</i>	<i>No. of Samples</i>	<i>Depth Range</i>	<i>Comments</i>
82677	2 December	A1-A8	10	Surface -1.5m	Asbestos only
82695	2 December	A1,2,4,5	5	0.3-1.7m	General

determinants

Notes: A7 & A8 surface samples.

In general terms, a range of heavy metals and polyaromatic hydrocarbons (PAH) are commonly left as a residue in ashy soils and are considered as reliable screening determinants in urban soils. Soil pH can also be used as an indicator of anomalous soil conditions.

Concentrations in soils were compared to Tier 1 thresholds for residential land use with private gardens published by the Environment Agency and supplemented by Tier 1 screening thresholds provided by the Chartered Institute of Environmental Health (CIEH). A concentration of 330 mg/kg was used for lead in the absence of an appropriate threshold. The following results were of note:

<i>Certificate</i>	<i>Determinant</i>
82677	Asbestos only
Asbestos	None detected

<i>Certificate</i>	<i>Determinant</i>
82695	General Determinants
PH range	7.4-8.1
Water sulphates	51 to 641 mg/l
Total organic carbon	0.85 to 17.3%
Total PAH hydrocarbons	0.34 mg/kg to 73.2 (Benzo(a)pyrene not exceeding 5.34 mg/kg)
Total EPH hydrocarbons	16 to 589 mg/kg.
Metals	Lead - 2 of 5 samples exceeding 330mg/kg (365, 399 mg/kg)
Total Cyanide	all less than detection
Total Phenols	all less than detection



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The sample from A1 (1.3-1.7m) which returned 589 mg/kg EPH was subject to further analysis for a range of aromatic and aliphatic hydrocarbons. The results reveal that the majority of the sample comprises mid and heavy end aliphatics. However, lightweight fractions were largely absent.

Soils were generally slightly alkaline. Water soluble sulphates were variable and did not exceed 641 mg/l.

The samples from A1 and A5 both produced elevated lead and PAH concentrations when compared to the Tier 1 residential targets.

17. Leaching Tests

The sample of made ground containing the highest lead concentration taken from A1 (1.3-1.7m) underwent a leaching test. The test is used to assess the potential 'washout' of certain contaminants. The sample underwent testing for a range of heavy metals and polyaromatic hydrocarbons and petroleum hydrocarbons including BTEX compounds. Trace concentrations of metals (arsenic 0.64 ug/l) and nickel (0.8 ug/l) were found to be leachable. A low leachable polyaromatic hydrocarbon concentration of 21 ug/l was recorded. Lightweight EPH petroleum hydrocarbons and BTEX compounds were below detection.

18. Groundwater Quality

No groundwater was detected in the 4 deep standpipes and to date no groundwater sampling or analysis has been undertaken. The site is not located over a sensitive aquifer.

19. Underground Potable Water Pipework

The site is a 'brownfield' site. There is evidence of variable made ground. Based on the conditions, barrier pipework is recommended. Consultation with the Water Utility Company is recommended as their standards are rigorous.

20. Sub-surface Concrete

Reference is made to the 2013 investigation results. A maximum of 1706 mg/l water soluble sulphates was measured. In this investigation the maximum concentration was 641 mg/l. Based on the results from both investigation and taking into account acidity, Subsurface concrete will require upgrading and should accord with DS-2, AC2. Further tests from made ground below 2m may be prudent assuming piled foundations are considered.

21. Soil Gas Measures

Soil gas monitoring has been undertaken over a relatively short period. However, cognisance is also taken of earlier investigation work which included gas monitoring. The maximum soil gas concentration of 7.4% carbon dioxide was not exceeded in recent monitoring. No methane was detected in either phases of work. Volatiles were low. The gas profile as recorded in this investigation largely corresponds with previous work. However, some cognisance should be taken of pockets of elevated TOC within the made ground. Using BS8485:2015 +A1 2019 '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*', the following gas assessment is made:



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Calculation of the Gas Screening Value (GSV)

The GSV for carbon dioxide is calculated using a maximum concentration of 7.4% and a maximum flow rate of 0.4 litres/hour (2013). The GSV is calculated at 0.029 litres/hour for the site.

Classification of the site using the GSV

The available range is from CS1 (very low) to CS6 (very high). This site is classed as 'CS2' as a result of the carbon dioxide concentration exceeding 5%.

Classify Proposed Building:

Type A – Private house;	small rooms
Type B – Private, public or commercial	small/medium rooms
Type C – Commercial or public	small to large rooms
Type D – Commercial or Industrial	large/retail park style

This development would be classed as 'Type A' building (High Risk).

Calculate the Gas Protection Score

The Classification and Building Type is used to calculate the Gas Protection Score (GSP). A score using a Classification of CS2 and a Building 'Type A' results in a GSP of 3.5. Soil Gas measures are recommended. In addition, taking cognisance of CIRIA C665 '*Assessing risks posed by hazardous ground gases to buildings*', the site is identified as a perceived '*very high gas generation*' potential (using a classification for the site as a post 1960's landfill site). Further gas monitoring is recommended and future survey results considered together with recommendations made in this report at the design stage for the proposed buildings.

22. Remedial Works

Based on the fieldwork and results of analysis in conjunction with comparison of contamination thresholds for residential development, a capping strategy is considered appropriate for areas of soft landscaping. Hard landscaped areas coupled with a drainage network that leads surface water away from or below the made ground will reduce any future leaching potential. The earlier assessment of perceived risk remains unaffected by the results of this investigation.

23. Garden Soils and Offsite Removal of Made Ground

There are no suitable surface soils available for re-use within the plot. The importation of garden soils will be required. Should offsite removal be planned, a Waste Acceptance Criteria (WAC) test may be required to properly characterise the quality of the made ground to be removed offsite (if landfill is the destination of soils).

24. Protection of Groundworkers, Construction Staff & the Public

Routine personal protection should suffice for ground workers and construction workers. Good working practices that include dust suppression during dry periods and should be employed. Given the location of the site, it is considered that there is no significant risk to the passing public.



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25. Summary

Intersoil were commissioned to undertake an environmental soils investigation on a plot of land off Station Road, Warkworth. Two houses are planned.

The site was formerly a quarry and later a builders yard. It forms part of a previously licenced landfill site. An earlier very limited investigation was undertaken by Intersoil in 2013. That investigation reported thick and loose or very loose ashy and clinker rich made ground and rubble, the presence of some heavy metals (lead) above residential thresholds and up to 7% carbon dioxide. Since 2013 old outbuildings have been demolished and the area has been landscaped.

Following a desk based study undertaken in November 2019, fieldwork comprising 6 hand augered holes to a maximum of 1.7m depth, two surface samples and 5 boreholes extending to a maximum of 5m were undertaken. A number of samples were taken, a series of in-situ standard penetration tests completed and a number of gas monitoring standpipes installed. Ten samples were submitted for asbestos testing and five for contamination analyses. Five soil gas and groundwater surveys have been undertaken over the past 10 weeks.

No asbestos was detected in any of the samples. Made ground was found to contain slightly elevated lead and polyaromatic hydrocarbons when compared to residential Tier 1 threshold concentrations. Remedial works should comprise the importation and placement of clean subsoil and topsoil for garden and soft landscaped areas.

No groundwater was detected in the deeper installations and no groundwater analysis has been undertaken to date. A leaching test confirms low levels of leachability from PAH compounds.

Soil gas has remained low. No methane was detected and carbon dioxide levels did not exceed 5.1% in this investigation. A previously recorded high of 7% has been used to make recommendations regarding the level of gas measures required. Gas measures are recommended.

Low levels of petroleum hydrocarbons are present within the made ground. However, volatile organic compounds measured from standpipes were negligible and speciation of hydrocarbons indicate mid and heavy aliphatics make up the majority of this group of organic determinants. Barrier pipework for potable water is recommended together with consultation with the Water Authority.

From a geotechnical perspective, further work will be necessary to enable any buried quarry walls or substantial hard spots to be identified and to enable foundations to be designed. This may be expected to comprise a geophysical survey with probing and rotary coring. Trial Pitting would also be beneficial in order to expose larger sections of the made ground and to assess excavation stability. Soil gas monitoring should be continued in accordance with CIRIA guidance. Preparation of a remedial statement should add detail as to how remedial measures will marry with the design and construction process.

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LAND AT SUNCROFT, STATION ROAD, WARKWORTH DESK BASED REPORT

CONTENTS

- 1 Introduction, Purpose and Objectives
- 2 Site Location and Description
- 3 Development History
- 4 Environmental Database Search
- 5 Geology & Mining
- 6 Radon
- 7 Hydrogeology
- 8 Hydrology
- 9 Historic Contaminating Land uses
- 10 Desk Based Study Assessment
- 11 Ground Investigation and 'Abnormal' Issues
- 12 Summary and Conclusions

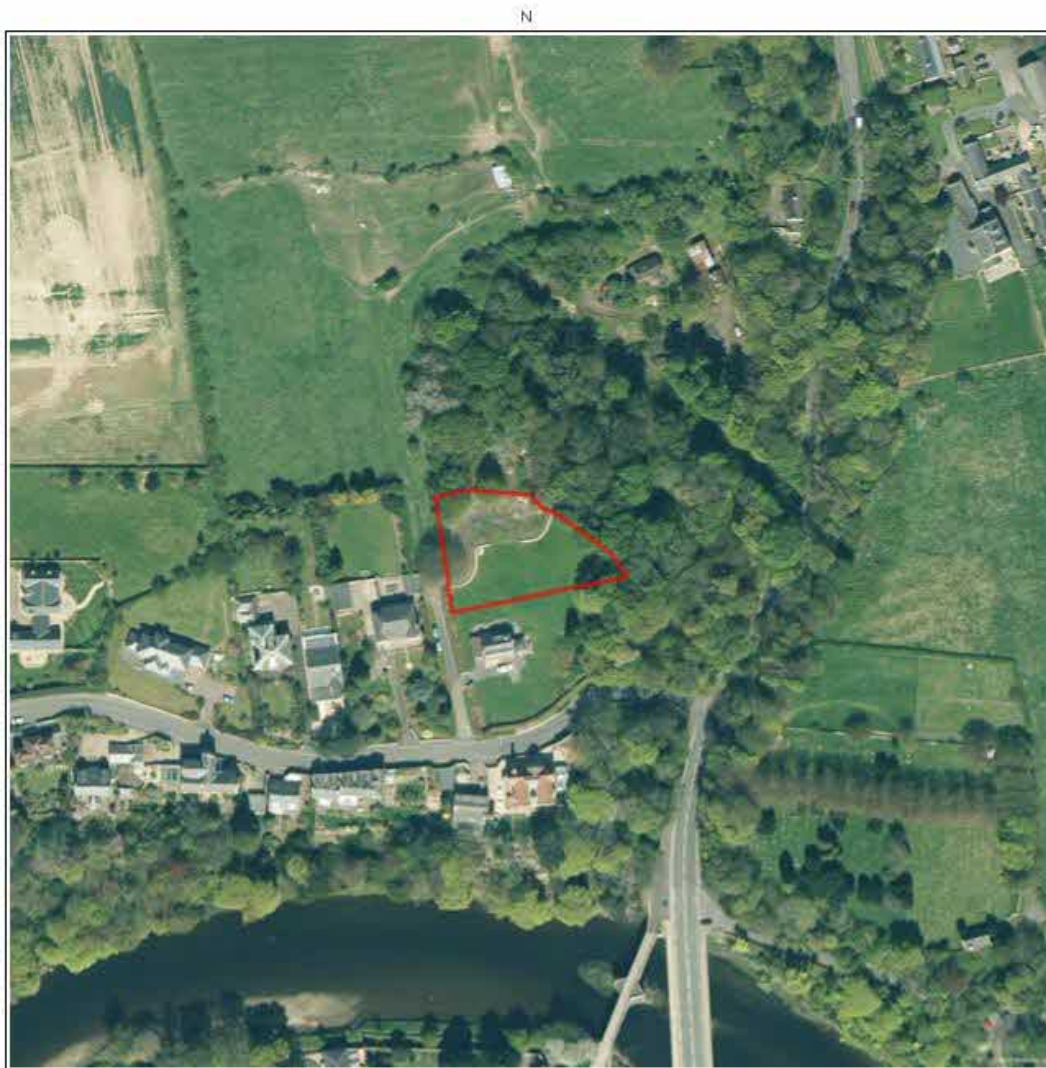
APPENDICES

Site Location
Study Area
Proposed Layout
Historical Map Extracts (Large Scale)
Walkover Plates & Selected Plates from Augering

Report Ref 19050 issue 27th November 2019



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Extract from Groundsure Enviro-insight Report 2019 – Aerial Photograph taken 2016



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Executive Summary

Intersoil was commissioned to undertake a soil investigation on ground at the rear of Suncroft, Warkworth. A previous investigation was undertaken in 2013 and a factual report completed by Intersoil. Two new houses with garages are planned.

The published geology suggests drift is absent in the immediate area. The map shows that the site is set within a wider area of Till. This overlies sandstones, limestones and mudstones of the Stainmore Formation.

Historical maps suggest that around 90% of the plot has been exposed to quarrying and made ground may be expected below the majority of the plot.

The site was operated as a landfill site by Warkworth Parish Council. It closed in 1970. The nature of the waste is not recorded. The operation of the site pre-dates waste licencing.

The previous investigation undertaken in 2013 proved ashy made ground extending to 4.8m. It comprised ashy gravel, clinker, brick rubble, glass, slate and a little plastic. Three samples were taken for analysis in the previous investigation. They were found to contain slightly elevated arsenic, lead and other heavy metals. The presence of polyaromatic and petroleum hydrocarbons were, however, low and not of concern. Zinc and nickel were found to be slightly leachable. Carbon dioxide levels reached a maximum of 7.4% (recorded in May 2013). No methane was recorded. Oxygen levels were slightly depleted with a minimum concentration of 16.1%.

Shallow coal mining or mine entries are not considered a potential risk to the development. Radon is not considered a risk to the development, although where drift is absent or thin it is good practice to consider radon or similar gas measures within new foundations.

The solid geology is classed as a 'Secondary' Aquifer and a source of groundwater. There are no groundwater abstractions in the area. A tributary of the coquet is present and partly culverted 50m east of the site and flows into the River Coquet, 100m to the south.

There are no permitted or licenced heavy industrial land uses in the area.

A preliminary assessment of perceived risk suggests that, in terms of soil contamination, the site is perceived as 'low' or 'medium' risk. Development of the site for housing raises a number of geotechnical issues which will require consideration.

A ground investigation to meet the requirements of Building Regulations is expected to comprise a number of boreholes together with associated testing and monitoring.



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Our Ref No. 19050
Date: 27 November 2019

Mr W Walton
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LAND AT SUNCROFT, STATION ROAD, WARKWORTH DESK BASED REPORT

1. Introduction, Purpose and Objectives

Commission

Intersoil was commissioned to undertake a ground investigation on a plot of land at the rear of Suncroft, Station Road, Warkworth. This report represents Phase 1 of the investigation.

Reliance

This report documents the Phase 1 work. The report has been prepared for use solely by Mr Walton (the Client). It should not be used or relied upon by third parties. Where referenced, depths are from surface and distances are stated in metres (m). This report is valid for 12 months from the date of issue.

Purpose

The purpose of this report is to provide an overview of the environmental and historical context of the site and ground conditions via various desk based searches and intrusive soil investigation work.

Principal Guidance & References

Elements of this report have been prepared with reference to guidance published for use by developers and consultants by a group of Local Authorities (YAHPAG). Reference has also been made to guidelines published by the NHBC and entitled '*Guidance for the Safe Development of Housing on Land Affected by Contamination*' and a previous soil investigation report undertaken by Intersoil in 2013.

2. Site Location & Description

Site

The study area is located at Postcode NE65 0XP and centred on Ordnance Survey Grid Coordinates 424799E, 606404N. It has an area of around 1900m². The site comprises a plot of ground at the rear (north) of Suncroft north of Station Road. The ground is grassed, mossy and generally flat lying. The ground around the north and east boundary drops away steadily to wooded ground. There are a number of well established trees around the boundary. There is a low dwarf wall cutting part way across the plot.

Surroundings

The site is set within a residential area with wooded ground to the north.



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3. Development History

Old Maps

A number of maps previously issued by the Ordnance Survey were acquired and selected maps are presented in the Appendices. Table 1 shows summarised observations of large scale maps from 1855 to 2003.

Date	Onsite	Offsite	Comments of note
1855	Open ground. 20% of site shown as 'quarry'	A quarry occupies the ground to the east and north east with some wooded ground. River 100m south Cemetery 100m south east	Part of site shown as quarry
1897	Quarry now forms around 35% of site area	Housing 40m south Birling village 150m north	Quarrying extended into site
1923	90% of plot shown as quarry	Well 50m south	Quarrying extended to cover most of site
1959	L/C	2 new houses shown adjacent and just beyond the south west of the plot	
1981	Shown as Builders yard with a number of buildings in the south west corner	Quarry shown as disused	Builders yard shown on site with buildings Quarry disused
1984/9	L/C	L/C	
1994	L/C	L/C	
2003	L/C	L/C	

TABLE 1: SUMMARY OF HISTORICAL LAND USE (AS DESCRIBED IN MAP EXTRACTS)
L/C – Little change

The brick outbuildings associated with the former builders yard within the south west of the plot have been demolished and the area landscaped since Intersoil undertook their previous report in 2013.



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4. Environmental Database Search

A Groundsure Enviro-insight Report (dated 22nd November) was acquired as part of the study. The following aspects of environmental information considered salient are summarised as follows:

Description	Onsite (Y/N)	Close to site (Y/N)	Comments
Historical land uses	Y	Y	Quarry and infilled ground onsite. Cemetery 65m south Blacksmiths 200m south
Tanks	N	N	Nearest are 220m north west from site
Energy	N	N	Nearest Substation is 220m south
Petrol and garages	N	N	Garage 230-240m south - 1959.
Infilled land	Y	Y	On site 1864-1991
Dangerous Substances	N	N	None
Control of Major Accident Hazards	N	N	None
Part A(2) & B Permits	N	N	None
Contraventions of groundwater or pollution incidents	N	N	None
Landfill Sites	Y	Y	The plot was a 'licenced' landfill site. Ref PA015. It was operated by Warkworth Parish Council and closed in 1970. The waste types are not recorded. The 'licence' is noted as being surrendered
Waste Operator	N	N	None
Contemporary Land Uses	N	Y	40m north east disused quarry/. 90m north unspecified works
National Grid or High Voltage Cables	N	N	None

TABLE 2: ENVIRONMENTAL DATA
 (The Groundsure report is copyright)



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5. Geology & Mining

Made Ground

A previous investigation on the plot was undertaken by Intersoil in 2013. The purpose of the investigation was to provide basic environmental information on the ground conditions. Made ground was proved to 4.8m depth. It comprised ashy gravel, clinker, brick rubble, glass, slate and a little plastic. Three samples were taken for analysis in the 2013 investigation. It was found to contain slightly elevated arsenic, lead and other heavy metals (compared to suggested Tier 1 guidance for residential land use published by the Environment Agency and supplemented by the Chartered Institute of Environmental Health). The presence of polyaromatic and petroleum hydrocarbons were, however, low and not of concern. Zinc and nickel were found to be slightly leachable. Carbon dioxide levels reached a maximum of 7.4% (recorded in May 2013). No methane was recorded. Oxygen levels were slightly depleted with a minimum concentration of 16.1%.

