

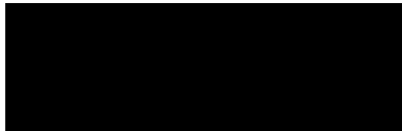
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PHASE 2: GROUND INVESTIGATION REPORT
PROPOSED RESIDENTIAL DEVELOPMENT
PORTLAND CONSULTING ENGINEERS
EBENEZER CHAPEL
SCALES CRESCENT
PRUDHOE

Project No: 22-1151

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Date: 3rd April 2023

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Date: 3rd April 2023

The information and / or advice contained in this Phase 2: 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.

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APPENDICES

Appendix I	Location Plan, Aerial Photograph, Existing Site Layout Plan and Proposed Development Layout Plan
Appendix II	Investigation Location Plan, Borehole and Trial Pit Record Sheets & Foundation Photo Record Sheets
Appendix III	DCP Test Reports
Appendix IV	Laboratory Results (Geotechnical & Ground Contamination)

1.0 Introduction

April 2023

As requested by Portland Consulting Engineers on behalf of SCATA Ltd, Phase 2: Ground Investigation works have been carried out for a for the conversion (with new build extension) of Ebenezer Chapel, Scales Crescent, Prudhoe, into five residential flats with soft landscaping and hard surfacing.

A Phase 1: Desk Top Study & Coal Mining Risk Assessment Report (Ref. 22-1151, March 2023) has been undertaken by Arc Environmental Ltd (ARC) for the site and the information contained within this report was utilised in the design of this ground investigation.

The intrusive investigation works comprised 3 no. windowless sampling boreholes (WS01 to WS03), 3 no. manually excavated trial pits (TP01 to TP03) and 5 no. manually excavated foundation trial pits (FP01 to FP05) and an insitu DCP test in the area of TP03 (DCP01).

The positions of the exploratory holes for this investigation can be seen on a copy of the Investigation Location Plan, attached 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 plan is not to a standard scale.

2.0 Site Details

Table 2.1

N = north, S = south, etc.

Site Name & Address:	Ebenezer Chapel, Scales Crescent, Prudhoe, NE42 5DW.
National Grid Reference:	410550, 562980 (representative of the central part of the site).
Description of Location:	The site is in a residential setting located c.750m to the east of Prudhoe.
Site Boundaries:	N + E= Scales Crescent & Public Footpath, W= Residential Garden & Public Grassland, S= Public Grassland beyond which is the B6395 carriageway (Stonyflat Bank).

3.0 Scope of Works

Table 3.1

Client:	SCATA Ltd.
Consultant:	Portland Consulting Engineers.
Project type:	Proposed residential development.
Site Location plan:	See Appendix I.
Layout plan (existing):	See Appendix I.
Layout plan (proposed):	See Appendix I.
Reporting:	Factual & Interpretative.
Laboratory Testing:	Geotechnical and Ground Contamination.
CLEA End-Use Classification:	Level 1 GORA –Residential with homegrown produce (most stringent criteria).

The information contained in this report is limited to the areas of the site, as indicated on the Existing and 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. 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 where access would allow, within the boundaries of the site. The rationale behind the location of each exploratory hole is summarised in Table 4.1 below.

Table 4.1

<u>Potential issue</u>	<u>Exploratory hole</u>
Geotechnical considerations across the site.	WS01 to WS03 & TP01 to TP03.
Determination nature and depth of existing foundations.	FP01 to FP05.
Determine the levels of contamination present within the initial deposits with a view to determining the risks posed towards the future site end-users.	WS01 to WS03 & TP01 to TP03.
Determine the CBR value of the existing materials underlying the existing basement.	DCP01.

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: Investigation of potentially contaminated sites –Code of practice & Land Contamination Risk Management (LCRM: October 2020), with the precautions below 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 c.2°C to 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, drill casing was used to seal off the made ground. Disposable plastic liners were used to collect samples from the windowless sampling boreholes carried out.

5.0 Ground Conditions

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

5.1 Soil Profile: -

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

Table 5.1

BCGL = Below Current Ground Level.

<u>Type of Strata</u>	<u>Depths Recorded (BCGL)</u>	<u>Description & General Comments</u>
MADE GROUND:	From 0.00m up to c.0.10m to c.1.00m.	Grass over black sandy clayey gravel was encountered in WS02, WS03 and TP01 whilst brick pavements over sand was recorded in TP03.

5.0 Ground Conditions (Cont'd)

5.1 Soil Profile (Cont'd): -

Table 5.1 (Cont'd)

BCGL = Below Current Ground Level.

Type of Strata	Depths Recorded (BCGL)	Description & General Comments
TOPSOIL:	From 0.00m up to c.0.10m to c.0.24m.	Grass over sandy gravelly clayey soil was encountered in WS01 & TP02.
SUPERFICIAL DEPOSITS (Glaciofluvial):	To depths in excess of c.745m.	Variable deposits comprising loose silty clayey SAND, soft to stiff very sandy gravelly CLAY, soft sandy SILT and medium dense clayey sandy GRAVEL.
SOLID GEOLOGY (Middle Coal Measures):	~	Not encountered.