Drift Geology

Reference to information published by the British Geological Survey (BGS) shows that drift deposits are absent although the wider area is set within an area of Glacial Till. This typically comprises boulder clay. Laminated clay was proved previously between 4.8m and 5m depth in one of the boreholes on the plot. It was uncertain if this was reworked or natural clay.

Solid Geology

The solid geology is shown to comprise the Stainmore Formation. This is typically interbedded sandstones, mudstones and limestones.

Coal & Metalliferous Mining

The site is within the North East Coalfield. However reference to the Coal Authority website indicates that the site is not within a 'development high risk area' (a Coal Authority Designation), is not located close to any recorded mine entries and is not underlain by any out-cropping coal seams. The Groundsure data suggests that the site may be 'potentially' exposed to localised underground vein mineral mining. The solid geology is, however, not well known for metalliferous mining in the area.

6. Radon

Information presented in the Groundsure Report indicates that the site does not lie within a radon affected area (between 1% and 3% of buildings are likely to be affected). However, where drift is absent or thin it is good practice to consider radon or similar gas measures within new foundations

7. Hydrogeology

The superficial deposits are shown as absent. The solid geology is shown as a '*Secondary Aquifer*'. The site is not within a 'Groundwater Source Protection Zone' (an Environment Agency Designation). There are no groundwater abstraction wells in the area. The nearest (according to the Groundsure data) is 875m south west of the site. Previous work on the site noted that no groundwater was noted during monitoring from the 3m long installations.



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8. Hydrology

A tributary of the River Coquet flows south 50m east of the site. It is partly culverted below the road as it reaches the River Coquet which is 100m south of the site. The site is not shown to be prone to river flooding, although there is a localised risk from pluvial events. There is no obvious existing drainage network present within the plot. The Groundsure report identifies the nearest discharge consent being 120m north east of a site in Birling.

9. Historic Contaminating Land Uses

Based on an assessment of the historical maps and environmental information provided, the site has been exposed to the following:

Situation	Details
Major Contaminative use Onsite	Former Quarry. Landfill site. Infilled ground.
Minor Contaminative use Onsite	Builders yard
Offsite Contaminative use (immediate vicinity)	The land to the north and east has been quarried and may also have been backfilled/landfilled.
Offsite Contaminative use (wider area)	Cemetery 70m south east
Other	The made ground is compressible and found previously to be very loose There may be buried high walls associated with the old quarry There may be quarry waste at the base of the quarry and overly coarse buried materials Old foundations may be present where former buildings were present

TABLE 3: SUMMARY OF CONTAMINATIVE EXPOSURE

10. Desk Based Study Assessment

The data collated from site has been assessed and the following possible receptors have been considered within a '*conceptual model*'. This is a summarised assessment which outlines the potential contamination issues within or near the site that may impact the proposed development.

Proposed Development

It is understood that two houses with garages are planned.



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Potential Sources

In general, potential sources of contamination relate to determinants within the made ground which may contain toxic or phytotoxic substances which may be viewed as a potential hazard. The results of a previous investigation supplemented by a recent set of historical maps and Groundsure data confirms that the site was a former quarry and subsequently a landfill site and a builders yard with a number of buildings present. These are no longer present. Up to 4.8m of ashy fill was noted. Although only 3 samples underwent analysis, the made ground contains slightly elevated heavy metals and sulphates.

It is noted that landfilling ceased in 1970 and the site became a builders yard. There was little regulation of landfilling until 1974 (the Control of Pollution Act). However, a previous investigation suggests the presence of a significant depth of ash and demolition rubble. The ash was found to be loose. Zinc and Nickel were found to be slightly leachable.

Potential Pathways

These are the means by which sources of contamination may reach sensitive receptors. This may comprise:

- Dermal contact
- Ingestion
- Inhalation
- Migration in dust
- Migration in vapours
- Groundwater
- Surfacewater

Potential Receptors

There are a number of potential receptors to be considered when re-development is planned. These may comprise:

- Construction Workers
- Future End Users
- The Public and users of adjoining land
- Property (concrete and utilities)
- Vegetation
- Animals
- Surface Water

For a potential hazard to be present there must be a relationship between the source and the receptors (or those at risk from contamination). This is termed the *source-pathway-receptor* relationship. Assuming all 3 elements are present, there are various combinations which may appear to be relevant to this site, albeit remote. A number of these are or may be perceived to be either likely (in terms of occurrence) or unlikely and a risk rating (in terms of potential effects or impact) has been assigned accordingly.



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The Conceptual Model provides information on relevant relationships that are thought possible or likely based on the sites current use.

Source(s)	Pathway(s)	Receptor	Linkage
Use of the site as a quarry, landfill site and builders yard. Made ground proved to 4.8m depth and shown to comprise largely ash and other wastes (glass, slate, rubble, plastic).	Dermal contact	Construction Workers Future users	Yes – plausible
	Inhalation	Construction Workers Future users	Yes – plausible
	Ingestion	Construction Workers Future users	Yes – plausible
Gas generated by infill and/or organic matter within made ground	Gas migration	Construction Workers Existing students and staff	Yes – plausible
	Aggressive ground	Subsurface concrete	Yes – plausible
	Aggressive ground	Potable water pipework	Yes - plausible
Leaching of contamination into underlying aquifer (drift)	Leaching/ Migration	Shallow groundwater	Yes – plausible
Leaching of contamination into underlying aquifer (solid)	Leaching/ Migration	Deep groundwater	Yes - plausible
Surface water contamination	Flood/flow	Surface water	Unlikely* ¹

TABLE 4: CONCEPTUAL MODEL – SOURCE-PATHWAY-RECEPTOR LINKS

Notes: * = mitigating factors

1 – site appears to drain with no ponding water



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Receptor	Pathway	Effects	Potential	Risk Rating
Shallow Groundwater from offsite source	Percolation through made ground	Contamination of perched water and drainage	LOW	LOW
Groundwater in Bedrock	Percolation from perched water	Contamination of groundwater	MEDIUM	MEDIUM
Construction Workers. Site Operatives	Dermal Contact Ingestion Inhalation	Health Effects	MEDIUM	MEDIUM
Public & Neighbours	Inhalation & Ingestion to Public	Health Effects	LOW	LOW
Site users	Inhalation, dermal contact & ingestion	Contamination from previous development and soil gas migration	LOW*	LOW*
Surface Water	Migration via perched water	Contamination from drainage and perched water migration	LOW	LOW
Property	Direct Contact	Aggressive Ground Conditions Soil Gas	MEDIUM	MEDIUM
Wildlife (Burrowing mammals or foragers)	Dermal Contact Ingestion Inhalation	Health Effects	LOW	LOW

TABLE 4A: PRELIMINARY ASSESSMENT OF PERCEIVED RISK

*=assumes development is viable and remedial works are undertaken

Normally a site with this background and profile would be considered 'high risk' in terms of its potential as future residential land. However, previous (albeit limited) investigations in 2013 suggests that the site is made up predominantly of ash and soil gas levels were not significantly elevated. Organic matter was recorded as 3.2%, 4.8% and 5.7%. There was little putrescible matter encountered in the retrieved samples of made ground.

The former landfill site does not appear to have been lined or capped and deposition of wastes may have been slow and the deposited wastes exposed to the elements. It is likely that water continues to percolate through the made ground.

This investigation has identified a 'low' or 'medium' risk category for the elements related to possible risks and anthropogenic soil contamination. However, there remain plausible linkages in terms of a *source-pathway-receptor* relationships. High levels of confidence will be needed in terms of the assessment to enable the site to be considered for residential development.

It should be noted that notwithstanding the above, the geotechnical situation is complex with thick very loose made ground present and the potential for buried foundations and a quarry high wall/boundary to consider.



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11. Ground Investigation & Abnormal Elements

Current Fieldwork

An environmental Phase 2 soil investigation has been commissioned and is underway. The composition and nature of any made ground on site was generally determined in a basic investigation in 2013. However, in 2013 there were no definite plans for re-development.

Currently 6 hand augered holes have been progressed to a maximum depth of 1.5m. Natural ground was only encountered at 0.6m in one hole at the south west corner of the plot. Natural chocolate brown firm sandy clay was encountered from 0.6m to 1.5m depth. A number of samples have been taken for chemical analysis and asbestos screening. Five shallow (up to 1.5m long) soil gas pipes have been installed and, to date, two soil gas surveys have been completed. The results are summarised as follows:

Date	Methane (% Range)	Carbon dioxide (%Range)	Oxygen (% Range)	Flow (l/hr Range)
21 Nov.	-	0.3% - 2.2%	20.7% - 18.4%	-
27 Nov.	-	0.2% - 4.5%	20.1% - 13.0%	-

Notes: - = absent/not detected

Both surveys were undertaken during periods of low atmospheric pressure (995 and 984 millibars respectively).

A number of mini rig boreholes are planned for the beginning of December. Deeper gas and groundwater wells will be installed at this time. The field and monitoring information will be presented in a Phase 2 investigation report.

At this time, 'abnormal' construction issues (broadly defined as elements that are required in addition to those that may be expected for a greenfield site with good ground at shallow depth) may include:

- Deep/thick compressible ash and made ground
- Possible buried foundations, quarry walls and/or other obstructions
- Tree roots around the boundary

This may necessitate the following:

- Deep foundations
- Upgrading of subsurface concrete
- Provision of barrier pipe for potable water
- Provision of soil gas measures
- Removal of unsuitable soils or made ground
- Provision of suitable soils
- Reinforcement of new drainage

The above list is not exhaustive and a two stage (a) environmental and b) geotechnical) investigation to establish conditions will be required.



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12. Summary & Conclusions

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A ground investigation to meet the requirements of Building Regulations is expected to comprise a number of boreholes together with associated testing and monitoring.

Report prepared by
Alistair MacDonald
(BSc, MSc, LL.M, CGeol, FGS)

**LAND AT SUNCROFT, STATION ROAD,
WARKWORTH
DESK BASED STUDY REPORT**

APPENDIX

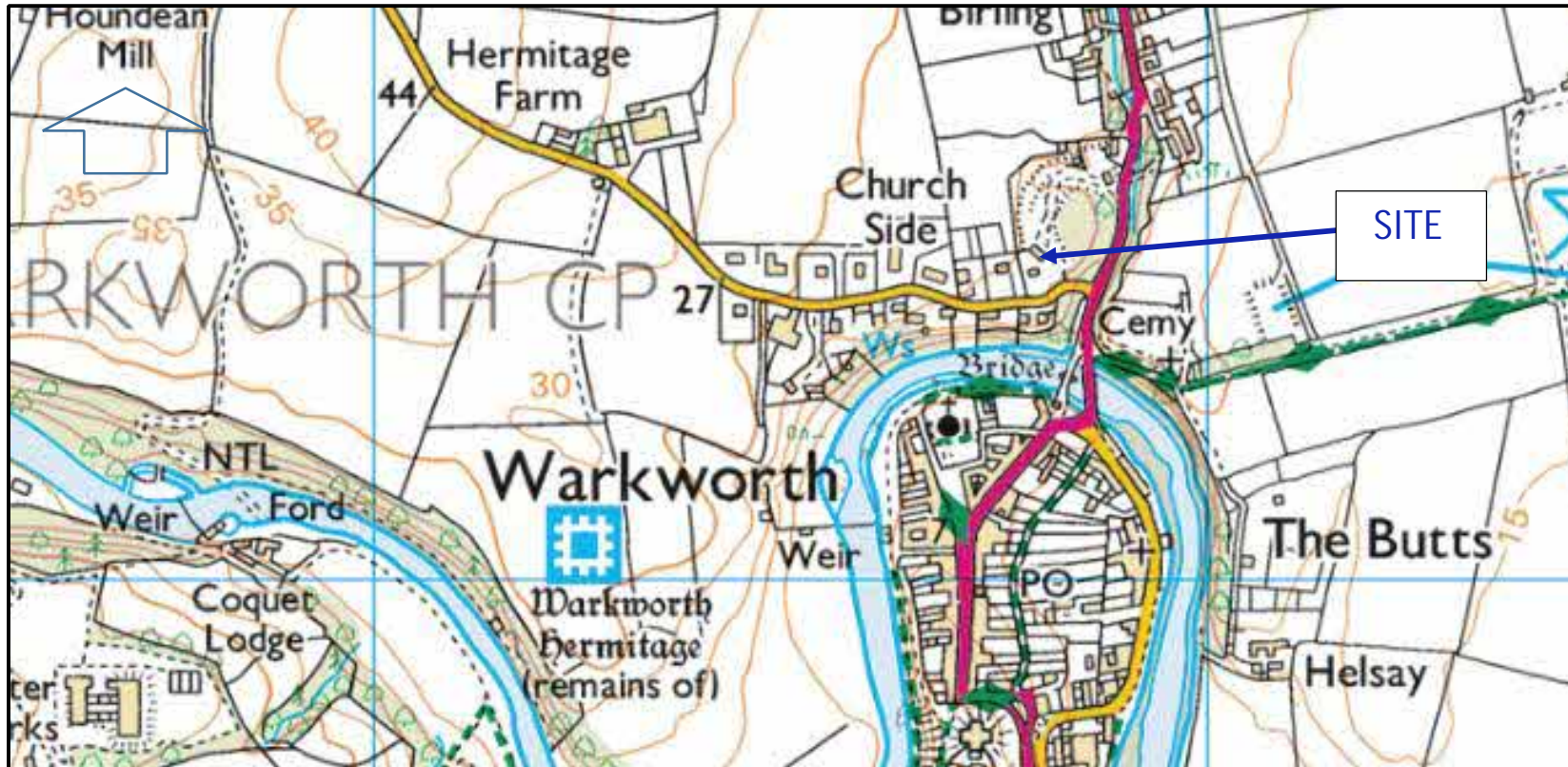
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LAND AT SUNCROFT, STATION ROAD, WARKWORTH

SITE LOCATION

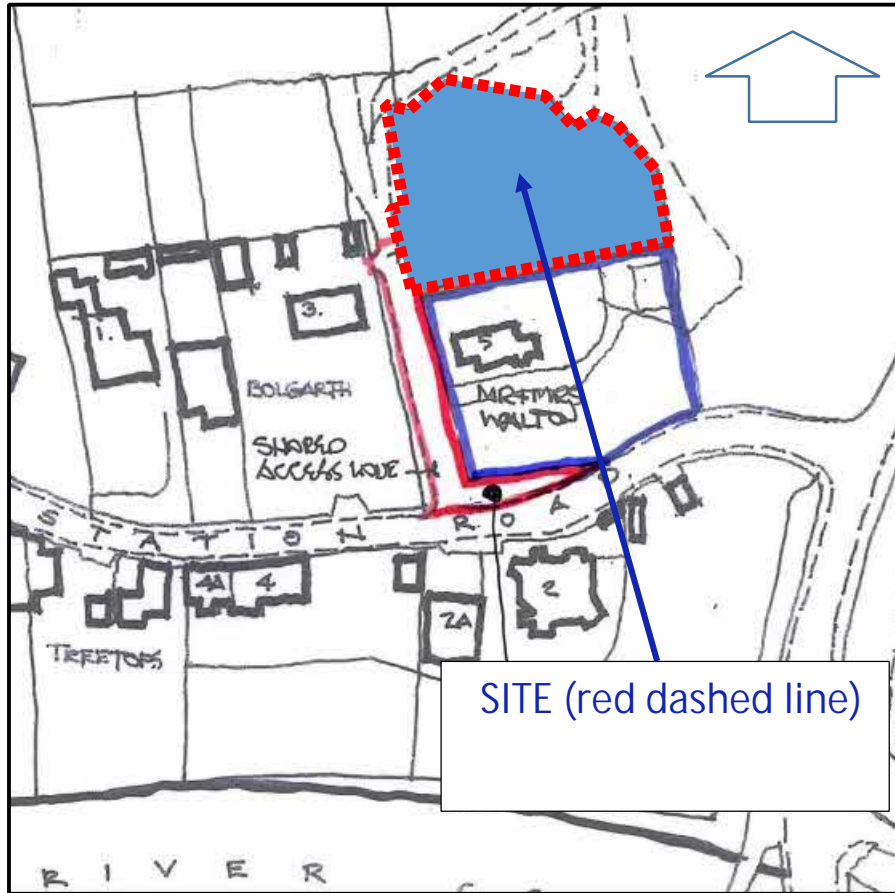
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November 2019