There was no evidence of significant or gross contamination such as Asbestos Containing Materials (ACM's), fuels, oils, etc. on site.

5.2 Existing Foundations: -

Table 5.2

BCGL = Below Current Ground Level.

Trial Pit	Description & General Comments
FP01	Sandstone blockwork was recorded to c.0.65m with a c.0.10m projection at c.0.50m and based within soft very sandy gravelly CLAY.
FP02	Brickwork was based on sandstone blockwork from c.0.05m to c.0.45m with a projection of c.0.50m at c.0.30m and based within firm very sandy gravelly CLAY.
FP03	Brickwork was based on sandstone blockwork from c.0.30m above ground level to c.0.45m BCGL with a projection of c.0.05m at c.0.25m BCGL and based within firm very sandy gravelly CLAY.
FP04	Sandstone blockwork was recorded to c.0.50m and based within soft and firm very sandy gravelly CLAY.
FP05	Sandstone blockwork was recorded to c.0.55m with a c.0.10m projection at c.0.15m and a c.0.12m projection at c.0.45m based within soft and firm very sandy gravelly CLAY.

5.3 Groundwater & Stability: -

Water ingresses were noted within WS02 & WS03 at depths of between c.2.00m and c.2.70m.

Therefore, it would be prudent to allow for the introduction of suitable groundwater control measures, to take care of any ingresses of groundwater which may occur, especially during the wetter periods of the year.

6.0 Insitu Testing & Sampling

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 natural superficial deposits encountered within the boreholes to determine the relative density / 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

* = Using N₆₀ values after Clayton 1995

Type of Strata	Range of SPT 'N' Values	Result details
SUPERFICIAL DEPOSITS:	1 – 25	Indicative of very loose to medium dense and soft to stiff deposits

6.0 Insitu Testing & Sampling (Cont'd)

6.2 Insitu Hand Shear Vane Tests: -

Insitu hand vane tests were carried out using portable insitu hand vane tester on the natural superficial deposits encountered. The insitu hand vane tester takes direct readings of shear strength, three vane sizes allow for the direct determination of undrained shear strength of extremely low to high strength clays. The peak vane value is determined by a calibrated scale ring built into the head assembly. The cross handle is used both to push the vane to the desired test depth and apply the shearing torque. The results are summarised in Table 6.2 below and can also be found adjacent to the appropriate sample level, on the borehole record sheets.

Table 6.2

Type of Strata	Range of Shear Strength Values	Result Details
SUPERFICIAL DEPOSITS:	21kN/m ² to 41kN/m ²	Low to medium strength deposits.

6.3 Insitu Dynamic Cone Penetrometer (DCP) Tests: -

A Dynamic Cone Penetrometer (DCP) test was undertaken on the initial natural superficial deposits in the basement of the current chapel to determine the insitu strength to assess their suitability as an undisturbed sub-grade. The DCP uses an 8kg hammer dropping through a height of 575mm to penetrate a 60° cone (20mm Ø) into 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 (%). The CBR value / penetration rates can be used to calculate an equivalent SPT 'N' value for determining density.

A summary of the results can be seen in Table 6.3 below, whilst the full results including a graphical representation can be seen within the DCP test reports attached in Appendix III.

Table 6.3

MG = Made Ground, NS = Natural Strata

Test Position	Layer	Strata	Thickness of Layer (mm)	Depth bcgl's to Bottom of Layer (mm)	Penetration Rate (mm/blow)	CBR Value (%)
DCP01 (TP03)	1	NS	540	640	44.00	6
	2	NS	350	990	16.67	15

The calculated CBR values for the initial underlying natural superficial deposits range between 6% and 15%.

When considering these results, it is recommended that a characteristic design CBR value of 5% should be taken for the natural superficial deposits.

However, it should be noted that the achievable CBR values may improve under compaction / proof rolling, prior to emplacement of the stone sub-base, which will also help to identify any 'soft spots' that may require re-compaction or digging out and replacement with additional compacted sub-base.

7.0 Laboratory Testing

All geotechnical testing was carried out in accordance with BS1377-1:2016 by Professional Soils Laboratory (PSL) of Doncaster, UK (UKAS accredited). Ground contamination was undertaken by Chemtech Environmental of Stanley, Co. Durham (UKAS & MCERTS accredited).

7.0 Laboratory Testing (Cont'd)

7.1 Determination of pH & SO₄: -

Representative samples of made ground materials, topsoil and natural superficial deposits recovered from across the site, were tested to determine their pH value and Soluble Sulphate (SO₄) levels. The results are shown in Table 7.1 below and are also contained in the Chemtech Environmental Limited Analytical Report (Ref. 119107), a copy of which is attached in Appendix IV.