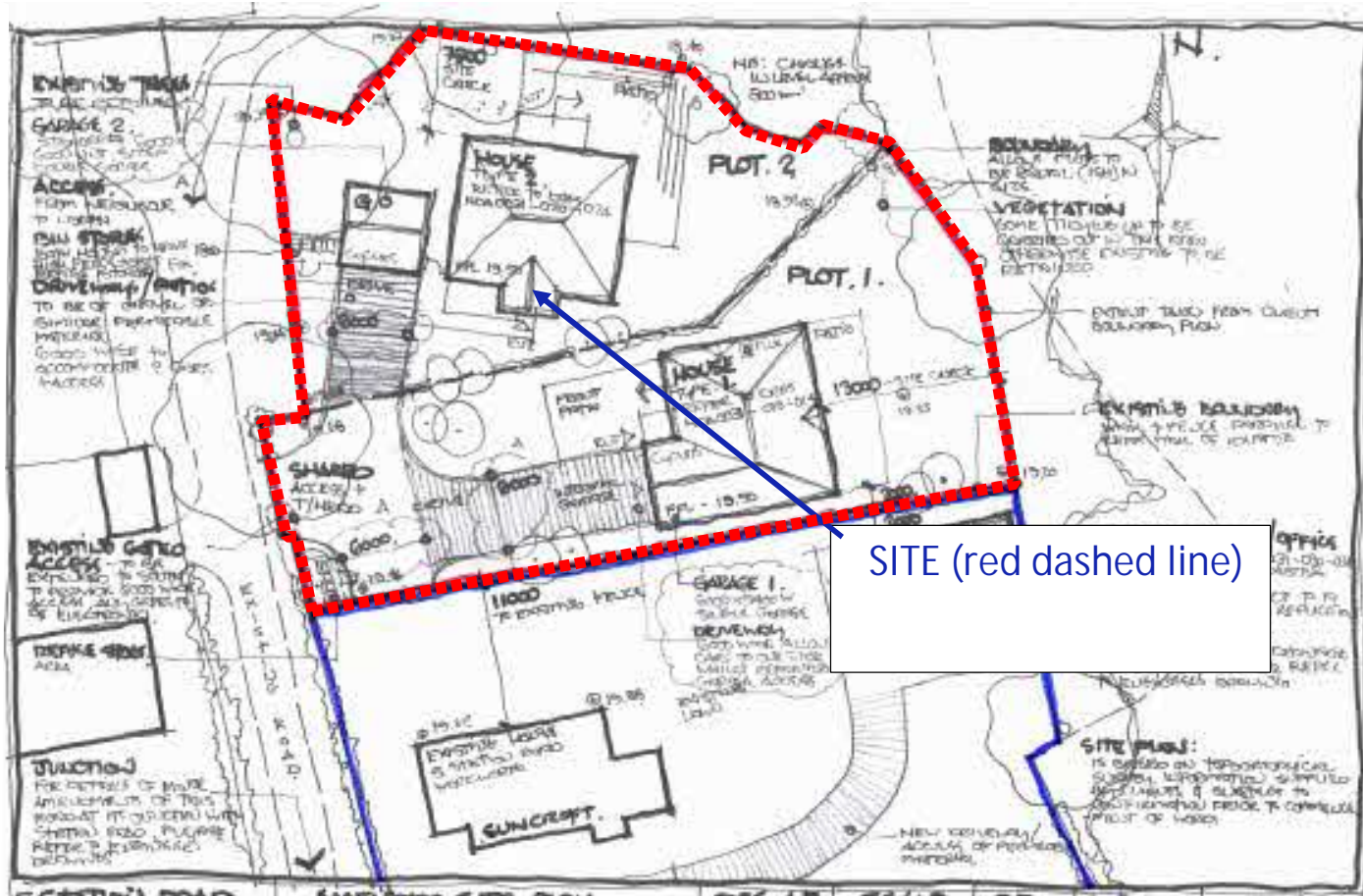
LAND AT SUNCROFT, STATION ROAD, WARKWORTH

SITE PLAN

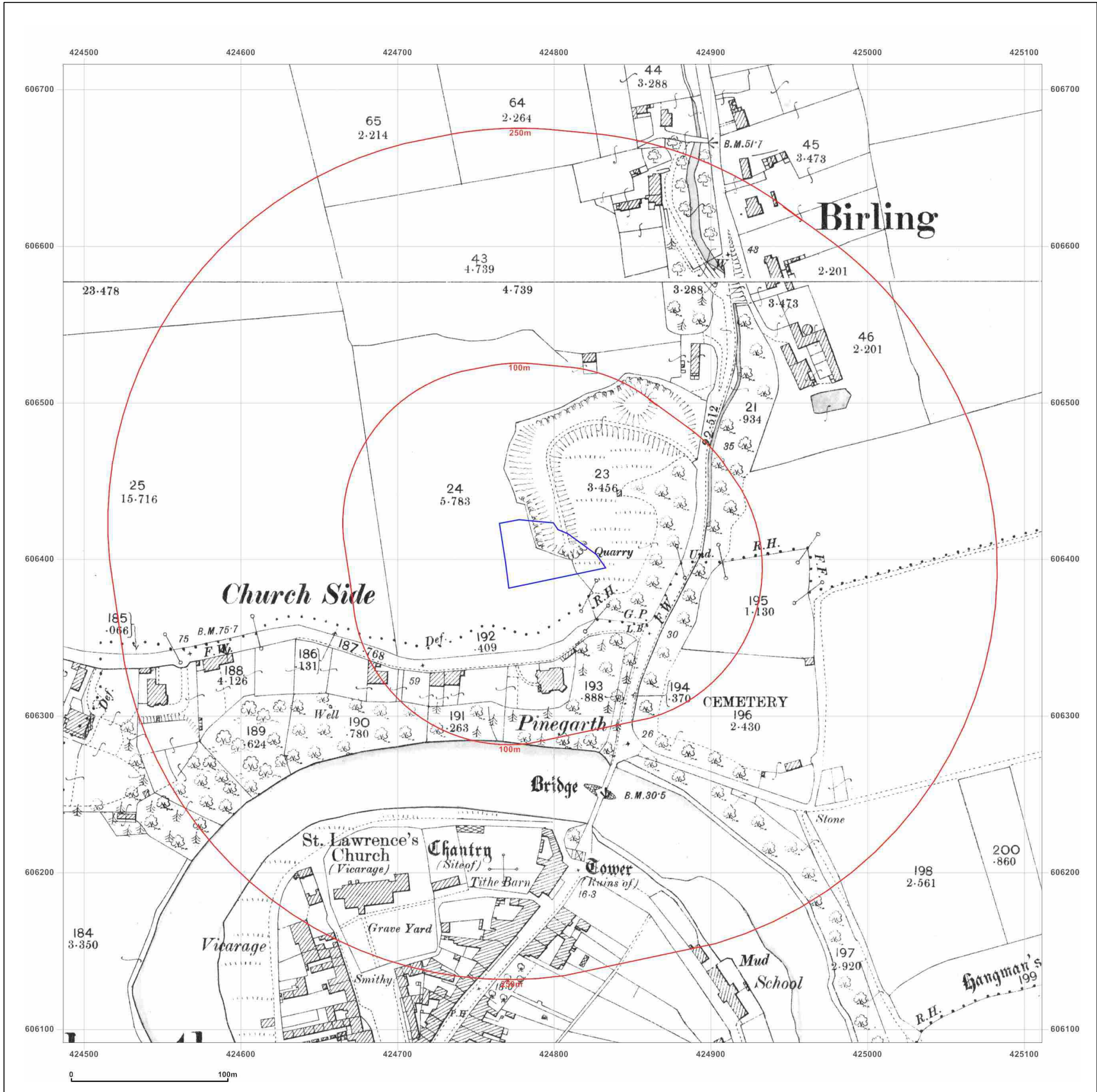


LAND AT SUNCROFT, STATION ROAD, WARKWORTH

PROPOSED LAYOUT



NOT TO SCALE – DO NOT SCALE OFF PLAN – TAKEN FROM PLANNING FILE



Site Details

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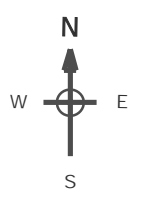
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 Grid Ref: 424799, 606404

Map Name: County Series

Map date: 1897

Scale: 1:2,500

Printed at: 1:2,500



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 Edition 1897
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Map legend available at:
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Site Details

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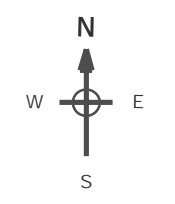
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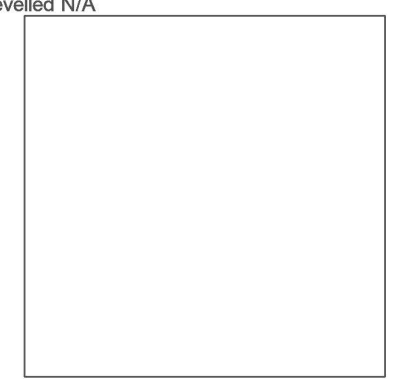
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Surveyed 1923
 Revised 1923
 Edition N/A
 Copyright N/A
 Levelled N/A

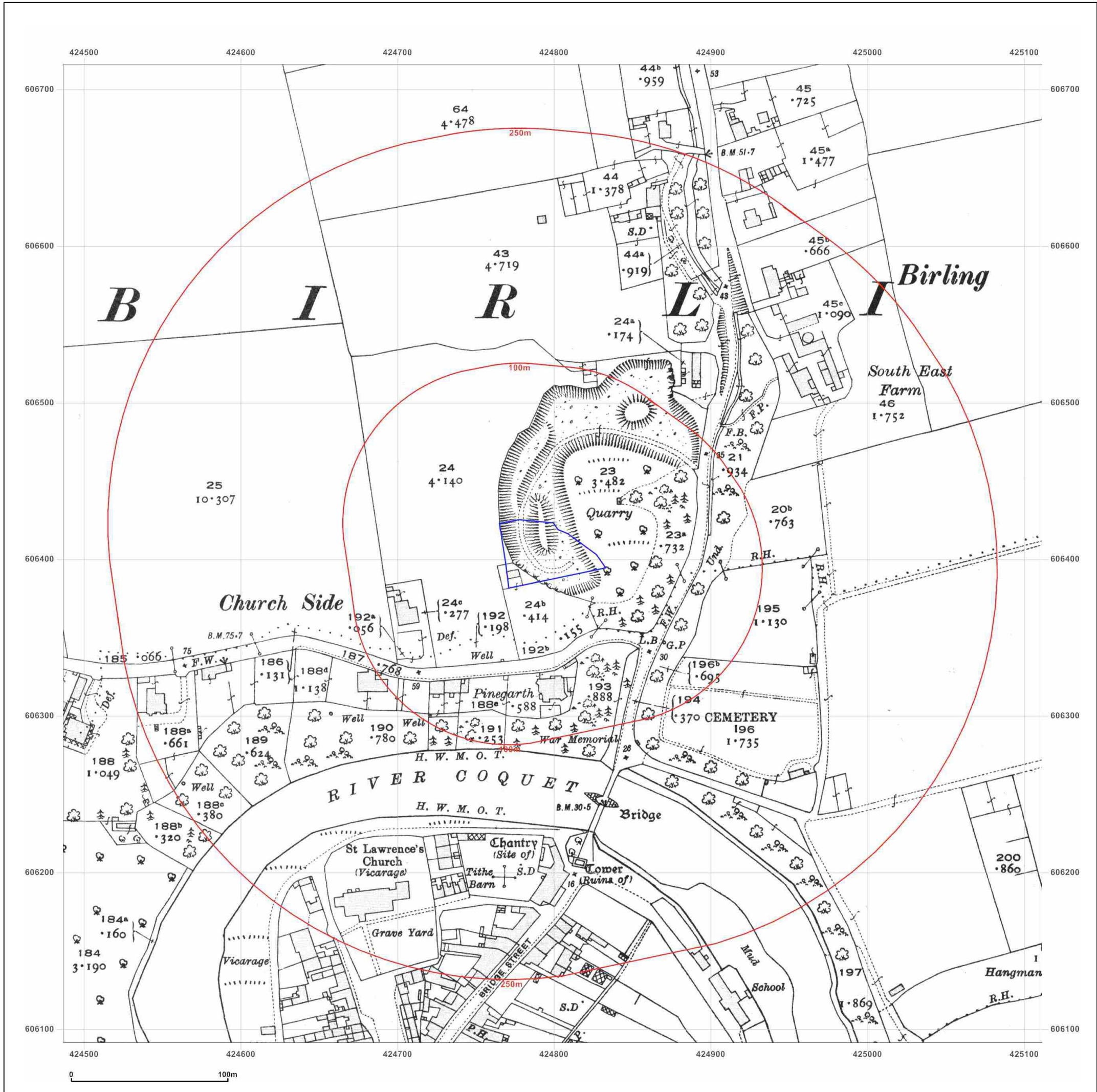


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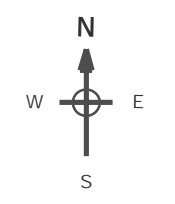
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Map Name: National Grid

Map date: 1959

Scale: 1:2,500

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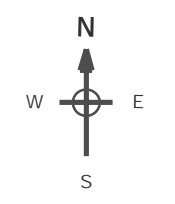
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Surveyed 1948
 Revised 1981
 Edition N/A
 Copyright 1981
 Levelled 1948

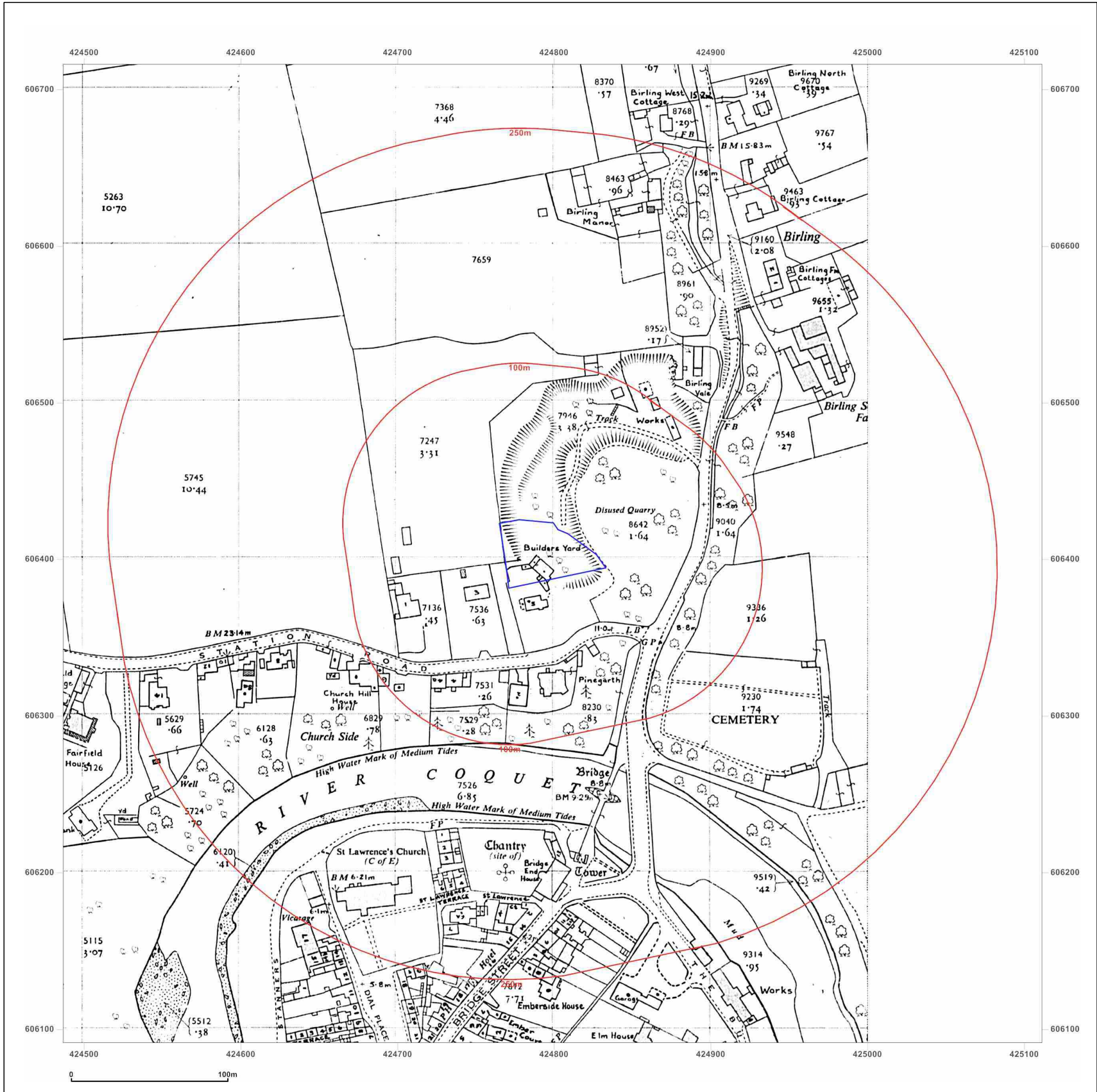


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Site Details

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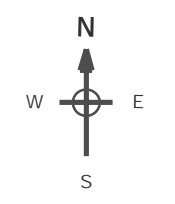
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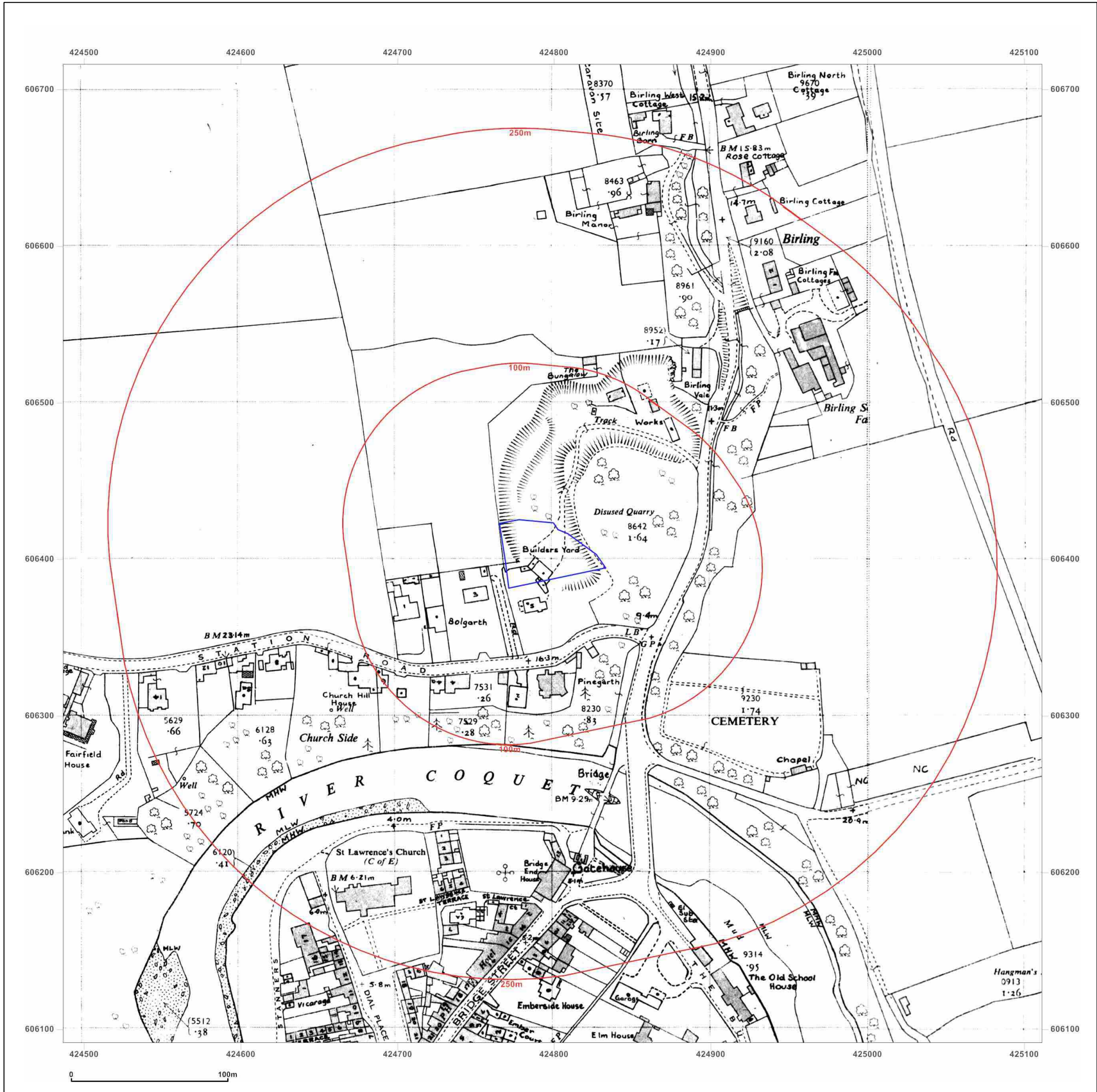
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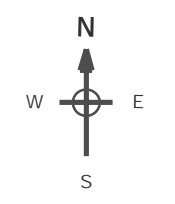
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Map Name: National Grid