Table 7.1

Position	Strata	Depth (m)	pH value	SO ₄ (mg/l)	Design SO ₄ Class	ACEC Class
TP01	MG	0.10 - 0.30	7.4	31	DS-1	AC-1
TP02	TS	0.00 - 0.10	6.7	10	DS-1	AC-1
WS01	TS	0.00 - 0.24	6.7	10	DS-1	AC-1
WS01	NS	1.00 - 1.40	6.2	20	DS-1	AC-1
WS02	NS	2.25 - 2.82	6.0	31	DS-1	AC-1
WS03	MG	0.80 - 1.00	8.0	31	DS-1	AC-1

MG = Made Ground, NS = Natural Strata, TS = Topsoil.

From these results, the samples tested range in pH from 6.0 to 8.0 and the amount of Soluble Sulphate present ranges between 10mg/l and 31mg/l. Therefore, in accordance with BRE Special Digest 1: 2005, the site can be given a classification of Class DS-1. When considering the pH values of the materials tested, and assuming potentially mobile groundwater, the assessment of the Aggressive Chemical Environment for Concrete (ACEC) classification for this site is AC-1.

7.2 Determination of Particle Size Distribution (PSD):-

Representative samples of the natural superficial deposits recovered from the boreholes, were tested to determine the particle size distribution (PSD) so these materials might be further classified. The results of the tests are represented both graphically and numerically on the PSD results sheets contained in the PSL Analytical Report (Ref. PSL23/0901), attached in Appendix IV and are summarised in Table 7.2 below.

Table 7.2

Position	Depth (m)	Clay/Silt Fraction (%)	Sand Fraction (%)	Gravel Fraction (%)	Cobble Fraction (%)	Grading Characteristics	Brief Soil Description
WS01	0.70-1.00	14	42	44	0	Poorly	Clayey silty SAND & GRAVEL
WS01	3.30-3.50	10	22	68	0	Poorly	Sandy clayey silty GRAVEL
WS02	1.25-2.00	20	50	30	0	Poorly	Sandy clayey silty GRAVEL
WS02	2.82-3.00	19	12	69	0	Poorly	Sandy clayey silty GRAVEL
WS03	2.10-2.70	36	51	13	0	Poorly	Gravelly very sandy CLAY

7.3 Contamination Screening / Screening Strategy: -

Representative samples of the made ground and topsoil materials recovered from across the site were passed onto Chemtech Environmental of Stanley, Co. Durham, so that soil contamination screening could be carried out. The samples were screened using a standard generic contamination suite (based on the current CLEA SGV listed analytes with historical additions), which is used to assess typical made ground (disturbed natural strata mixed with anthropogenic debris) of an unknown source.

Although no evidence of significant or gross contamination such as Asbestos Containing Materials (ACM's), fuels, oils, etc. was noted within the exploratory positions, for completeness and to aid in an assessment for off-site disposal classification, representative samples were tested for Speciated PAH (Polycyclic Aromatic Hydrocarbons), Speciated TPH (Total Petroleum Hydrocarbons) & Asbestos.

7.0 Laboratory Testing (Cont'd)

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

The catalogue of testing results can be found in the Chemtech Analytical Report (Ref. 119107), attached in Appendix IV, and the total analysis carried out is summarised below:

- 4 no. soil sample screened for a generic (metals and non-organics) soil suite which includes the following determinants; Arsenic, Cadmium, Chromium (III & VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide and Total Organic Carbon (TOC).
- 4 no. soil sample screened for Speciated Polycyclic Aromatic Hydrocarbons (PAH's)
- 4 no. soil sample screened for Speciated Total Petroleum Hydrocarbons (based on full Aliphatic / Aromatic Split & BTEX).
- 4 no. sample screened for the presence of asbestos.

8.0 Ground Contamination Risk Assessment

8.1 Methodology: -

Following completion of the contamination screening undertaken, Level 1 quantitative ground contamination risk assessments have been undertaken, generally in accordance with BS10175:2011+A2:2017: Investigation of potentially contaminated sites –Code of practice & Land Contamination Risk Management (LCRM: October 2020). 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).

Based on the Conceptual Site Model (CSM) for this site (described further in Section 8.3), 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 assessment can be found in Section 8.2 (Human Health) below and continued on the following page.

8.2 Level 1 Risk Assessment (Human Health): -

The soil screening results have been assessed by comparing the Maximum Concentration values (C_M) recorded for each analyte to the Critical Concentration (C_C) values chosen for this site. The results of the testing are contained in Appendix IV, and the risk assessment has been summarised in Table 8.1 below and on the following page.

Table 8.1

Bold = result exceeds Target concentration

<u>Determinants</u>	<u>Critical Conc. (C_C) mg/kg</u>	<u>No. of Samples Screened</u>	<u>Max. Conc. (C_M) recorded mg/kg</u>	<u>No. of Samples > C_C</u>
Arsenic	37 ⁽¹⁾	4	8.5	0
Cadmium	11 ⁽¹⁾	4	0.4	0
Chromium III	910 ⁽¹⁾	4	174	0
Chromium VI	6 ⁽¹⁾	4	<1	0
Copper	2400 ⁽¹⁾	4	32	0
Lead	200 ⁽²⁾	4	67	0
Mercury	40 ⁽¹⁾	4	<0.5	0

⁽¹⁾ = LQM CIEH Suitable 4 Use Levels (S4UL Nov 2014 (Revised August 2015)) –Residential with homegrown produce –6.0% SOM), ⁽²⁾ = C4SL Values (Residential with homegrown produce), ⁽³⁾ = ATRISK^{SOIL} SSV . Note = All units are mg/kg.