Map date: 1994

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1994 Revised N/A Edition N/A Copyright 1994 Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright 1994 Levelled N/A
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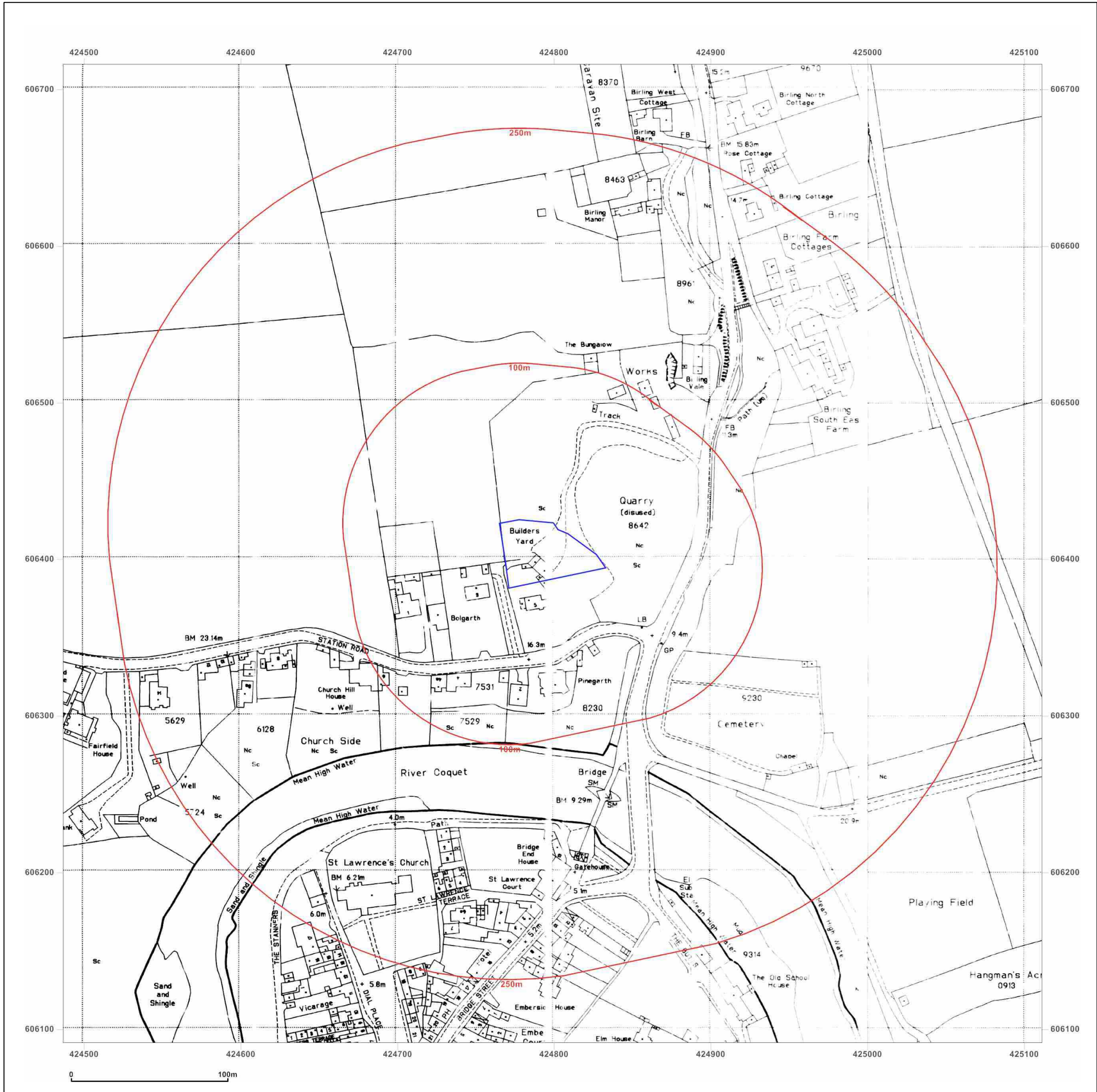


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Site Details

LAND - SUNCROFT, STATION ROAD, WARKWORTH, NE65 0XP

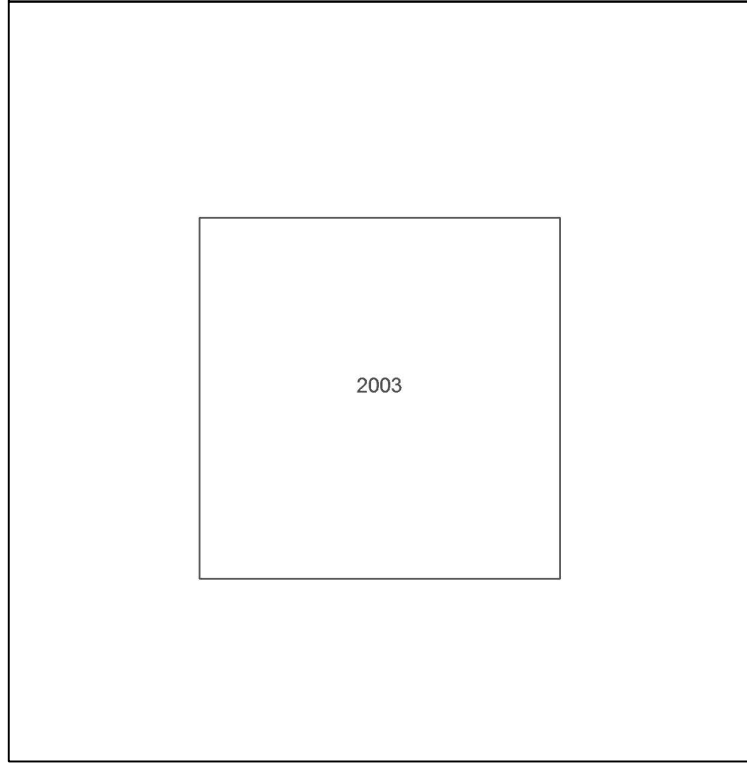
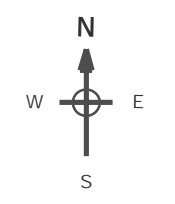
Client Ref: wark
 Report Ref: SG-BAR-6480260
 Grid Ref: 424799, 606404

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



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Site looking south east across plot



Site looking west from north east corner



East and south east corner from northern boundary



Typical ash and clinker arisings from one of the hand augered holes (A1)



Typical made ground arisings to left and natural clay to right (A3)



Gravel and shaley rubble and a little debris on surface in extreme north west corner.

info@intersoil.co.uk
JANUARY 2020

LAND AT SUNCROFT, WARKWORTH ENVIRONMENTAL SOILS INVESTIGATION REPORT

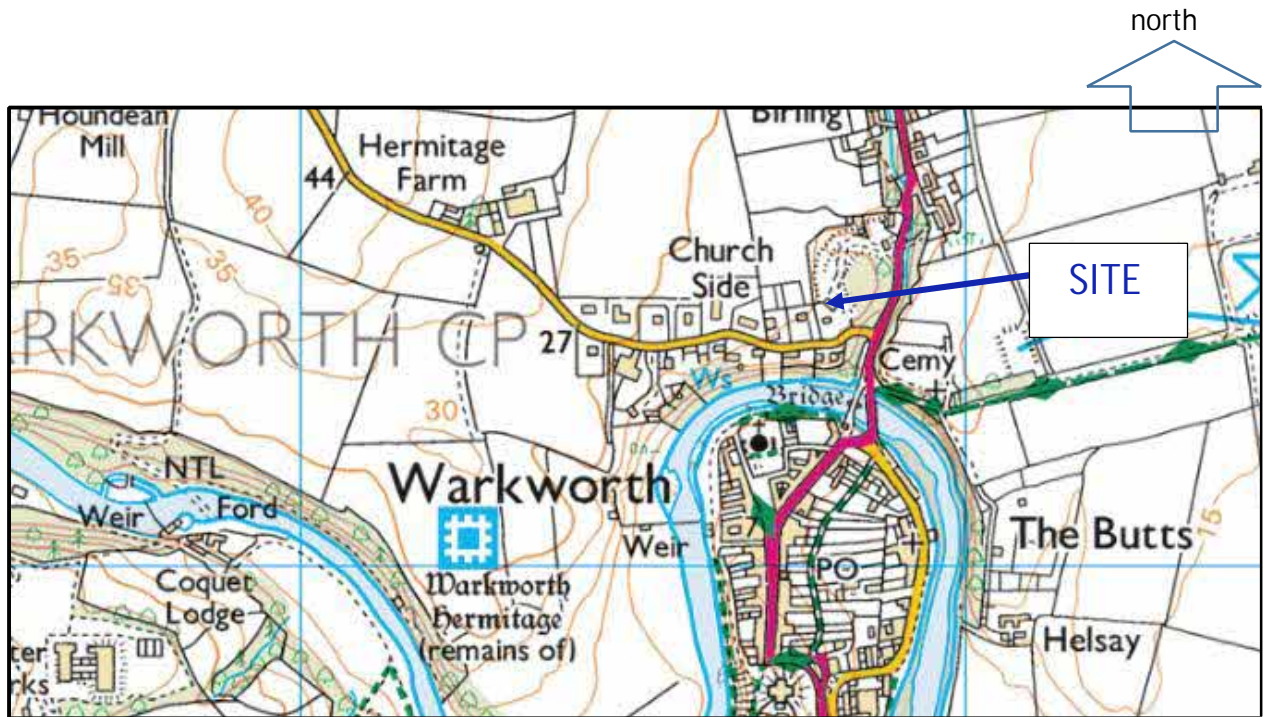
APPENDIX

LAND AT SUNCROFT, STATION ROAD, WARKWORTH

SITE LOCATION

Area approximate – do not scale off plan/not to scale

November 2019



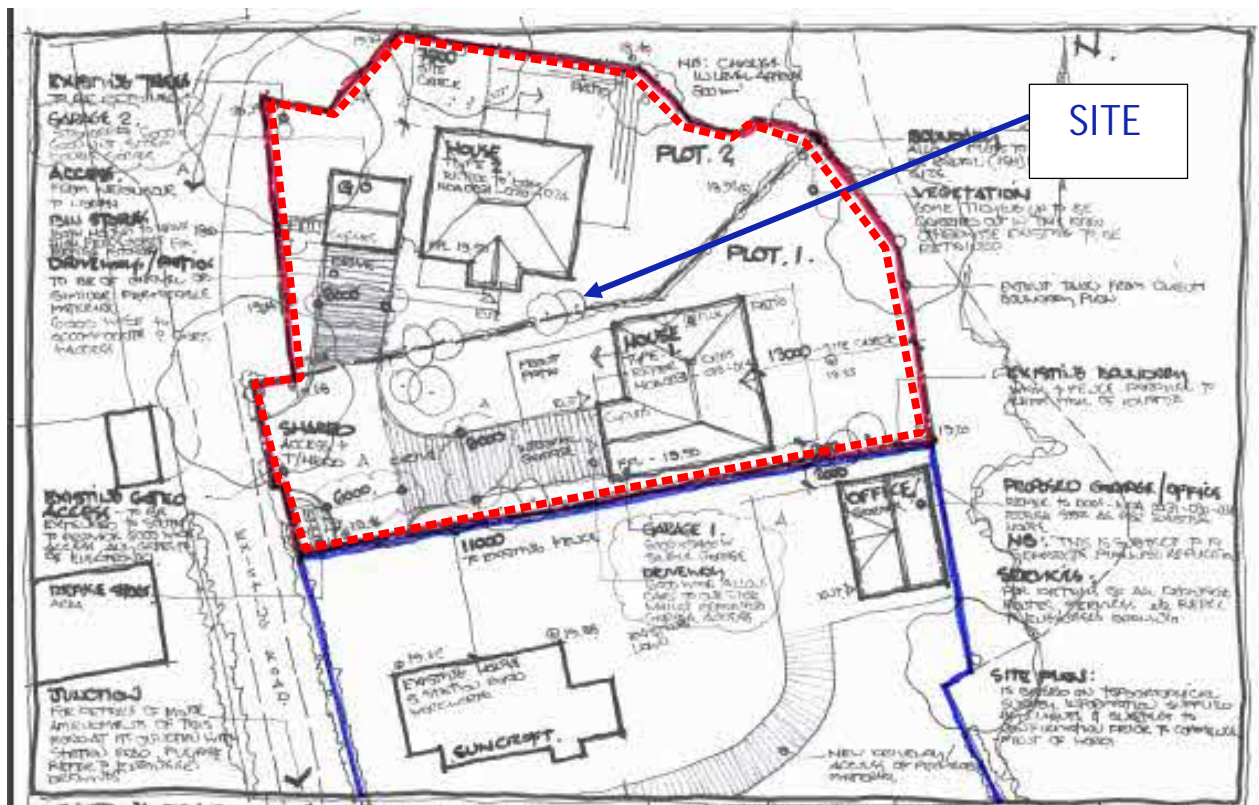
LAND AT SUNCROFT, STATION ROAD, WARKWORTH

PROPOSED LAYOUT

Area approximate – do not scale off plan/not to scale

November 2019

north

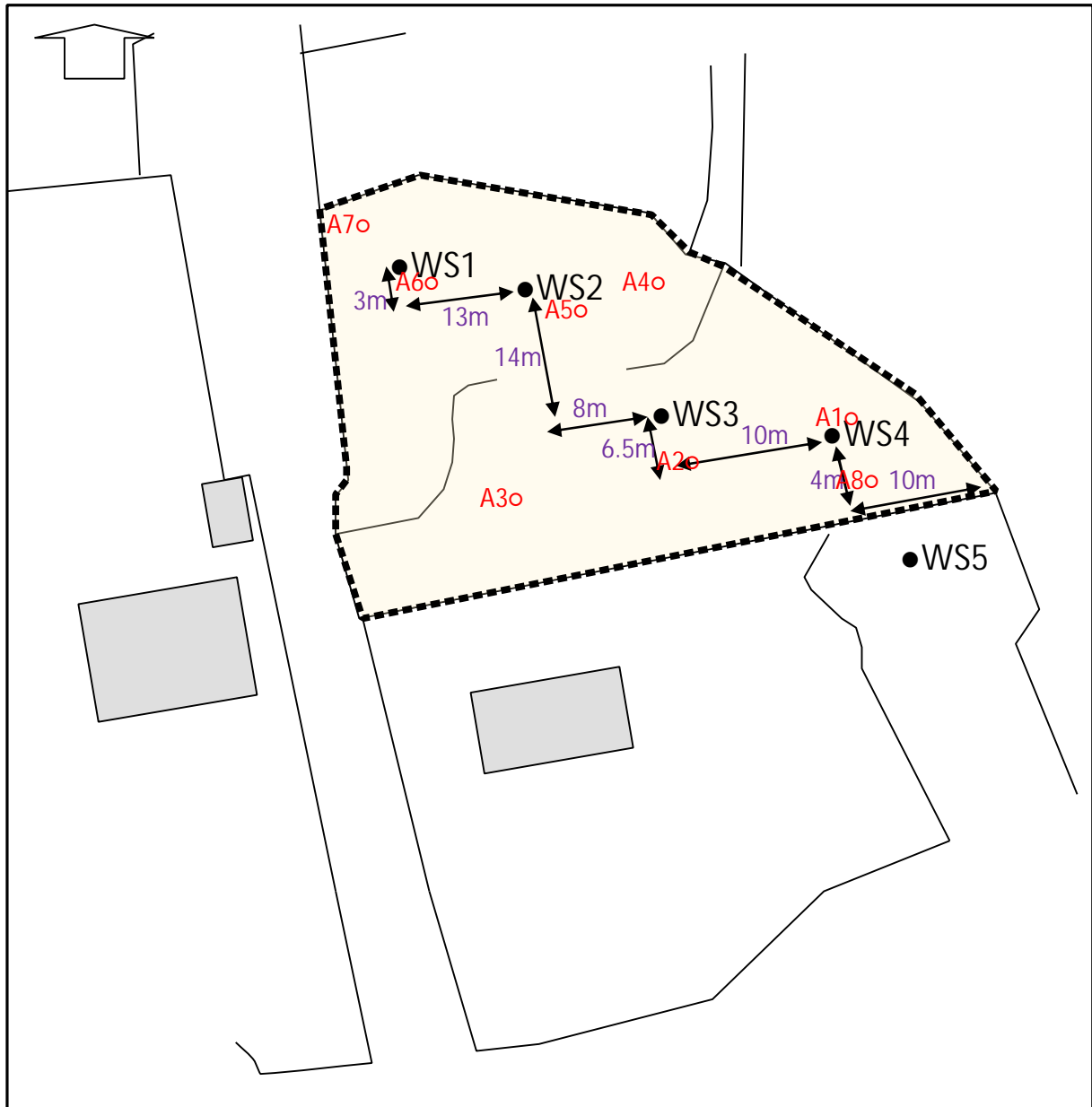




Intersoil Limited
Suite 30, 58 Low Friar Street, Newcastle, NE1 5UE
Tel 01670 515566
info@intersoil.co.uk

SUNCROFT, STATION ROAD, WARKWORTH NORTHUMBERLAND

EXPLORATORY PLAN: JANUARY 2020



LOCATIONS APPROXIMATE: DO NOT SCALE OFF PLAN: NOT TO SCALE: A7 & A8 ARE SURFACE SAMPLES ONLY.

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Site
 WARKWORTH

Number
WS1

Machine: Premier
 Method : Drive-in Windowless
 Sampler

Dimensions

Ground Level (MOD)

Client
 WALTON



Job
 Number
 001WARK

Location

Dates
 02/12/2019

Project Contractor
 RD

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (MOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D		SPT 1.2-1.65m N7		0.50	MADE GROUND brown and grey brown gravelly soil type with much ash, some brick and stone rubble		
0.80	D				1.20	MADE GROUND grey brown and grey black clay with ash gravel and some rubble. obstruction at base - terminated		
1.40	D				1.70	Complete at 1.70m		

Remarks
 DRY
 STANDPIPE TO 1.5m

Scale (approx)
 1:50

Logged By
 rh

Figure No.
 001WARK.WS1

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Site
 WARKWORTH

Number
WS2

Machine: Premier
 Method : Drive-in Windowless
 Sampler

Dimensions

Ground Level (MOD)

Client
 WALTON

Job
 Number
 001WARK

Location

Dates
 02/12/2019

Project Contractor
 RD

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (MOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D				(1.10)	MADE GROUND brown and grey brown gravelly CLAY with little ash, some brick and stone rubble	[Cross-hatched pattern]	
0.80	D			1.10				
1.40	D		SPT 1.2-1.65m N6			MADE GROUND grey black ash and clinker little glass and rubble		
1.80	D		SPT 2-2.45m N2					
2.80	D				(3.90)			
3.80	D							
4.80	D		SPT 3-3.45m N3					
			SPT 4-4.45m N3		5.00			
						Complete at 5.00m		

Remarks
 STANDPIPE TO 4m
 DRY

Scale (approx)
 1:50

Logged By
 rh

Figure No.
 001WARK.WS1

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Site
 WARKWORTH

Number
WS3

Machine: Premier
 Method : Drive-in Windowless
 Sampler

Dimensions

Ground Level (mOD)

Client
 WALTON

Job
 Number
 001WARK

Location

Dates
 02/12/2019

Project Contractor
 RD

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D				(1.10)	MADE GROUND brown and grey brown gravelly CLAY with little ash, some brick and stone rubble	[Cross-hatched pattern]	
0.80	D							
1.40	D		SPT 1.2-1.65m N4		1.10	MADE GROUND grey brown clay and gravel with some ash and clinker, rubble		
1.80	D		SPT 2-2.45m N3		(2.00)			
2.80	D							
			SPT 3-3.45m N4		3.10	MADE GROUND grey black ash and clinker little glass, slate	[Cross-hatched pattern]	
3.80	D				(1.90)			
4.80	D		SPT 4-4.45m N3		5.00	Complete at 5.00m		

Remarks
 DRY
 STANDPIPE TO 4m

Scale (approx)
 1:50

Logged By
 rh

Figure No.
 001WARK.WS1

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Site
 WARKWORTH

Number
 WS4

Machine: Premier
Method : Drive-in Windowless Sampler

Dimensions

Ground Level (mOD)

Client
 WALTON

Job Number
 001WARK

Location

Dates
 02/12/2019

Project Contractor
 RD

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D				(0.50)	MADE GROUND grey brown gravelly CLAY with little brick and stone rubble	[Cross-hatched pattern]	
0.80	D				0.50	MADE GROUND grey black ash and clinker little glass and rubble		
1.40	D		SPT 1.2-1.65m N5					
1.80	D		SPT 2-2.45m N4					
2.80	D		SPT 3-3.45m N4		(4.50)			
3.80	D		SPT 4-4.45m N4					
4.80	D				5.00	Complete at 5.00m		

Remarks
 STANDPIPE TO 4m
 DRY

Scale (approx)
 1:50

Logged By
 rh

Figure No.
 001WARK.WS1

Intersoil Ltd

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Site
 WARKWORTH

Number
WS5

Machine: Premier
 Method : Drive-in Windowless
 Sampler

Dimensions

Ground Level (MOD)

Client
 WALTON


Job
 Number
 001WARK

Location

Dates
 02/12/2019

Project Contractor
 RD

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (MOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D					MADE GROUND grey black ash and clinker little glass and rubble - collapse at base of uncased hole		
0.80	D							
1.40	D		SPT 1.2-1.65m N3					
1.80	D		SPT 2-2.45m N4	(4.00)				
2.80	D		SPT 3-3.45m N2					
3.80	D			4.00				
						Complete at 4.00m		

Remarks
 DRY
 BACKFILLED

Scale (approx)
 1:50

Logged By
 rh

Figure No.
 001WARK.WS1

Reference A1

0-0.3m Brown occ light brown and rarely grey clayey topsoil with little sandstone gravel
0.3-1.5m Brown rarely ochre and dark purple brown ash with occ glass, rare pottery, rare coke gravel

Notes; Standpipe Installed – all made ground. dry

Reference A2

0-0.35m Brown occ light brown sandy topsoil type
0.35-0.8m Brown and grey brown gravelly clay fill with traces of red brick and coal fragments

Obstruction at 0.8m: Standpipe Installed – all made ground . dry

Reference A3

0-0.1m Brown sandy topsoil type
0.1-0.6m grey brown topsoil type with traces of brick and coal gravel
0.6-1.5m Firm and firm to stiff chocolate brown slightly silty gravelly clay

Standpipe installed. dry

Reference A4

0-0.1m Brown sandy topsoil type
0.1-0.45m dark grey black clinker and ash, glass, coke, small piece concrete
0.45-0.9m brown and buff clayey gravel with rare pockets of grey black ash and rare brick gravel
0.9-1.2m brown gravelly soil type and pockets of ash
1.2-1.5m purple brown clinker, ash and little broken crockery

Standpipe installed. dry

Reference A5

0-0.1m Brown sandy topsoil type and gravel and cobbles
0.1-0.6m grey brown gravelly clay fill and rare pieces of brick and rounded river gravel

Obstruction at 0.6m . Backfilled . dry

Reference A6

0-0.15m dark brown sl peaty topsoil type and piece polythene
0.15-0.45m buff sandstone gravel , weak and weathered and piece glass at base
0.45-1.2m purple brown clinker , ash , some coke , piece polythene, little ochre in places

Backfilled . dry

Sample A7 taken from gravel/rubble on surface close to the tree

Sample A8 taken of ash and cloth on a patch of grass from an old fire

ANALYTICAL TEST REPORT

Contract no: 82677
Contract name: Warkworth
Client reference: 19049
Clients name: Intersoil
Clients address: Suite 30
58 Low Friar Street
Newcastle Upon Tyne
NE1 5UE

Samples received: 25 November 2019
Analysis started: 25 November 2019
Analysis completed: 02 December 2019
Report issued: 02 December 2019

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:



Dave Bowerbank
Customer Support Hero

Chemtech Environmental Limited

SOILS

Lab number			82677-1	82677-2	82677-3	82677-4	82677-5	82677-6
Sample id			A1	A2	A3	A4	A4	A5
Depth (m)			0.50-0.80	0.30-0.60	0.30-0.60	0.00-0.30	1.20-1.50	0.30-0.60
Date sampled			-	-	-	-	-	-
Test	Method	Units						
Subcontracted analysis								
Asbestos (qualitative)	\$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			82677-7	82677-8
Sample id			A6	A6
Depth (m)			0.00-0.30	0.70-1.00
Date sampled			-	-
Test	Method	Units		
Subcontracted analysis				
Asbestos (qualitative)	\$	-	NAD	NAD

Chemtech Environmental Limited

SOLIDS

Lab number			82677-7	82677-8
Sample id			A7	A8
Date sampled			-	-
Test	Method	Units		
Subcontracted analysis				
Asbestos (qualitative)	\$	-	NAD	NAD

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOLIDS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-



ANALYTICAL TEST REPORT

Contract no: 82695
Contract name: Warkworth
Client reference: 19049
Clients name: Intersoil
Clients address: Suite 30
58 Low Friar Street
Newcastle Upon Tyne
NE1 5UE

Samples received: 25 November 2019
Analysis started: 02 December 2019
Analysis completed: 09 December 2019
Report issued: 09 December 2019

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed. BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:



Dave Bowerbank
Customer Support Hero

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
82695-1	A1	0.30-0.70	Clayey Sand with Gravel	-	-	24.1
82695-2	A1	1.30-1.70	Clayey Sand with Gravel	-	-	20.2
82695-3	A3	1.20-1.50	Clay with Gravel	-	-	17.9
82695-4	A4	0.90-1.20	Sandy Clay with Gravel	-	-	14.6
82695-5	A5	0.30-0.60	Sandy Clay with Gravel	-	-	15.1

Chemtech Environmental Limited

SOILS

Lab number			82695-1	82695-2	82695-3	82695-4	82695-5
Sample id			A1	A1	A3	A4	A5
Depth (m)			0.30-0.70	1.30-1.70	1.20-1.50	0.90-1.20	0.30-0.60
Date sampled			21/11/2019	21/11/2019	21/11/2019	21/11/2019	21/11/2019
Test	Method	Units					
Arsenic (total)	CE127 ^M	mg/kg As	30	30	8.0	7.2	9.6
Cadmium (total)	CE127 ^M	mg/kg Cd	1.3	4.0	0.2	0.2	0.2
Chromium (total)	CE127 ^M	mg/kg Cr	62	63	73	44	56
Copper (total)	CE127 ^M	mg/kg Cu	142	104	26	63	33
Lead (total)	CE127 ^M	mg/kg Pb	365	399	34	142	90
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 ^M	mg/kg Ni	95	69	52	35	35
Selenium (total)	CE127 ^M	mg/kg Se	2.8	1.4	1.1	0.9	1.0
Zinc (total)	CE127 ^M	mg/kg Zn	353	357	76	155	97
pH	CE004 ^M	units	7.4	7.9	8.1	7.6	8.0
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	641	270	192	122	51
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 ^M	% w/w C	17.3	14.5	0.8	6.4	1.9
PAH							
Naphthalene	CE087 ^M	mg/kg	<0.02	0.07	<0.02	<0.02	<0.02
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	0.19
Acenaphthene	CE087 ^M	mg/kg	<0.02	0.46	<0.02	<0.02	0.48
Fluorene	CE087 ^U	mg/kg	0.02	0.53	<0.02	<0.02	0.65
Phenanthrene	CE087 ^M	mg/kg	0.48	6.57	<0.02	0.21	7.26
Anthracene	CE087 ^U	mg/kg	0.18	2.59	<0.02	0.11	3.34
Fluoranthene	CE087 ^M	mg/kg	0.71	13.16	<0.02	0.81	14.49
Pyrene	CE087 ^M	mg/kg	0.60	10.56	<0.02	0.70	11.08
Benzo(a)anthracene	CE087 ^U	mg/kg	0.27	6.37	<0.02	0.45	6.39
Chrysene	CE087 ^M	mg/kg	0.27	6.05	<0.03	0.37	6.38
Benzo(b)fluoranthene	CE087 ^M	mg/kg	0.40	6.65	<0.02	0.65	7.28
Benzo(k)fluoranthene	CE087 ^M	mg/kg	0.11	2.89	<0.03	0.18	2.88
Benzo(a)pyrene	CE087 ^U	mg/kg	0.29	5.01	<0.02	0.46	5.34
Indeno(123cd)pyrene	CE087 ^M	mg/kg	<0.02	3.24	<0.02	0.17	3.55
Dibenz(ah)anthracene	CE087 ^M	mg/kg	<0.02	0.87	<0.02	<0.02	1.00
Benzo(ghi)perylene	CE087 ^M	mg/kg	<0.02	2.61	<0.02	0.04	2.90
PAH (total of USEPA 16)	CE087	mg/kg	3.33	67.6	<0.34	4.15	73.2
TPH							
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	<0.01	-	-	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	<0.01	-	-	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	<0.01	-	-	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	-	<1	-	-	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	-	2	-	-	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	-	38	-	-	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	-	36	-	-	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	-	5	-	-	-

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SOILS

Lab number			82695-1	82695-2	82695-3	82695-4	82695-5
Sample id			A1	A1	A3	A4	A5
Depth (m)			0.30-0.70	1.30-1.70	1.20-1.50	0.90-1.20	0.30-0.60
Date sampled			21/11/2019	21/11/2019	21/11/2019	21/11/2019	21/11/2019
Test	Method	Units					
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	<0.1	-	-	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	<0.1	-	-	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	<0.1	-	-	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	-	<4	-	-	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	-	10	-	-	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	-	491	-	-	-
EPH Aliphatic (>C35-C44)	CE068	mg/kg	-	137	-	-	-
EPH (>C10-C40)	CE033 ^M	mg/kg	303	589	16	56	428

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PREPARED LEACHATES

Lab number			82695-2L
Sample id			A1
Depth (m)			1.30-1.70
Test	Method	Units	
Arsenic (dissolved)	CE128 ^u	µg/l As	0.64
Cadmium (dissolved)	CE128 ^u	µg/l Cd	<0.07
Lead (dissolved)	CE128 ^u	µg/l Pb	<0.2
Mercury (dissolved)	CE128 ^u	µg/l Hg	<0.008
Nickel (dissolved)	CE128 ^u	µg/l Ni	0.8
PAH			
Naphthalene	CE051	µg/l	<0.1
Acenaphthylene	CE051	µg/l	<0.1
Acenaphthene	CE051	µg/l	4.6
Fluorene	CE051	µg/l	2.0
Phenanthrene	CE051	µg/l	9.2
Anthracene	CE051	µg/l	1.5
Fluoranthene	CE051	µg/l	2.3
Pyrene	CE051	µg/l	1.3
Benzo(a)anthracene	CE051	µg/l	<0.1
Chrysene	CE051	µg/l	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1
PAH (total of USEPA 16)	CE051	µg/l	21.0
BTEX & TPH			
Benzene	CE057 ^u	µg/l	<1
Toluene	CE057 ^u	µg/l	<1
Ethylbenzene	CE057 ^u	µg/l	<1
m & p-Xylene	CE057 ^u	µg/l	<1
o-Xylene	CE057 ^u	µg/l	<1
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	7
EPH Aromatic (>EC16-EC21)	CE161	µg/l	21
EPH Aromatic (>EC21-EC35)	CE161	µg/l	4
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1
VPH Aliphatic (>C5-C6)	CE175	µg/l	<1
VPH Aliphatic (>C6-C8)	CE175	µg/l	<1
VPH Aliphatic (>C8-C10)	CE175	µg/l	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	18
EPH Aliphatic (>C12-C16)	CE161	µg/l	32

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number	82695-2L		
Sample id	A1		
Depth (m)	1.30-1.70		
Test	Method	Units	
EPH Aliphatic (>C16-C35)	CE161	µg/l	66
EPH Aliphatic (>C35-C44)	CE161	µg/l	3

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	As received		0.5	mg/kg PhOH
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		4	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg

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METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE002	Leachate preparation (EA)	L:S 10:1		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE051	Naphthalene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluorene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Phenanthrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Chrysene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(b)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(k)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Indeno(123cd)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Dibenz(ah)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(ghi)perylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE057	Benzene	Headspace GC-FID	U	1	µg/l
CE057	Toluene	Headspace GC-FID	U	1	µg/l
CE057	Ethylbenzene	Headspace GC-FID	U	1	µg/l
CE057	m & p-Xylene	Headspace GC-FID	U	2	µg/l
CE057	o-Xylene	Headspace GC-FID	U	1	µg/l
CE175	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE161	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID		1	µg/l
CE175	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE161	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID		1	µg/l

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
82695-1	A1	0.30-0.70	N	
82695-2	A1	1.30-1.70	N	
82695-3	A3	1.20-1.50	N	
82695-4	A4	0.90-1.20	N	
82695-5	A5	0.30-0.60	N	

SUNCROFT, WARKWORTH, NORTHUMBERLAND – PLATES (NOV 2019)



Arisings from A1



Arisings from A2



Natural Clay below made ground in A3

SUNCROFT, WARKWORTH, NORTHUMBERLAND – PLATES (NOV 2019)



Arisings from A4



Arisings from A5



Arisings from A6

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Suncroft House & Garden Station Road, Warkworth Environmental Study

Prepared by Alistair MacDonald (*BSc, MSc, LL.M, CGeol, FGS*)
Intersoil Ltd.

CONTENTS

- 1 Commission, Purpose and Scope
- 2 Searches
- 3 Previous Ground Investigations
- 4 Fieldwork
- 5 Monitoring Standpipes
- 6 Ground Conditions
- 7 Malodours
- 8 Obstructions
- 9 Stability
- 10 In Situ Testing
- 11 Groundwater
- 12 Soil Gas
- 13 Assessment & Conclusion

APPENDICES

Site Plan
Historical Maps
Exploratory Location plan
Exploratory Logs
Soil Gas Results

Draft 13 June 2013

Intersoil Limited
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Date: 13 June 2013
Ref: Issue 12023/amd2

Ms. Forsyth
Suncroft
Station Road
Warkworth

Suncroft House & Garden Station Road, Warkworth Environmental Study

1. COMMISSION, PURPOSE & SCOPE

Intersoil was commissioned to undertake an environmental study within the grounds of Suncroft, Station Road, Warkworth. The purpose of the study was to provide an environmental and historical context and background information on the site and its surroundings, supplemented by a general and up to date overview of ground conditions across the Site (house and garden) from exploratory boring and shallow hand dug pits.

The purpose of this report was to establish the history and ground conditions of land occupied by a house (Suncroft) and gardens. Specifically, the objective was to establish if refuse or ashy waste was present in the garden area. The scope was prepared following discussions at a site visit in April 2013. This report has been prepared solely for Ms. Forsyth of Suncroft. This report is valid for 12 months from date of issue by Intersoil.

2. SEARCHES

2.1 Site Description

The study area and location are presented in the Appendix. The site is centred on O.S. Grid Reference 424780E, 606370N and has an approximate area of 1800m². Access is off Station Road. The site rises from Station Road along the southern boundary. It is occupied by a private house and garden with hedge and associated outbuildings. There was no visual evidence of land contamination, poor house-keeping, distressed vegetation or significant ground irregularity (depressions or mounds) on Site at the time of the site visit. A tank thought to contain heating oil was noted.

The land to the south, east and west are similarly residential with open gardens. The land to the north comprises open scrub, ashy gravel and woodland with a small workshop.

2.2 Historical Maps

A number of maps previously issued by the Ordnance Survey were acquired and selected large scale maps are presented in the Appendix. Table 1 shows the main features:

Date	Onsite	Offsite	Comments
1855	Open ground	Quarry and woodland immediately north east Well 100m south west Cemetery 50m south east	Open ground
1897	No change	Quarry boundary retracted 20m north Housing south of site	
1923	Small outbuilding in north of plot	Quarry shown occupying its original boundary	Small outbuilding in north of site
1959	No change	Housing extending to west	
1981	House and outbuildings on site	Housing extending west, next door.	House and outbuildings on site
1989	Little change	Little change	
2012	Little change	Little change	

TABLE 1: SUMMARY OF HISTORICAL LAND USE

Information provided by the Client indicates that the property was acquired in the late 1950's. Correspondence suggests that the quarry immediately north of the Site was, around that time, operated as a tip by the Council.