8.0 Ground Contamination Risk Assessment (Cont'd)

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

Table 8.1 (Cont'd)

Bold = result exceeds Target concentration

Determinants	Critical Conc. (C _c) mg/kg	No. of Samples Screened	Max. Conc. (C _M) recorded mg/kg	No. of Samples > C _c
Nickel	130 ⁽¹⁾	4	89	0
Selenium	250 ⁽¹⁾	4	1.6	0
Zinc	3700 ⁽¹⁾	4	139	0
Cyanide	34 ⁽³⁾	4	<1	0
Acenaphthene	1100 ⁽¹⁾	4	0.04	0
Acenaphthylene	920 ⁽¹⁾	4	0.08	0
Anthracene	11000 ⁽¹⁾	4	0.19	0
Benzo(a)anthracene	13 ⁽¹⁾	4	0.83	0
Benzo(a)pyrene	3.0 ⁽¹⁾	4	0.70	0
Benzo(b)fluoranthene	3.7 ⁽¹⁾	4	1.10	0
Benzo(ghi)perylene	350 ⁽¹⁾	4	0.47	0
Benzo(k)fluoranthene	100 ⁽¹⁾	4	0.45	0
Chrysene	27 ⁽¹⁾	4	0.92	0
Dibenz(ah)anthracene	0.3 ⁽¹⁾	4	0.13	0
Fluoranthene	890 ⁽¹⁾	4	1.47	0
Fluorene	860 ⁽¹⁾	4	0.07	0
Indeno(123cd)pyrene	41 ⁽¹⁾	4	0.46	0
Naphthalene	13 ⁽¹⁾	4	0.06	0
Phenanthrene	440 ⁽¹⁾	4	0.70	0
Pyrene	2000 ⁽¹⁾	4	1.17	0
Benzene	0.37 ⁽¹⁾	4	<0.01	0
Toluene	660 ⁽¹⁾	4	<0.01	0
Ethylbenzene	260 ⁽¹⁾	4	<0.01	0
m&p-Xylene	310 ⁽¹⁾	4	<0.02	0
o-Xylene	330 ⁽¹⁾	4	<0.01	0
VPH Aliphatic (>C5-C6)	160 ⁽¹⁾	4	<0.1	0
VPH Aliphatic (>C6-C8)	530 ⁽¹⁾	4	<0.1	0
VPH Aliphatic (>C8-C10)	150 ⁽¹⁾	4	<0.1	0
EPH Aliphatic (>C10-C12)	760 ⁽¹⁾	4	<6	0
EPH Aliphatic (>C12-C16)	4300 ⁽¹⁾	4	<6	0
EPH Aliphatic (>C16-C35)	110000 ⁽¹⁾	4	<15	0
EPH Aliphatic (>C35-C44)	110000 ⁽¹⁾	4	<10	0
VPH Aromatic (>EC5-EC7)	300 ⁽¹⁾	4	<0.01	0
VPH Aromatic (>EC7-EC8)	660 ⁽¹⁾	4	<0.01	0
VPH Aromatic (>EC8-EC10)	190 ⁽¹⁾	4	<0.01	0
EPH Aromatic (>EC10-EC12)	380 ⁽¹⁾	4	14	0
EPH Aromatic (>EC12-EC16)	660 ⁽¹⁾	4	27	0
EPH Aromatic (>EC16-EC21)	930 ⁽¹⁾	4	16	0
EPH Aromatic (>EC21-EC35)	1700 ⁽¹⁾	4	94	0
EPH Aromatic (>EC35-EC44)	1700 ⁽¹⁾	4	29	0
Asbestos	Presence	4	NAD	0

⁽¹⁾ = LQM CIEH Suitable 4 Use Levels (S4UL Nov 2014 (Revised August 2015)) –Residential with homegrown produce –6.0% SOM), ⁽²⁾ = C4SL Values (Residential with homegrown produce), ⁽³⁾ = ATRISK^{SOIL} SSV . Note = All units are mg/kg.

The results have identified the following:

- None of the Maximum Concentration (C_M) values for any of the analytes exceed the Critical Concentration (C_c) values taken for this site.

8.0 Ground Contamination Risk Assessment (Cont'd)

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

Bearing this in mind, it is felt that the made ground and topsoil materials on this site do not represent a risk to the end users and no further investigation, sampling, screening or risk assessment is considered necessary.

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 (2nd Edition, 2011) Workplace exposure limits.

8.3 Revised Conceptual Site Model (CSM): -

From the results of the Phase 1: Desk Top Study & Coal Mining Risk Assessment Report previously completed, a Revised Conceptual Site Model (CSM) has been developed for this site and Sections 8.3.1 to 8.3.3 below and on the following page summarise the various contamination sources, plausible migration pathways and potentially sensitive receptors identified for this site, assuming no remediation, additional protection measures and / or removal of the sources of contamination takes place.

8.3.1 Sources: -

The site is covered by a layer of made ground materials (up to c.1.00m in thickness) which represents a source of ground contamination for this site. The majority of the made ground contains some anthropogenic debris mixed with disturbed natural strata, and representative samples of these materials have been assessed using a standard generic soil suite, with the site considered as a single averaging area for these analytes.

Although no evidence of significant or gross contamination such as Asbestos Containing Materials (ACM's), fuels, oils, etc. was noted within the exploratory positions, for completeness and to aid in an assessment for off-site disposal classification, the samples were tested for Speciated PAH (Polycyclic Aromatic Hydrocarbons), Speciated TPH (Total Petroleum Hydrocarbons) & Asbestos.

8.3.2 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.

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, the majority of these pathways will not be available.

8.0 Ground Contamination Risk Assessment (Cont'd)

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

8.3.2 Pathways (Cont'd): -

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.

8.3.3 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 *Residential*, *Allotment* and *Public Open Space (Park)* end uses based on a child aged 0 to 6 years, *Public Open Space (Residential)* based on a child aged 3 to 9 and *Commercial* end uses based upon a working exposure period of up to 49 years (i.e. 16 to 65).

Key generic assumptions for *Residential* and *Public Open Space (Residential)* are based upon a typical residential property, consisting of a two-storey small, terraced house, with private garden, and a *Commercial* 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 *Allotment* or *Public 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 shown on the following page.

- 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*

The proposed development comprises a residential dwelling with private garden and associated driveway and the Level 1 Risk Assessment has taken the end use category as:

- 1) *Residential – with home grown produce*

9.0 Conclusions & Recommendations

9.1 Ground Conditions: -

Made ground materials were recorded within WS02, WS03 and TP03 and comprised grass over black sandy clayey gravel to depths of between c.0.10m and c.1.00m bcgl and did not include any evidence of significant or gross contamination such as Asbestos Containing Materials (ACM's), fuels, oils, etc. on site.

Topsoil materials were recorded within WS01 and TP02 and comprised grass over sandy gravelly clayey soil to depths of between c.0.10m and c.0.24m bcgl.

Superficial soil deposits comprising variable deposits of loose silty clayey sand, soft to stiff very sandy gravelly clay, soft sandy silt and medium dense clayey sandy gravel were recorded to depths in excess of c.7.45m bcgl.

9.0 Conclusions & Recommendations

9.2 Groundwater & Stability: -

Water ingresses were noted within WS02 & WS03 at depths of between c.2.00m and c.2.70m. Therefore, it would be prudent to allow for the introduction of groundwater control measures (i.e. sump pumping equipment), to take care of any localised ingresses of groundwater, especially during the wetter periods of the year.

9.3 Foundation Options: -

Based on the variable ground conditions encountered on site, in order to prevent excessive differential settlement, it is felt that traditional shallow strip / pad foundations will not be a suitable foundation option. Therefore, it is recommended that the proposed development is based on a rafted foundation and based on the findings of this site investigation, should be based on a minimum 300mm compacted stone and in keeping with NHBC guidelines. A maximum allowable bearing pressure of 40kN/m² should not be exceeded for this type of foundation, to ensure all normal and differential settlements are kept to a minimum. Foundations should be maintained at a minimum depth of 1.00m below finished ground levels, to consider potential shrinkage and swelling of the clays.

Should a higher bearing pressure be required, then a piled foundation or a ground improvement solution may be appropriate. The information within this report should be forwarded to piling and ground improvement specialists for their comment.

From the results of the pH and soluble sulphate testing carried out, future foundations and buried concrete across the site should be constructed using a concrete design class of DS-1 and ACEC class of AC-1.

9.4 Ground Gas Protection Measures: -

From the Phase 1: Desk Top Study & Coal Mining Risk Assessment Report (Ref. 22-1151, March 2023), the potential risk from hazardous on-site or off-site ground gas generation is low. However, as the site is underlain by the Middle Coal Measures and in accordance with Northumberland County Councils methodology and approach on sites within the Northumberland Coalfield, gas protection measures are likely to be required within the proposed development. Correspondence with Northumberland County Council should be sought with regards to the level of protection required, at this stage any gas protection measures required will need to meet a Characteristic Situation 2 (CS2) classification in accordance with CIRIA 665.

9.5 Ground Contamination: -

From the results of the contamination screening carried out, no elevated levels been recorded which represent a potential risk to the proposed end users. As such no remedial measures are considered necessary at this stage and the materials on site can be reused within the proposed development.

When considering the risks to any future maintenance or construction workforce, appropriate 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.

9.0 Conclusions & Recommendations (Cont'd)

9.5 Ground Contamination (Cont'd): -

No asbestos fibres have been identified within the samples screened. Consequently, there is no requirement for removal, treatment, protection measures and/or further risk assessment to protect the existing end users (i.e. no risk to Human Health) from potential asbestos fibres.