2.3. Environmental Database Search

An Homecheck report¹ was acquired as part of the study and the following aspects of environmental information are summarised as follows:

Description	Onsite (Y/N)	Close to site (Y/N)	Comments
Landfill Site	N	Y	Old Council Tip north east of the Site Ref PA15 Northumberland County Council Closed 1970
Waste Transfer and treatment	N	N	-
Integrated Pollution Control licensing	N	N	-
Radioactive Licencing	N	N	-
Hazardous substances licencing	N	N	-
Dangerous Substances	N	N	-
Control of Major Accident Hazards	N	N	-
Emissions to air	N	N	-
Contraventions of groundwater or pollution	N	N	-
Contaminated land Register	N	N	-

¹ Envirocheck Report Ref 45677749-1 dated 23 April 2013 . Envirocheck reports are copyright.

Past Land uses	Y	Y	Quarry and landfilling immediately or within 20m north of the site Factory/Works 145m north east Cemetery 50m south east Possible tanks 240 south east
Contemporary Land uses	N	Y	-
Flooding	Y	Y	Pluvial & surface water risk possible
Other	Y	Y	See geology and hydrogeology sections

TABLE 2: ENVIRONMENTAL DATA

3.3 Mining & Geology

The site is shown to overlie Devensian Till of the Quaternary. The underlying geology is shown to be the Stainmore Formation of the Carboniferous, comprising sandstones, limestone and mudstones. No previous soil investigation data has been identified for the Site. Information from the British Geological Survey (BGS) shows two boreholes were sunk in the wider area. One is located along Station Road and the second on the Birling Road beyond the east of the site. The BGS database suggests, however, that the boreholes were relatively shallow and did not exceed 2m depth. The Envirocheck report suggests a possible risk of coal seams at shallow depth in the area.

3.4 Hydrogeology & Hydrology

The site is located on thin Devensian till (clay) overlying sandstone. There may be perched water within any made ground above the clays. The sandstones and potentially limestones within the Stainmore formation have aquifer properties. The nearest discharge consent is 116m south east of the site and licenced to Northumbrian Water. A second discharge consent applies to Birling Farm 170m north of the site. The nearest major surface water feature is the River Coquet. This flows eastward and is 50m south of the site.

3.5 Radon

Reference to an environmental database report confirms that radon is not an issue in the area and between 1 and 3% of properties are thought to be affected in the wider area.

3.6 Character Summary

Based on an assessment of the historical maps and environmental information provided, the site has been exposed to the following:

Potential Major Contaminative use Onsite	None
Potential Minor Contaminative use Onsite	Above ground tank
Offsite Potential Contaminative use (immediate vicinity)	Old quarry and landfill Builders compound
Offsite Potential Contaminative use (wider area)	Works to north

TABLE 3: SUMMARY OF CONTAMINATIVE EXPOSURE

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3.7 Risk Assessment

The data collated from site has been assessed and the following possible receptors have been considered within a '*conceptual model*'. This is a summarised assessment which outlines the potential issues within or near the site that may impact the proposed development.

Potential Sources

In general, potential sources of contamination relate to determinants within the made ground which may contain toxic or phytotoxic substances which may be viewed as a potential hazard. Historical maps supplemented by other search data have not revealed any potentially contaminating land use on the Site.

Given the proximity of the old quarry which has been partly backfilled, there is some risk of elevated soil gas in the area. However, there was no obvious clay capping or other cover across the ground.

Potential Pathways

These are the means by which sources of contamination may reach sensitive receptors. This may comprise:

- Dermal contact
- Ingestion
- Inhalation
- Migration in dust
- Migration in vapours
- Groundwater
- Surfacewater

Potential Receptors

There are a number of potential receptors to be considered when re-development is planned. These may comprise:

- Construction Workers
- Future End Users
- The Public and users of adjoining land
- Property (concrete and utilities)
- Vegetation
- Animals
- Surface Water

For a potential hazard to be present there must be a relationship between the source and the receptors (or those at risk from contamination). This is termed the *source-pathway-receptor* relationship. Assuming all 3 elements are present, there are various combinations which may appear to be relevant to this site, albeit remote. A number of these are or may be perceived to be either likely (in terms of occurrence) or unlikely and a risk rating (in terms of potential effects or impact) has been assigned accordingly.

Receptor	Pathway	Effects	Potential	Risk Rating
Shallow Groundwater from offsite source	Percolation through made ground	Contamination of perched water and drainage	LOW	LOW
Groundwater in Bedrock	Percolation from perched water	Contamination of groundwater	LOW	LOW
Construction Workers. Site Operatives	Dermal Contact Ingestion Inhalation	Health Effects	LOW	LOW
Public & Neighbours	Inhalation & Ingestion to Public	Health Effects	LOW	LOW
Site users	Inhalation, dermal contact and ingestion	Contamination from previous development and soil gas migration	LOW	LOW
Surface Water	Migration via perched water	Contamination from drainage and perched water migration	LOW	LOW
Property	Direct Contact	Aggressive Ground Conditions. Possible elevated soil gas	LOW-MED	LOW-MED
Wildlife (Burrowing mammals or foragers)	Dermal Contact Ingestion Inhalation	Health Effects	LOW	LOW

TABLE 4: CONCEPTUAL MODEL & PRELIMINARY RISK ASSESSMENT

The Conceptual Model provides information on relevant relationships that are thought possible or likely based on the sites current use. This investigation has identified a 'low' risk category for most of the elements related to soil contamination. A soil investigation was commissioned to provide up to date information on the ground conditions and establish soil gas conditions. Exploratory work was also undertaken within the old tip. This is reported elsewhere.

4. EXPLORATORY FIELDWORK

Fieldwork was undertaken on the 25th April 2013. Two boreholes and a shallow augered pit was excavated in the garden between the house and the old quarry. A light percussion rig was used to sink the boreholes. A series of small disturbed samples were taken as the borehole progressed. Any suspect samples of made ground were stored in smoked glass bottles and vials. Three hand dug pits were also excavated to 0.6m depth along the boundary.

5. MONITORING STANDPIPES

Monitoring standpipes were installed in selected boreholes as follows:

- BH1- 3m (50mm dia.)
- BH2- 1m (50mm dia.) hand augured hole
- BH3- 3m (50mm dia.)

The standpipes were slotted 50mm in diameter with plain pipe in the top 0.5m and completed with a steel tap and rubber bung and plastic cover. Below the ground the pipe annulus was surrounded by 10mm pea gravel and the top 300mm sealed by bentonite pellets.

6. GROUND CONDITIONS

6.1 Made Ground – crushed rubble and debris

A dark grey brown and brown clayey topsoil type made ground was encountered in all three boreholes and was found to be from 0.2, 0.4 and 0.5m in thickness.

6.2 Natural Superficial Deposits

The topsoil type cover was underlain by firm or firm to stiff dark brown clay with sandstone gravels. This extended to 3m depth in two of the boreholes and to the base of the shallow augered pit (1m). Hand dug pits encountered thin topsoil type soils over brown clay.

6.3 Solid Geology

None of the boreholes proved rock-head.

7. MALODOURS

No malodours were reported.

8. OBSTRUCTIONS

None of the boreholes were terminated early.

9. STABILITY

No trial pits were excavated and no comment is made of excavation stability.

10. IN-SITU TESTING

10.1 Shear Vanes in clay

Seven shear vanes were undertaken in the clay. Results ranged from 54kPa (firm) to 119kPa.

10.2 Probing

No dynamic probing was undertaken.

11. GROUNDWATER

Ground water was not encountered during boring. Groundwater monitoring from shallow standpipes was undertaken from the three standpipes as follows:

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BOREHOLE	27 April	17 May	23 May	24 May	4 June	13 June
1(3m)	Dry	Dry	Dry	Nm	Dry	Dry
2 (1m)	Dry	Dry	Dry	Nm	Dry	Dry
3 (3m)	0.73	0.73	0.72	Nm	0.78	0.94

TABLE 5: Groundwater Monitoring

Nm =not measured. Metres below surface.

12. SOIL GAS

Soil gas monitoring was undertaken on 6 occasions. Gas monitoring was undertaken using a Gas data LMS portable gas analyser. No methane was detected. Carbon dioxide was low where detected and did not exceed 0.9%. Oxygen levels remained above 18%. No positive and maintained flow was recorded although there were minor fluctuations noted periodically. One of the six surveys was undertaken at low atmospheric pressure.

13. ASSESSMENT & CONCLUSION

The purpose of this report was to establish the history and ground conditions of land occupied by a house (Suncroft) and gardens. Specifically, the objective was to establish if refuse or ashy waste was present in the garden area. The presence of the backfilled quarry is highlighted in environmental database searches acquired as part of property searches routinely undertaken as part of land transactions.

This study shows that the plot forming the existing house and garden forming Suncroft was acquired in the late 1950's. Historical maps indicate that the plot was located just south of a quarry which was subsequently backfilled with waste until 1970. There is no evidence to suggest that the plot was exposed to, or formed part of, the old tip.

In order to provide additional certainty, three boreholes were sunk between the house and the edge of the former quarry. The boreholes did not encounter any refuse or ashy fill evident on the surface of the nearby tip. Clayey topsoil type soils were found to overlie firm brown clays which extended to at least 3m depth from surface. Three hand dug pits along the boundary with the wall, fence and hedge extended to 0.6m and did not encounter ash or refuse.

Soil gas monitoring has not detected any elevated concentrations of soil gas of concern.

Groundwater was detected in only one of the 3 exploratory holes. It is considered to be perched, accumulating from ingress from the surface and rainwater and perched within the clay.

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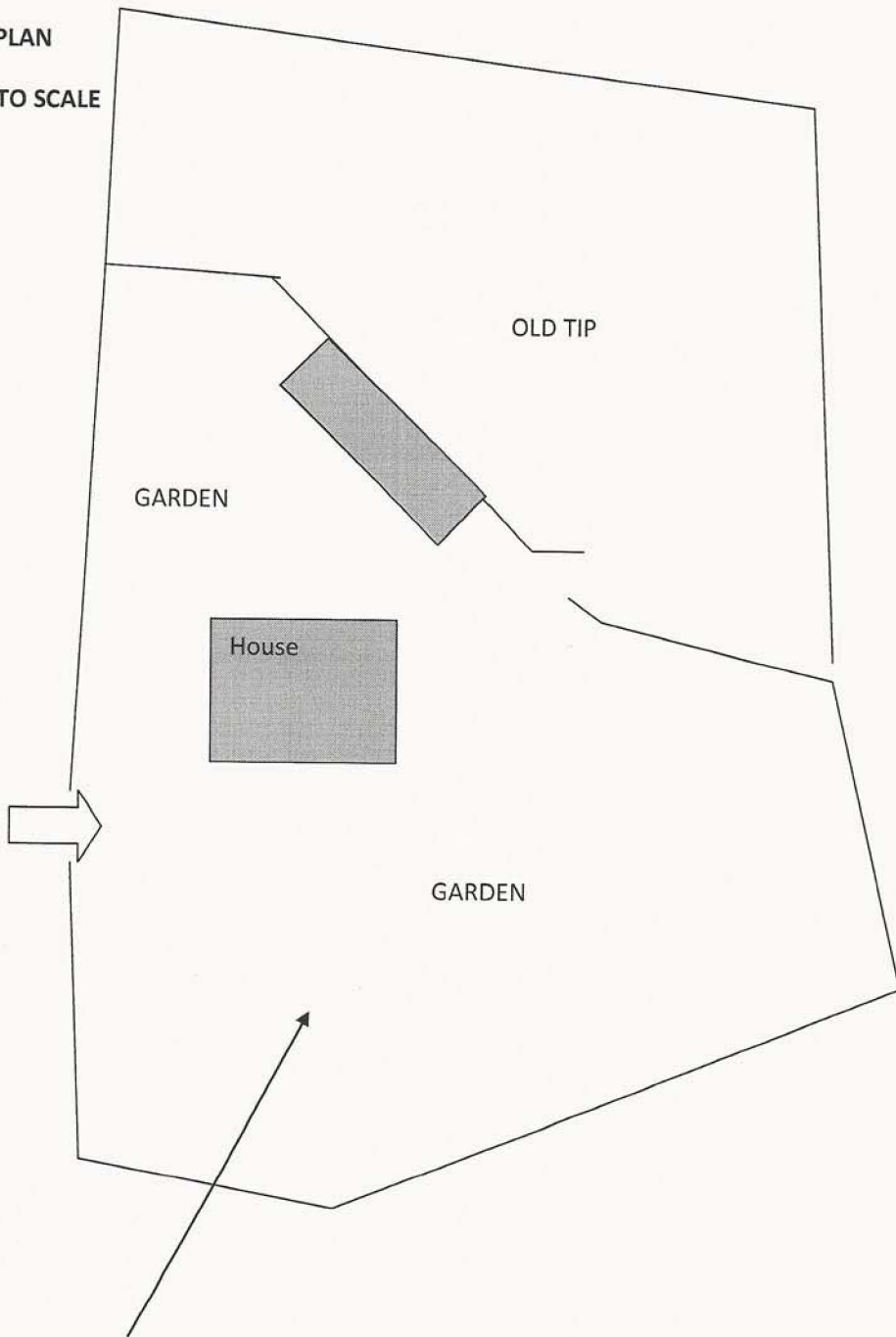
APPENDICES

Site Plan
Historical Maps
Exploratory Location plan
Exploratory Logs
Soil Gas Results



SITE PLAN

NOT TO SCALE



SUNCROFT HOUSE & GARDEN

SITE PLAN

JUNE 2013



Site Details:

BUILDERS YARD 18M FROM
SUNCROFT STATION ROAD,
55M FROM STATION ROAD,
NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: MasterMap
Map date: 2012
Scale: 1:1,250
Printed at: 1:2,500

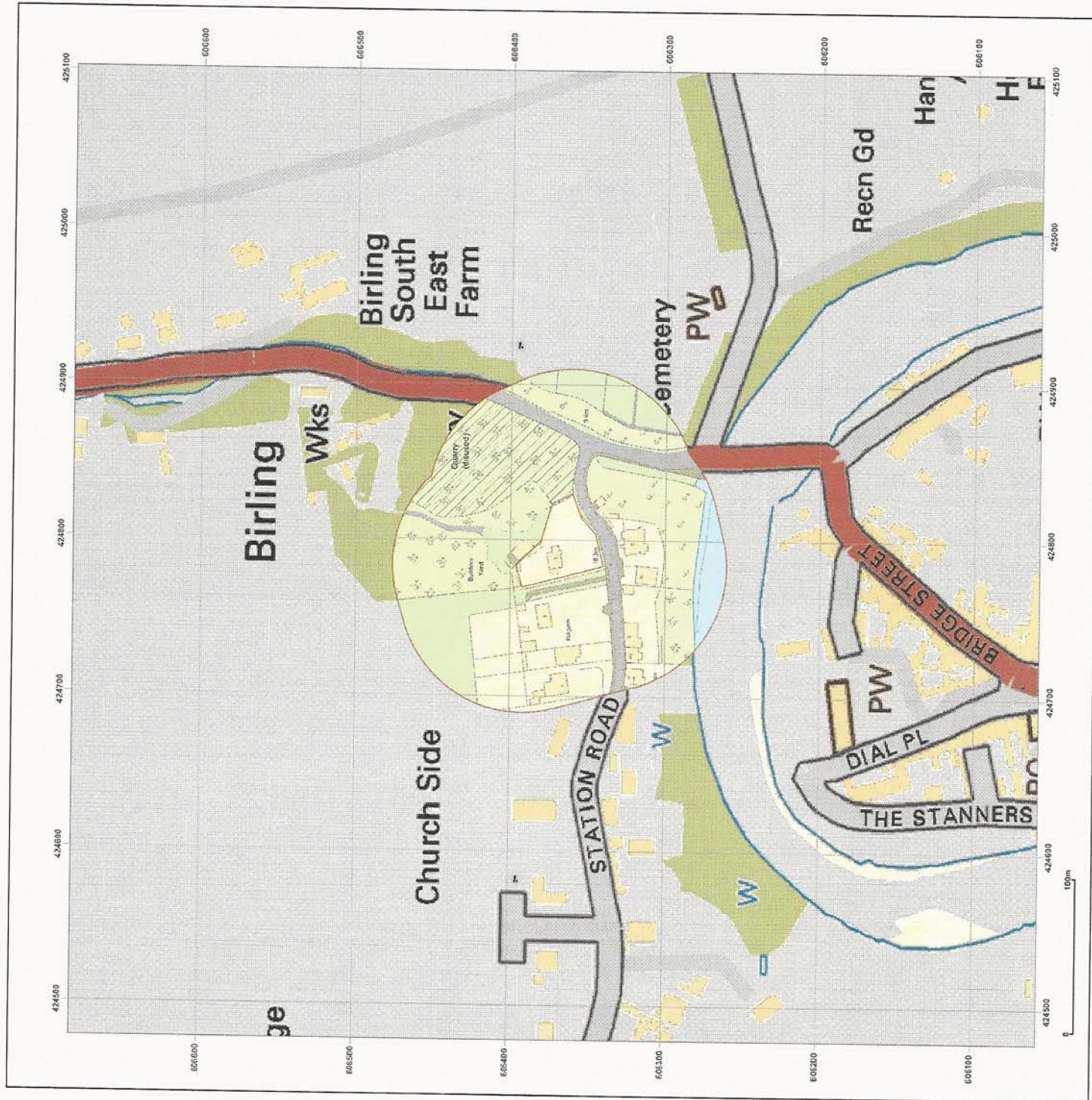


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T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

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Production date: 15 April 2013

To view map legend click here [Legend](#)





Site Details:
 BUILDERS YARD 18M FROM
 SUNCROFT STATION ROAD,
 55M FROM STATION ROAD,
 NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: National Grid
Map date: 1984-1989
Scale: 1:2,500
Printed at: 1:2,500