During future development works any excavated materials other than those screened that are to be discarded and removed from this site as a waste to landfill will need to be classified in accordance with the 'Guidance on the Classification and Assessment of Waste (1st Edition V1.1, May 2018) –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 could 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.

9.6 General Comments: -

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, where there were previous features that were infilled (old hollows, pits etc) or where significant quantities of materials such as demolition and brick rubble exist.

It is not uncommon for historical asbestos wastes to be deliberately buried on derelict sites or imported old demolition rubble which could contain asbestos to be imported for use as hardstanding / hardcore. Unless otherwise stated we have not assessed any below ground features such as service ducts, culverts, partly demolished or dilapidated structures, spoil heaps, fly tipped materials, etc.

For future site works, 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.

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

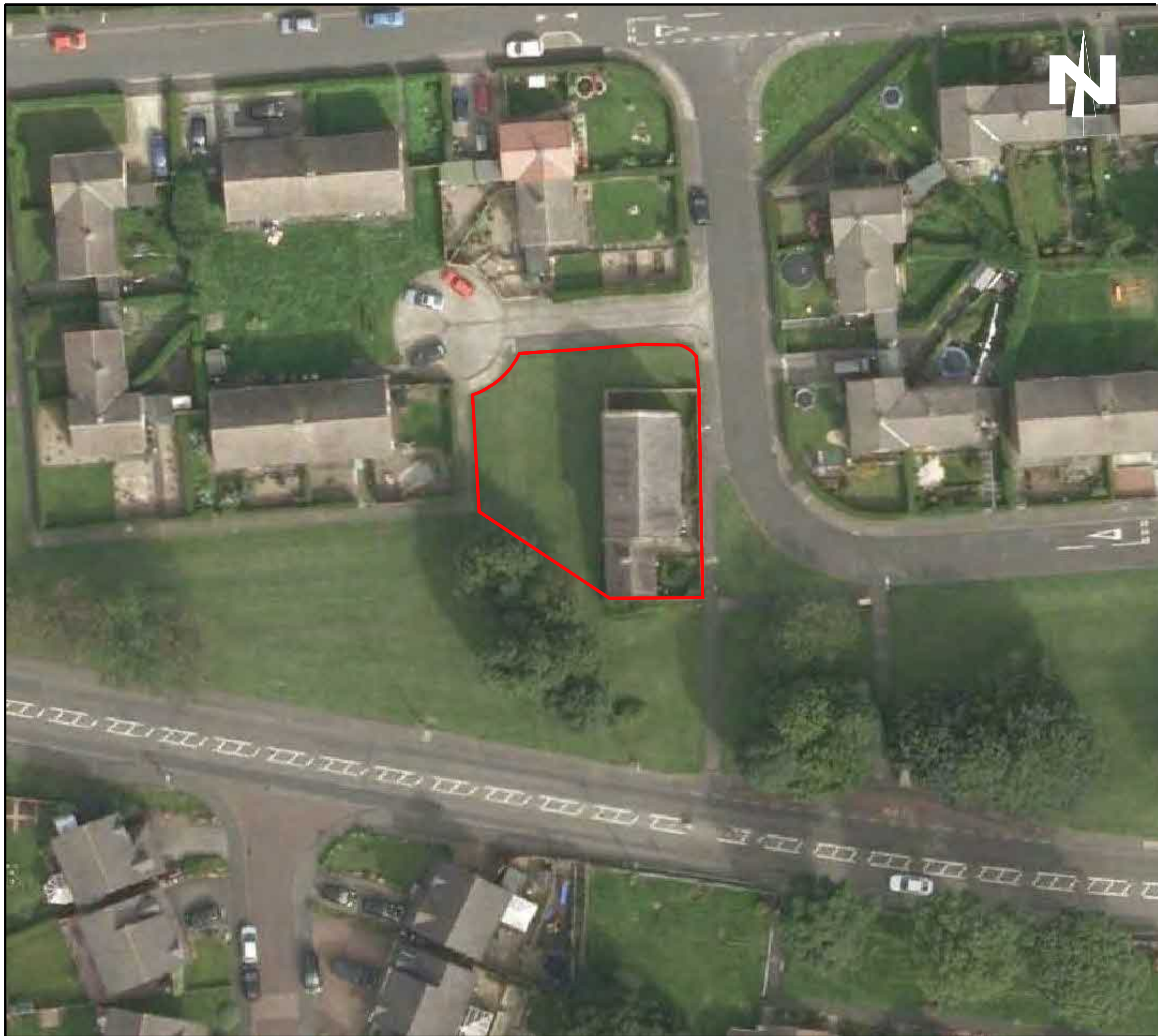
In addition, for deeper excavations, drainage, service runs or the like that may pass close to or beneath any proposed new foundations, these should be undertaken with care and completed prior to the preparation of any new foundations, so as not to allow any loose or granular material to move or 'flow',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

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 Engineer should be sought.

END OF REPORT

APPENDIX I

Location Plan, Aerial Plan, Existing and Proposed Site Layout Plans



ARC ENVIRONMENTAL LTD

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 Durham, DH7 8PN
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 e-mail: admin@arc-environmental.com
 web: www.arc-environmental.com

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.
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LEGEND

	APPROXIMATE SITE BOUNDARY
--	------------------------------

rev.	date	amendments	drawn chkd

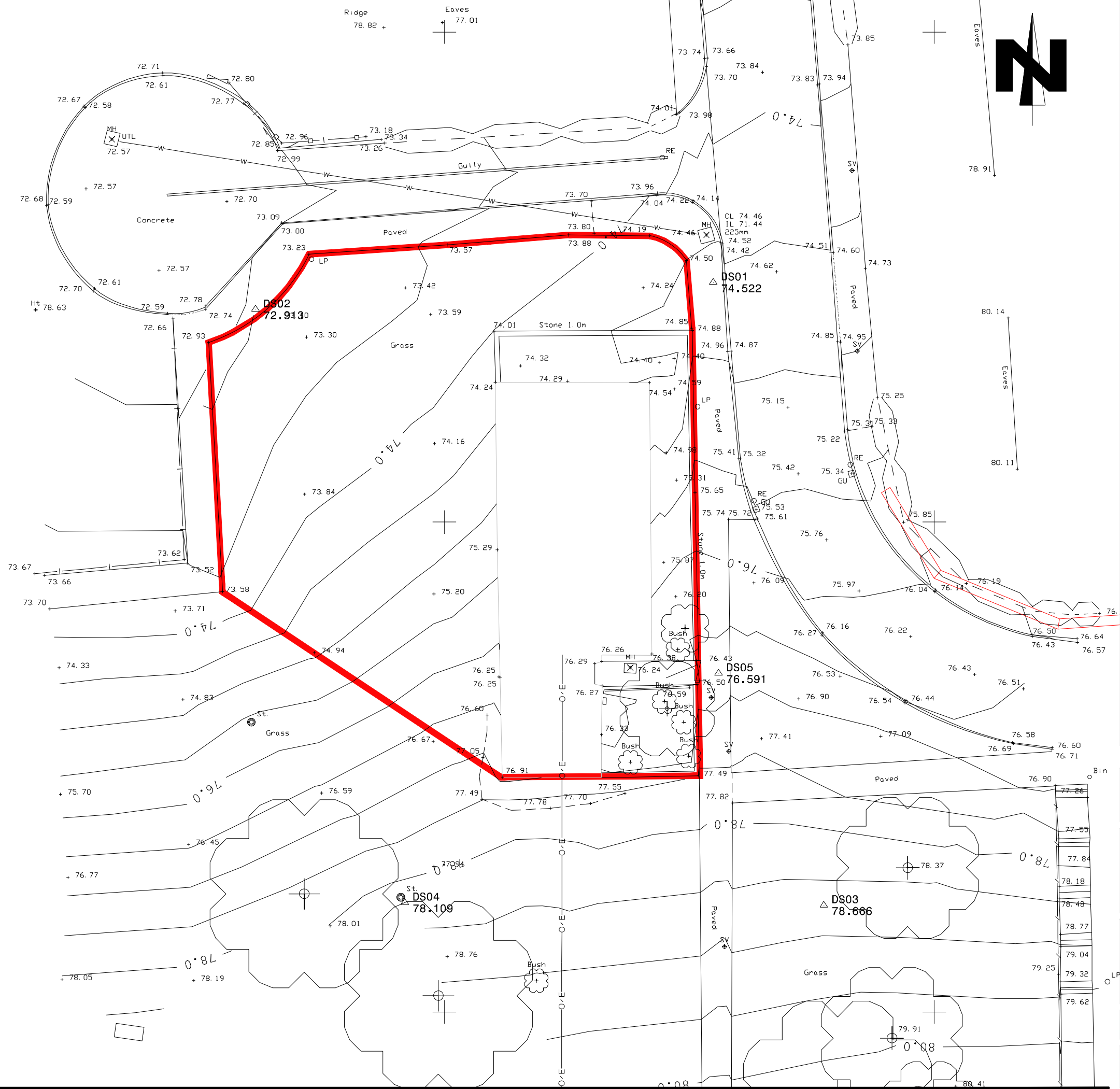
Client:
PORTLAND CONSULTING

Project Title:
 Proposed Residential Development
 Ebenezer Chapel, Scales Crescent
 Prudhoe, NE42 5DW

Drawing Title:
 Aerial Photograph

Scale at A3: NTS @ A3	Date: 03.02.23	Drawn by: P.D	Approved by: M.P.B
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Job Ref: 22-1151	Drg no: -	Rev: -
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LEGEND	
	APPROXIMATE SITE BOUNDARY

rev.	date	amendments	drawn	chckd

Client:
PORTLAND CONSULTING

Project Title:
 Proposed Residential Development
 Ebenezer Chapel, Scales Crescent
 Prudhoe, NE42 5DW

Drawing Title:
 Existing Site Layout Plan

Scale at A3: 1:200 @ A3	Date: 03.02.23	Drawn by: P.D	Approved by: M.P.B
----------------------------	-------------------	------------------	-----------------------

Job Ref: 22-1151	Drg no: -	Rev: -
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Scale as shown



Client:

PORTLAND CONSULTING

Project Title:
Proposed Residential Development
Ebenezer Chapel, Scales Crescent
Prudhoe, NE42 5DW

Drawing Title:
Location Plan

Job Reference:
22-1151

Drawing Number:
-

Revision:
-

Drawn by:
P.D

Date:
01.03.23

Scale at A4:
As Shown

Checked by:
S.H

Approved by:
S.H

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.