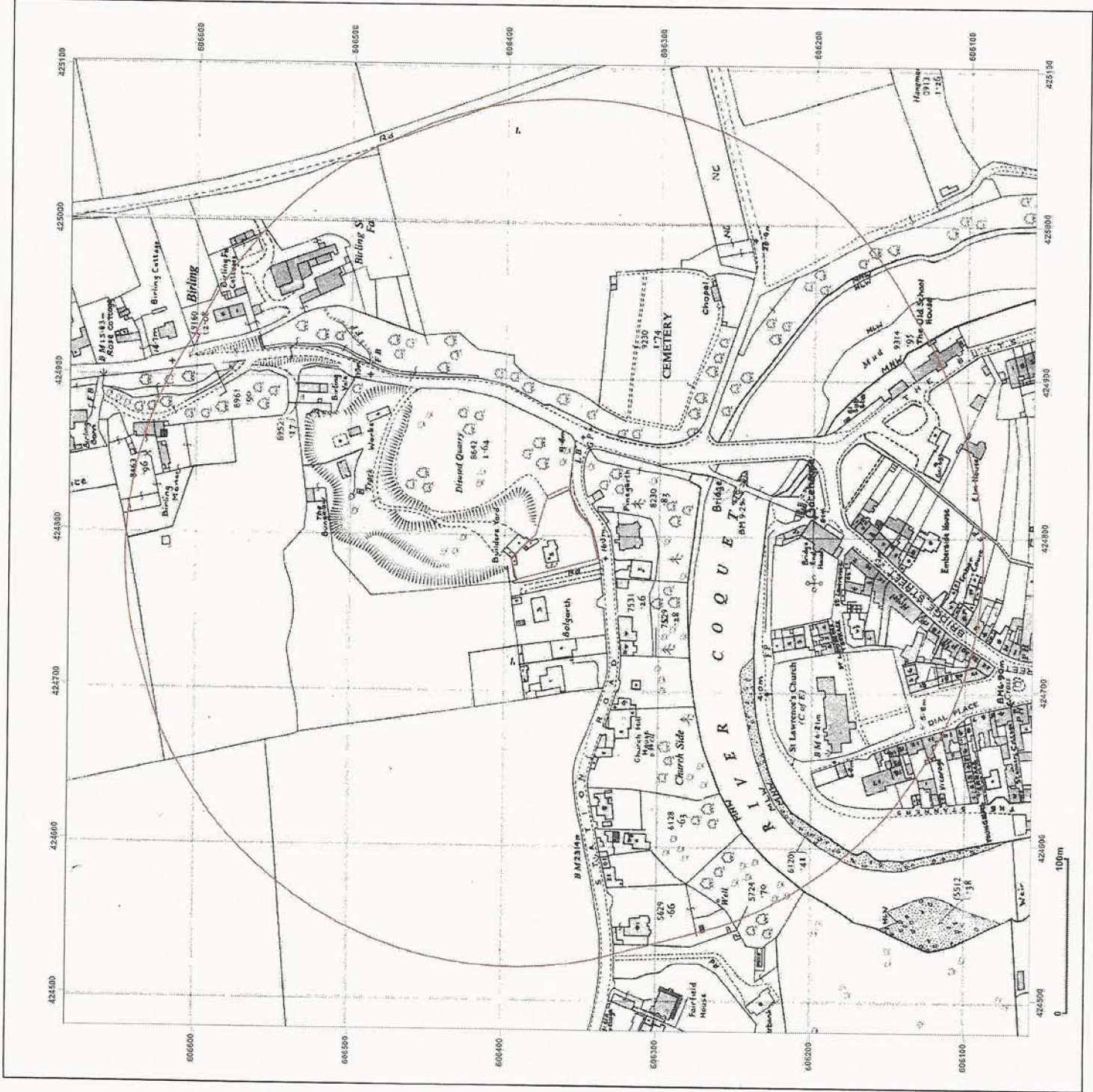
Surveyed 1966
 Revised 1988
 Edition N/A
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Site Details:

BUILDERS YARD 18M FROM
SUNCROFT STATION ROAD,
55M FROM STATION ROAD,
NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: National Grid

Map date: 1981

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1948
Revised 1981
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Site Details:

BUILDERS YARD 18M FROM
SUNCROFT STATION ROAD,
55M FROM STATION ROAD,
NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: National Grid

Map date: 1959

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1959
Edition N/A
Copyright 1960
Levelled 1948

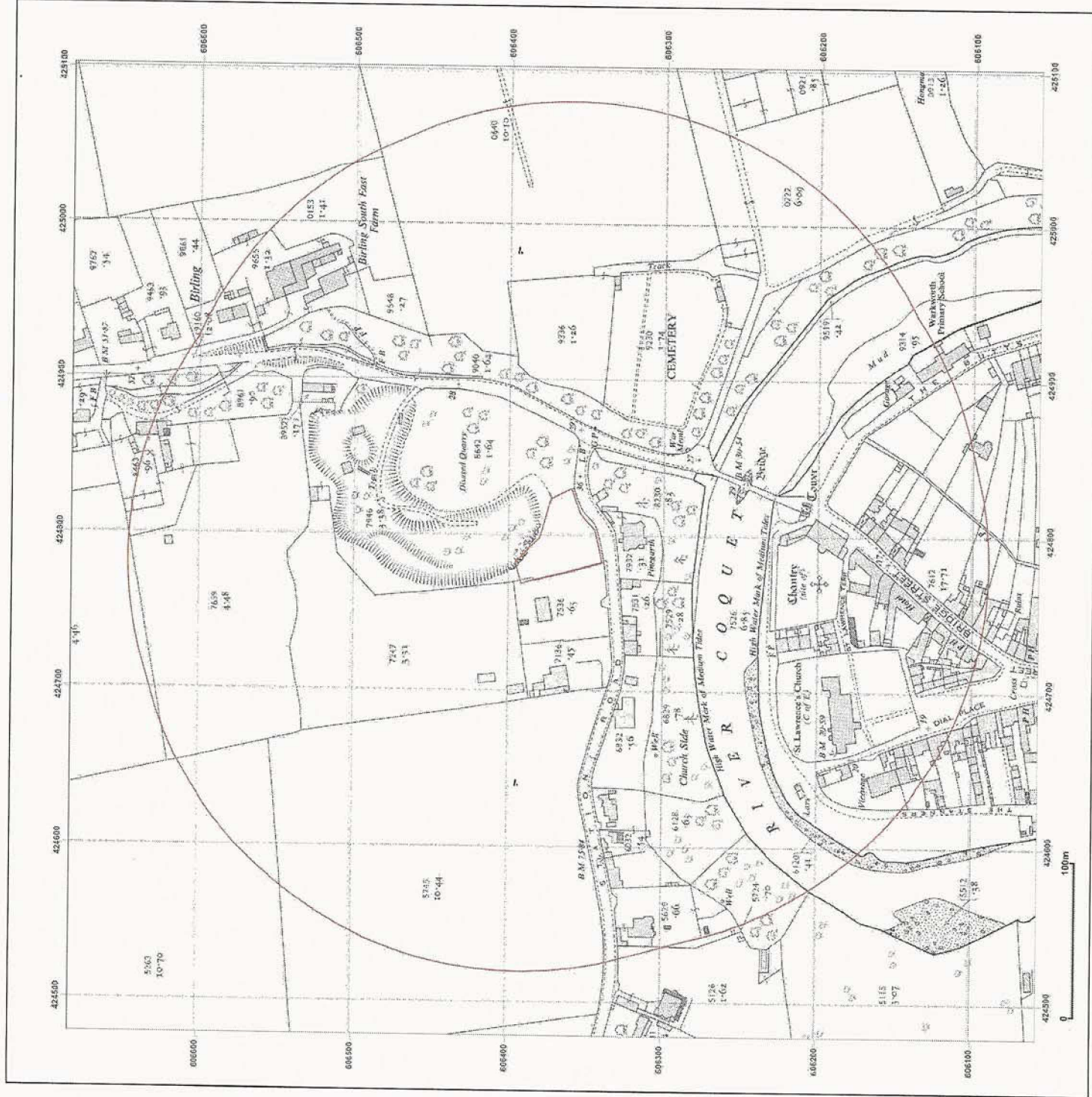


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Site Details:

BUILDERS YARD 18M FROM
SUNCROFT STATION ROAD,
55M FROM STATION ROAD,
NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: County Series

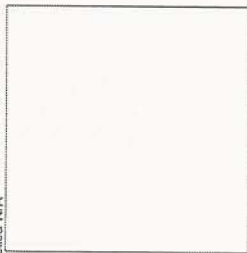
Map date: 1923

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1923
Revised 1923
Edition N/A
Copyright N/A
Levelled N/A



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Site Details:

BUILDERS YARD 18M FROM
SUNCROFT STATION ROAD,
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NE65 OXP

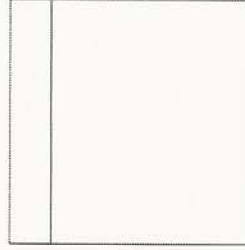
Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: County Series

Map date: 1897

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1897
Revised 1897
Edition N/A
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Site Details:

BUILDERS YARD 18M FROM
SUNCROFT STATION ROAD,
55M FROM STATION ROAD,
NE65 0XP

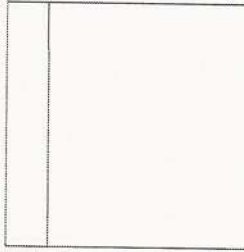
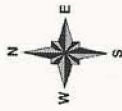
Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: County Series

Map date: 1855

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1855
Revised 1855
Edition N/A
Copyright N/A
Laravelle N/A



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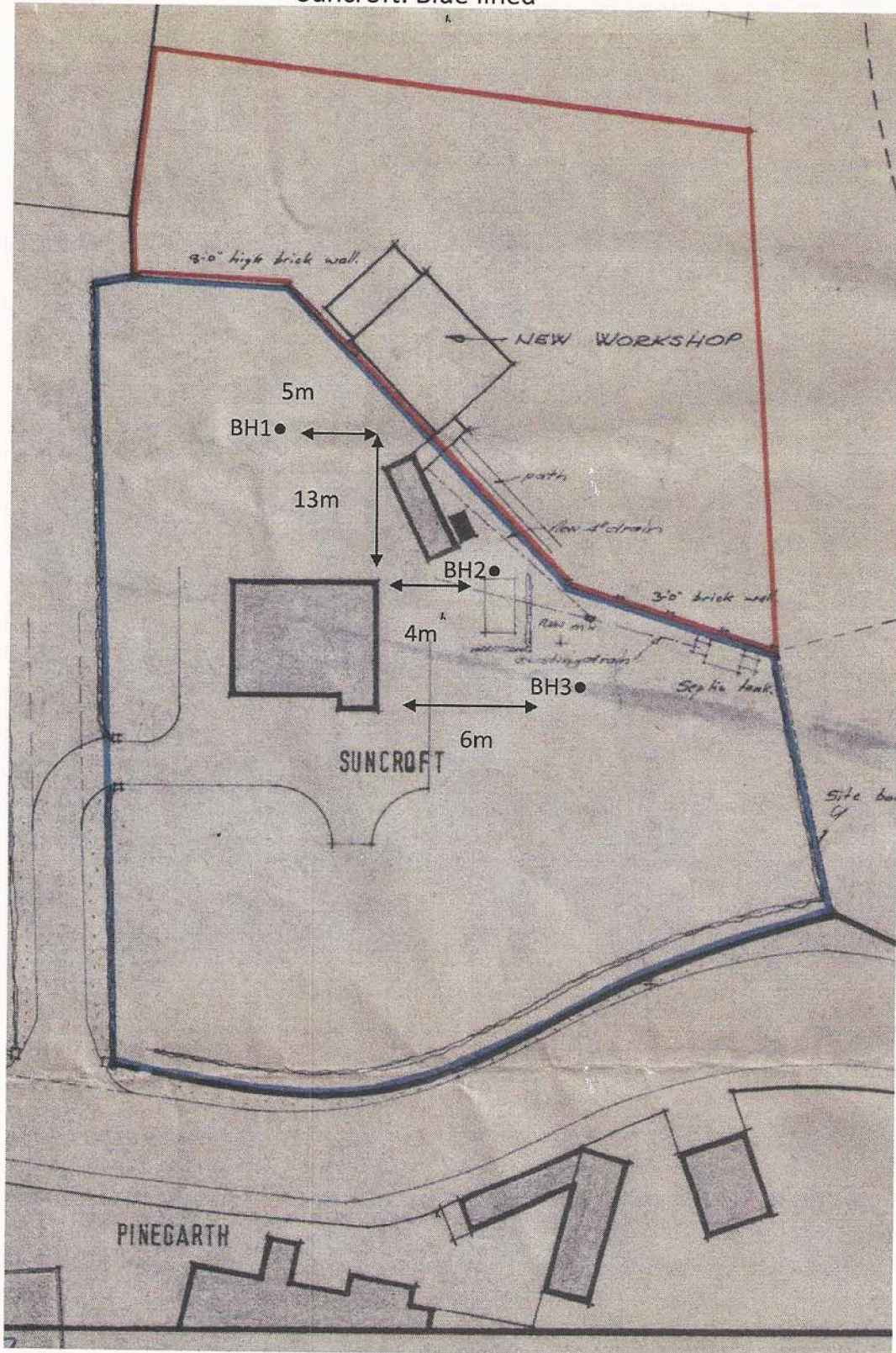
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Production date: 15 April 2013

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Suncroft: Blue lined



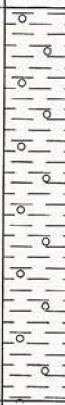


BOREHOLE LOCATIONS

(BH2 - Hand Augured)

BOREHOLE LOG

Project suncroft warkworth				BOREHOLE No BH1	
Job No 13032	Date 24-04-13	Ground Level (m)	Co-Ordinates ()		
Contractor INTERSOIL				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
						(0.40)	Topsoil type (MADE GROUND)		
						0.40 (0.70)	Firm dark brown CLAY		
						1.10 (1.90)	Firm to stiff dark brown sandy CLAY with little gravel		
						3.00			



Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											PIPE TO 3M DRY

All dimensions in metres Scale 1:34.375	Client Forsyth	Method/ Plant Used	Logged By AM
--	----------------	-----------------------	-----------------

AGS3 UK BH WARKWORTH SUNCROFT.GPJ AGS 3 1.GDT 14/6/13

BOREHOLE LOG

Project suncroft warkworth				BOREHOLE No BH2	
Job No 13032	Date 24-04-13	Ground Level (m)	Co-Ordinates ()		
Contractor INTERSOIL				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
						(0.50) 0.50	Topsoil type (MADE GROUND)		
						(0.50) 1.00	Firm dark brown CLAY with little gravel		

AGS3 UK BH WARKWORTH SUNCROFT.GPJ AGS 3 1.GDT 14/6/13

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											PIPE TO 1M DRY
All dimensions in metres Scale 1:34.375			Client Forsyth			Method/ Plant Used			Logged By AM		

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

1

SOIL GAS SURVEY

27-Apr-13

1015 MILLIBARS

1015 MILLIBARS

cool dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2013
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.3	21.6	nmf	dry to 3m base	
BH2	0	0	0.3	21.3	nmf	dry to 0.73m base	
BH3	0	0	0	21.7	nmf	NM	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

2

SOIL GAS SURVEY

17-May-13

1005 MILLIBARS

1005 MILLIBARS

cool dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.2	20.2	nmf	dry to 3m base	
BH2	0	0	0.2	20.3	nmf	dry to 0.73m base	
BH3	0	0	0	20.8	nmf	0.73m	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

3

SOIL GAS SURVEY

23-May-13

1009 MILLIBARS

1009 MILLIBARS

sun breezy

NOTES

- 1) nmf=no maintained flow
- 2) positive flow rate fluctuated during readings
- 3) Gasdata LM1 used: Next calibration due May 2014
NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.1	20.2	nmf	dry to 3m base	
BH2	0	0	0.2	20.3	nmf	dry to 0.73m base	
BH3	0	0	0.2	20.5	nmf	0.72m	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

4

SOIL GAS SURVEY

24-May-13

1011 MILLIBARS

1011 MILLIBARS

Cool dry

NOTES

- 1) nmf=no maintained flow
- 2) positive flow rate fluctuated during readings
- 3) Gasdata LM1 used: Next calibration due May 2014
NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.1	20.5	nmf	NM	
BH2	0	0	0.2	20.8	nmf	NM	
BH3	0	0	0.2	21.1	nmf	NM	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

5

SOIL GAS SURVEY

04-Jun-13

1030 MILLIBARS

1030 MILLIBARS

dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.4	20.1	nmf	dry	
BH2	0	0	0.7	19.8	nmf	dry	
BH3	0	0	0.1	20.5	nmf	0.78m	

intersoil.co.uk

Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

6

SOIL GAS SURVEY

13-Jun-13

998 MILLIBARS

998 MILLIBARS

dry. Mild

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.8	20	nmf	dry	
BH2	0	0	0.9	19.2	nmf	dry	
BH3	0	0	0.1	20.4	nmf	0.94m	

Intersoil Limited
Suite 30, 58 Low Friar Street
Newcastle,
NE1 5UE
TEL 01670 515566
FAX 01670 515577

Date: 13 June 2013
Ref: issue 13024/amd2

Ms. Forsyth
Suncroft
Station Road
Warkworth

Land at the rear of Suncroft

Commission

Intersoil was commissioned to undertake an environmental investigation of part of a former quarry and backfilled tip (termed the 'old tip') at the rear (north) of Suncroft, located off Station Road, Warkworth. The site comprises rough ground, woodland and a small workshop.

Purpose

The purpose of the investigation was to provide basic environmental information on the content of the old tip.

Scope

The scope comprised sinking two exploratory boreholes, the installation of soil gas standpipes and subsequent environmental testing of soils and gas monitoring.

Fieldwork

Two lightweight percussion boreholes were undertaken using a mini-rig. Fieldwork was undertaken on the 24th April 2013. Boreholes were planned to extend to 5m. A number of disturbed samples were taken at metre intervals from each borehole. A number of in-situ Standard Penetration Tests (SPT's) were undertaken at metre intervals. Boreholes extended to 5m in Borehole 4 and 4.2m in Borehole 5.

Ground Conditions

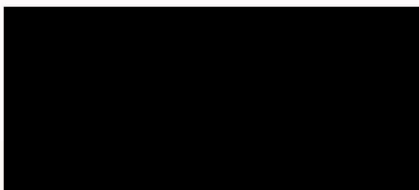
Made ground comprising ashy gravel with brick rubble, glass, clinker, slate and a little plastic was noted in both locations. It extended from surface to 4.8m in Borehole 4 and to the base (4.2m) of Borehole 5. Firm brown poorly laminated clay was noted between 4.8 and 5m depth in Borehole 4.

Installations

Standpipes were installed in each borehole. Slotted pipe was 3m in length and 50mm in diameter. The standpipes were surrounded by pea gravel and the annulus sealed by bentonite pellets. A gas tap was placed at the top of each pipe and marked by plastic headworks.

In-Situ Testing

The results of the SPT testing recorded values between N1 and N5. No progress was possible beyond 4.2m in Borehole 5.



Intersoil Limited
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Newcastle,
NE1 5UE
TEL 01670 515566
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Soils Analysis

Three samples of ashy fill underwent testing by Chemtech (reported in Certificate 48007). The samples were scheduled for a range of heavy metals, phenol, cyanide, water soluble sulphate, sulphides, acidity, organic content and hydrocarbons (total petroleum hydrocarbons – TPH and polycyclic aromatic hydrocarbons - PAH). The results are appended.

Leaching

A leaching test was undertaken on the soil sample containing the highest arsenic concentration. The sample underwent analysis for a range of heavy metals and PAH hydrocarbon. The results are appended.

Soil Gas Monitoring

Six soil gas surveys have been undertaken. Monitoring was undertaken using a Gasdata LMS portable meter. The meter underwent its factory calibration in early May 2013. No methane was detected. Carbon dioxide was a little elevated at times and reached a maximum of 7.4% on the 24th May 2013. Oxygen concentrations dropped to a low of 16.1% on the 24th May. No maintained positive flow was recorded during the surveys. However some minor fluctuation in flow was recorded periodically. The results are appended.

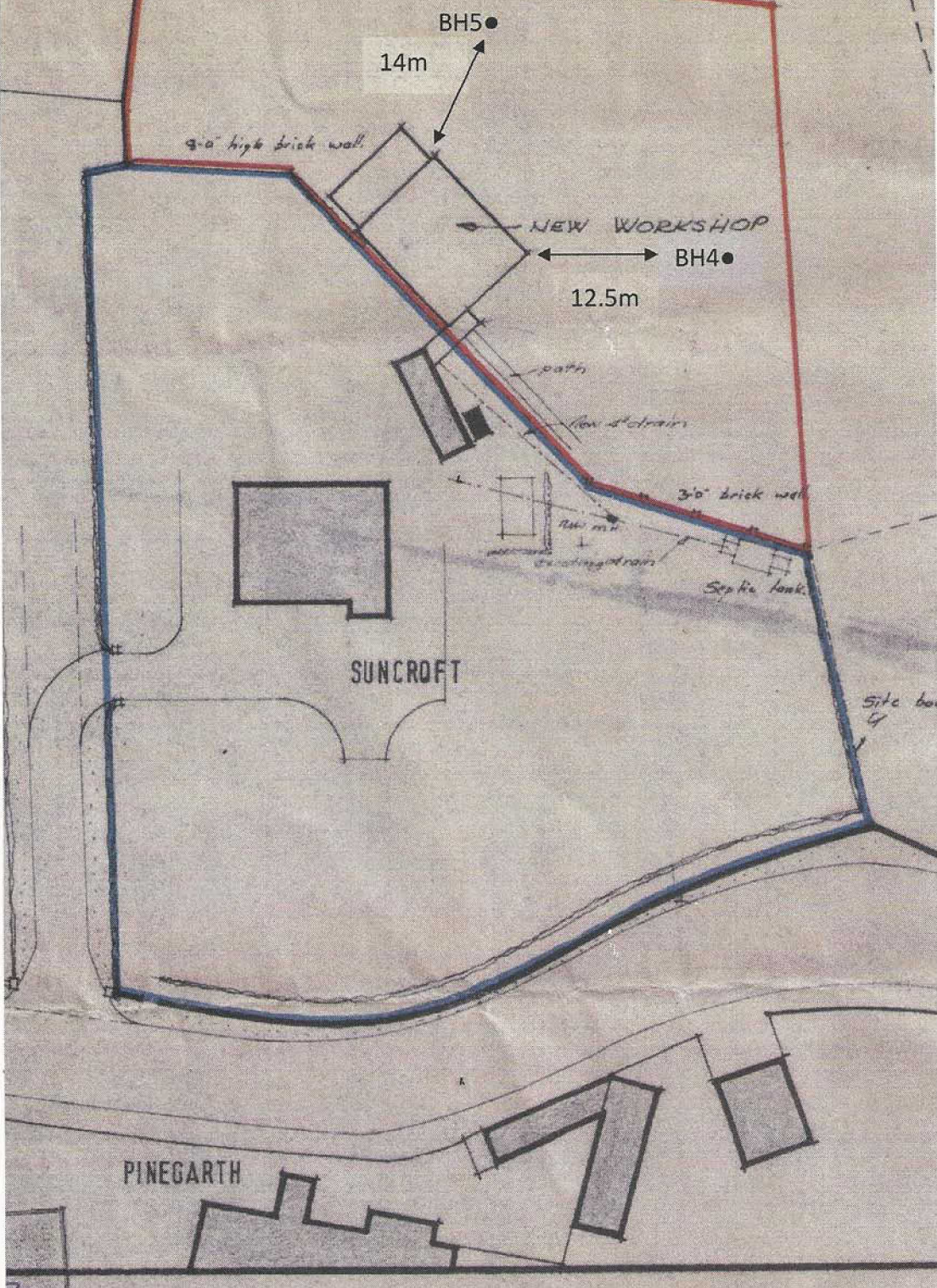
Groundwater

No groundwater was recorded during boring. No groundwater was recorded in the standpipes during monitoring.

Intersoil Ltd

Enc:
Borehole Locations
Borehole Logs
Gas Results
Soil Analysis Results

Land at Rear of Suncroft: Red



BOREHOLE LOG

Project suncroft warkworth				BOREHOLE No BH4	
Job No 13032	Date 24-04-13	Ground Level (m)	Co-Ordinates ()		
Contractor INTERSOIL				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.30	D						MADE GROUND loose grey and grey black ash, with clinker, little glass, slate, brick, plastic gravel		
0.80	D								
1.00	SPT	N2							
1.80	D								
2.00	SPT	N2							
2.80	D					(4.80)			
3.00	SPT	N1							
3.80	D								
4.00	SPT	N5							
4.80	D					4.80			
						5.00	Firm brown sandy laminated CLAY		

AGS3 UK BH WARKWORTH SUNCROFT.GPJ AGS 3.1.GDT 14/8/13

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											PIPE TO 3M DRY

All dimensions in metres Scale 1:34.375	Client Forsyth	Method/ Plant Used	Logged By AM
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BOREHOLE LOG

Project suncroft warkworth				BOREHOLE No BH5	
Job No 13032	Date 24-04-13	Ground Level (m)	Co-Ordinates ()		
Contractor INTERSOIL				Sheet 1 of 1	

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
0.30	D				X	(0.60)	MADE GROUND grey brown clay fill with brick rubble and sandstone cobble and gravel. little ash.	
0.80	D				X	0.60	MADE GROUND Very loose grey and grey black, grey brown ash and clinker, brick rubble, glass, slate, plastic	
1.00	SPT	N1			X			
1.80	D				X	(3.60)	terminated early on obstruction at 4.2m	
2.80	D				X			
3.00	SPT	N3			X			
3.80	D				X			
4.00	SPT	40/200mm			X	4.20		

AGS3 UK BH WARKWORTH SUNCROFT.GPJ AGS 3 1.GDT 14/6/13

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											PIPE TO 3M DRY

All dimensions in metres Scale 1:34.375	Client Forsyth	Method/ Plant Used	Logged By AM
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ANALYTICAL TEST REPORT

Contract no: 48007
Contract name: Suncroft, Warkworth
Client reference: -
Clients name: Intersoil
Clients address: Suite 30
58 Low Friar Street
Newcastle Upon Tyne
NE1 5UE

Samples received: 29 April 2013

Analysis started: 29 April 2013

Analysis completed 07 May 2013

Report issued: 07 May 2013

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope. Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling. Methods, procedures and performance data are available on request. Results reported herein relate only to the material supplied to the laboratory. This report shall not be reproduced except in full, without prior written approval. Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:



Karan Campbell
Director

John Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are exclusive of stones.

Lab ref	Sample id	Depth (m)	Soil description passing 2mm sieve	Description of material retained on 2mm sieve	% Retained on 2mm sieve	Moisture (%)
48007-1	BH 4	0.30-0.50	Loamy Sandy Clay	Stones, Slag, Gravel & Glass	49.4	26.6
48007-2	BH 4	1.80-2.00	Loamy Sandy Clay	Slag & Gravel	36.8	23.0
48007-3	BH 5	0.80-1.00	Loamy Sandy Clay	Stones, Glass & Gravel	55.5	18.5

Chemtech Environmental Limited

SOILS

Lab number			48007-1	48007-2	48007-3
Sample id			BH 4	BH 4	BH 5
Depth (m)			0.30-0.50	1.80-2.00	0.80-1.00
Date sampled			24/04/2013	24/04/2013	24/04/2013
Test	Method	Units			
Antimony (total)	CE058	mg/kg Sb	15	14	17
Arsenic (total)	CE054 ^M	mg/kg As	52	75	58
Cadmium (total)	CE054 ^M	mg/kg Cd	<0.2	<0.2	0.4
Chromium (total)	CE054 ^M	mg/kg Cr	54	48	58
Chromium (VI)	CE050	mg/kg CrVI	<1	<1	<1
Copper (total)	CE054 ^M	mg/kg Cu	187	608	249
Iron (total)	CE054 ^M	mg/kg Fe	126500	150200	179800
Lead (total)	CE054 ^M	mg/kg Pb	861	393	251
Mercury (total)	CE054	mg/kg Hg	<0.5	<0.5	<0.5
Nickel (total)	CE054 ^M	mg/kg Ni	135	135	156
Zinc (total)	CE054 ^M	mg/kg Zn	346	899	382
pH	CE004 ^M	units	6.7	7.4	8.0
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	53	1706	92
Sulphide	CE079	mg/kg S ²⁻	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<2	<2	<2
Cyanide (total)	CE077	mg/kg CN	<2	<2	<2
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5
Organic matter content (OMC)	CE005 ^M	% w/w	5.72	3.27	4.80
PAH					
Naphthalene	CE087	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	CE087	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	CE087	mg/kg	<0.1	<0.1	<0.1
Fluorene	CE087	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	CE087	mg/kg	0.4	<0.1	0.2
Anthracene	CE087	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	CE087	mg/kg	0.4	<0.1	0.2
Pyrene	CE087	mg/kg	0.4	<0.1	0.2
Benzo(a)anthracene	CE087	mg/kg	<0.1	<0.1	<0.1
Chrysene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE087	mg/kg	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE087	mg/kg	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE087	mg/kg	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE087	mg/kg	<0.1	<0.1	<0.1
PAH (total)	CE087	mg/kg	<5	<5	<5
TPH					
TPH Aromatic EC5-EC7	CE068	mg/kg	<0.01	<0.01	<0.01
TPH Aromatic EC7-EC8	CE068	mg/kg	<0.01	<0.01	<0.01
TPH Aromatic EC8-EC10	CE068	mg/kg	<0.01	<0.01	<0.01
TPH Aromatic EC10-EC12	CE068	mg/kg	<1	<1	<1

48007

Suncroft, Warkworth

Chemtech Environmental Limited

SOILS

Lab number			48007-1	48007-2	48007-3
Sample id			BH 4	BH 4	BH 5
Depth (m)			0.30-0.50	1.80-2.00	0.80-1.00
Date sampled			24/04/2013	24/04/2013	24/04/2013
Test	Method	Units			
TPH Aromatic EC12-EC16	CE068	mg/kg	<1	<1	<1
TPH Aromatic EC16-EC21	CE068	mg/kg	1	<1	<1
TPH Aromatic EC21-EC35	CE068	mg/kg	<1	<1	<1
TPH Aromatic EC35-EC44	CE068	mg/kg	<1	<1	<1
TPH Aliphatic EC5-EC6	CE068	mg/kg	<0.1	<0.1	<0.1
TPH Aliphatic EC6-EC8	CE068	mg/kg	<0.1	<0.1	<0.1
TPH Aliphatic EC8-EC10	CE068	mg/kg	0.2	0.1	0.2
TPH Aliphatic EC10-EC12	CE068	mg/kg	2	3	<1
TPH Aliphatic EC12-EC16	CE068	mg/kg	6	4	5
TPH Aliphatic EC16-EC35	CE068	mg/kg	185	52	40
TPH Aliphatic EC35-EC44	CE068	mg/kg	21	9	6

Chemtech Environmental Limited

LEACHATES

Lab number			48007-2L
Sample id			BH 4
Depth (m)			1.80-2.00
Test	Method	Units	
Aluminium (dissolved)	CE055 ^u	mg/l Al	<0.03
Antimony (dissolved)	CE058	mg/l Sb	<0.001
Arsenic (dissolved)	CE055	mg/l As	<0.001
Cadmium (dissolved)	CE055 ^u	mg/l Cd	<0.001
Chromium (dissolved)	CE055 ^u	mg/l Cr	<0.003
Copper (dissolved)	CE055 ^u	mg/l Cu	<0.004
Lead (dissolved)	CE055 ^u	mg/l Pb	<0.009
Mercury (dissolved)	CE055	mg/l Hg	<0.001
Nickel (dissolved)	CE055 ^u	mg/l Ni	0.045
Zinc (dissolved)	CE055 ^u	mg/l Zn	0.092
PAHs			
Naphthalene	CE087	mg/l	<0.0001
Acenaphthylene	CE087	mg/l	<0.0001
Acenaphthene	CE087	mg/l	<0.0001
Fluorene	CE087	mg/l	<0.0001
Phenanthrene	CE087	mg/l	<0.0001
Anthracene	CE087	mg/l	<0.0001
Fluoranthene	CE087	mg/l	<0.0001
Pyrene	CE087	mg/l	<0.0001
Benzo(a)anthracene	CE087	mg/l	<0.0001
Chrysene	CE087	mg/l	<0.0001
Benzo(b)fluoranthene	CE087	mg/l	<0.0001
Benzo(k)fluoranthene	CE087	mg/l	<0.0001
Benzo(a)pyrene	CE087	mg/l	<0.0001
Indeno(1,2,3cd)pyrene	CE087	mg/l	<0.0001
Dibenz(ah)anthracene	CE087	mg/l	<0.0001
Benzo(ghi)perylene	CE087	mg/l	<0.0001
PAH (total)	CE087	mg/l	<0.0001

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE058	Antimony (total)	Aqua regia digest, ICP-OES	Dry		1	mg/kg Sb
CE054	Arsenic (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg As
CE054	Cadmium (total)	Aqua regia digest, ICP-OES	Dry	M	0.2	mg/kg Cd
CE054	Chromium (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cr
CE050	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE054	Copper (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Cu
CE054	Iron (total)	Aqua regia digest, ICP-OES	Dry	M	20	mg/kg Fe
CE054	Lead (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Pb
CE054	Mercury (total)	Aqua regia digest, ICP-OES	Dry		0.5	mg/kg Hg
CE054	Nickel (total)	Aqua regia digest, ICP-OES	Dry	M	1	mg/kg Ni
CE054	Zinc (total)	Aqua regia digest, ICP-OES	Dry	M	3	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	Wet	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄
CE079	Sulphide	Extraction, Continuous Flow Colorimetry	Wet		10	mg/kg S ²⁻
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	Wet		2	mg/kg CN
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	Wet		2	mg/kg CN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	Wet		0.5	mg/kg PhOH
CE005	Organic matter content (OMC)	Based on BS 1377, Colorimetry	Dry	M	0.01	% w/w
CE087	PAH (speciated)	Solvent extraction, GC-MS	Wet		0.1	mg/kg
CE087	PAH (total)	Solvent extraction, GC-MS	Wet		5	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C5-C10)	Headspace GC-FID	Wet		0.01-0.1	mg/kg
CE068	TPH Aliphatic/Aromatic fractions (C10-C44)	Solvent extraction, GC-FID	Wet		1	mg/kg

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METHOD DETAILS

METHOD	LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE055	Aluminium (dissolved)	ICP-OES	U	0.03	mg/l Al
CE058	Antimony (dissolved)	ICP-OES		0.001	mg/l Sb
CE055	Arsenic (dissolved)	ICP-OES		0.001	mg/l As
CE055	Cadmium (dissolved)	ICP-OES	U	0.001	mg/l Cd
CE055	Chromium (dissolved)	ICP-OES	U	0.003	mg/l Cr
CE055	Copper (dissolved)	ICP-OES	U	0.004	mg/l Cu
CE055	Lead (dissolved)	ICP-OES	U	0.009	mg/l Pb
CE055	Mercury (dissolved)	ICP-OES		0.001	mg/l Hg
CE055	Nickel (dissolved)	ICP-OES	U	0.003	mg/l Ni
CE055	Zinc (dissolved)	ICP-OES	U	0.020	mg/l Zn
CE087	PAH (speciated)	Solvent extraction, GC-MS		0.0001	mg/l
CE087	PAH (total)	Solvent extraction, GC-MS		0.0001	mg/l

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

- N No (not deviating sample)
- Y Yes (deviating sample)
- A Sampling date not provided
- B Sampling time not provided (waters only)
- C Sample exceeded holding time(s)
- D Sample not received in appropriate containers
- E Headspace present in sample container
- F Sample not chemically fixed (where appropriate)
- G Sample not cooled
- H Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
48007-1	BH 4	0.30-0.50	Y	TPH C5-C10 (D,E)
48007-2	BH 4	1.80-2.00	Y	TPH C5-C10 (D,E)
48007-3	BH 5	0.80-1.00	Y	TPH C5-C10 (D,E)

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REAR SUNCROFT (TIP)

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

1

SOIL GAS SURVEY

27-Apr-13

1015 MILLIBARS

1015 MILLIBARS

cool dry

NOTES

- 1) nmf=no maintained flow
- 2) positive flow rate fluctuated during readings
- 3) Gasdata LM1 used: Next calibration due May 2013

NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH4	0	0	1.5	19.9	nmf	dry to 4m base	
BH5	0	0	0.4	20.8	nmf	dry to 2.3m base	

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REAR SUNCROFT (TIP)

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

2

SOIL GAS SURVEY

17-May-13

1005 MILLIBARS

1005 MILLIBARS

cool dry

NOTES

- 1) nmf=no maintained flow
- 2) positive flow rate fluctuated during readings
- 3) Gasdata LM1 used: Next calibration due May 2014

NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH4	0	0	0.4	19.8	nmf	dry to 4m base	
BH5	0	0	0.2	19.6	max 0.3l/hr	dry to 2.3m base	
					fluctuating		

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REAR SUNCROFT (TIP)

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

3

SOIL GAS SURVEY

23-May-13

1009 MILLIBARS

1009 MILLIBARS

sun breezy

NOTES

- 1) nmf=no maintained flow
- 2) positive flow rate fluctuated during readings
- 3) Gasdata LM1 used: Next calibration due May 2014

NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH4	0	0	3.6	17.5	max 0.3	dry to 4m base	
BH5	0	0	3.6	16.8	flow -2.7 to 1.8 fluc.	dry to 2.3m	

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REAR SUNCROFT (TIP)

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

4

SOIL GAS SURVEY

24-May-13

1011 MILLIBARS

1011 MILLIBARS

Cool dry

NOTES

- 1) nmf=no maintained flow
- 2) positive flow rate fluctuated during readings
- 3) Gasdata LM1 used: Next calibration due May 2014

NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH4	0	0	3.7	16.9	max 0.4	dry	
BH5	0	0	7.4	16.1	max 0.3 fluc.	dry	

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REAR SUNCROFT (TIP)

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

5

SOIL GAS SURVEY

04-Jun-13

1030 MILLIBARS

1030 MILLIBARS

dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH4	0	0	0.6	19.8	nmf	dry	
BH5	0	0	2.3	16.1	nmf	dry	

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REAR SUNCROFT (TIP)

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

6

SOIL GAS SURVEY

13-Jun-13

998 MILLIBARS

998 MILLIBARS

dry. Mild

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH4	0	0	0	20.4	max 0.1	dry	
BH5	0	0	0.2	19.8	max 0.1	dry	
					fluc.		