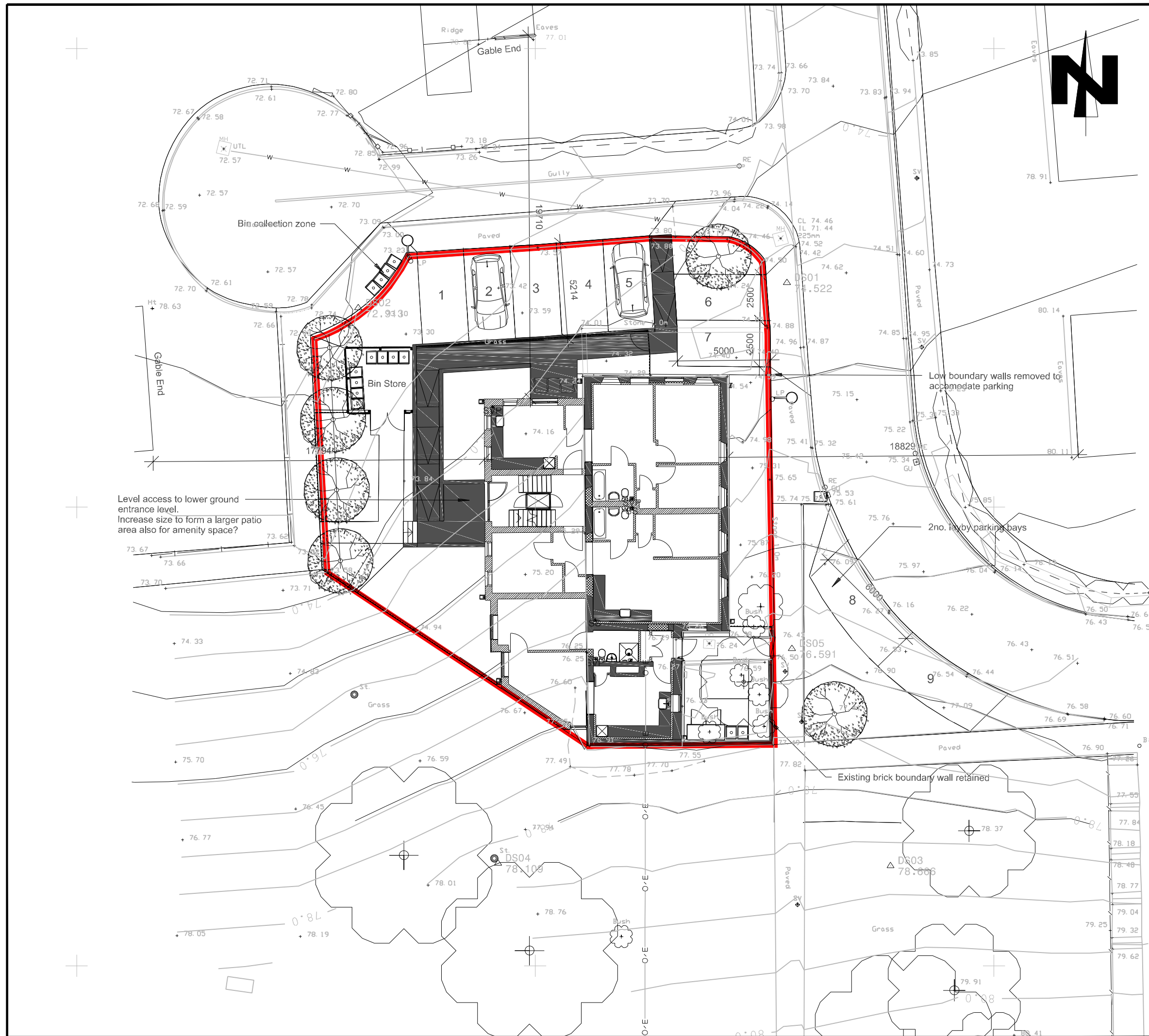
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rev.	date	amendments	drawn	chckd

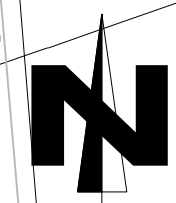
ARC ENVIRONMENTAL LTD

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Level access to lower ground entrance level.
Increase size to form a larger patio area also for amenity space?



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LEGEND

	APPROXIMATE SITE BOUNDARY
--	---------------------------

rev.	date	amendments	drawn	chckd

Client:
PORTLAND CONSULTING

Project Title:
 Proposed Residential Development
 Ebenezer Chapel, Scales Crescent
 Prudhoe, NE42 5DW

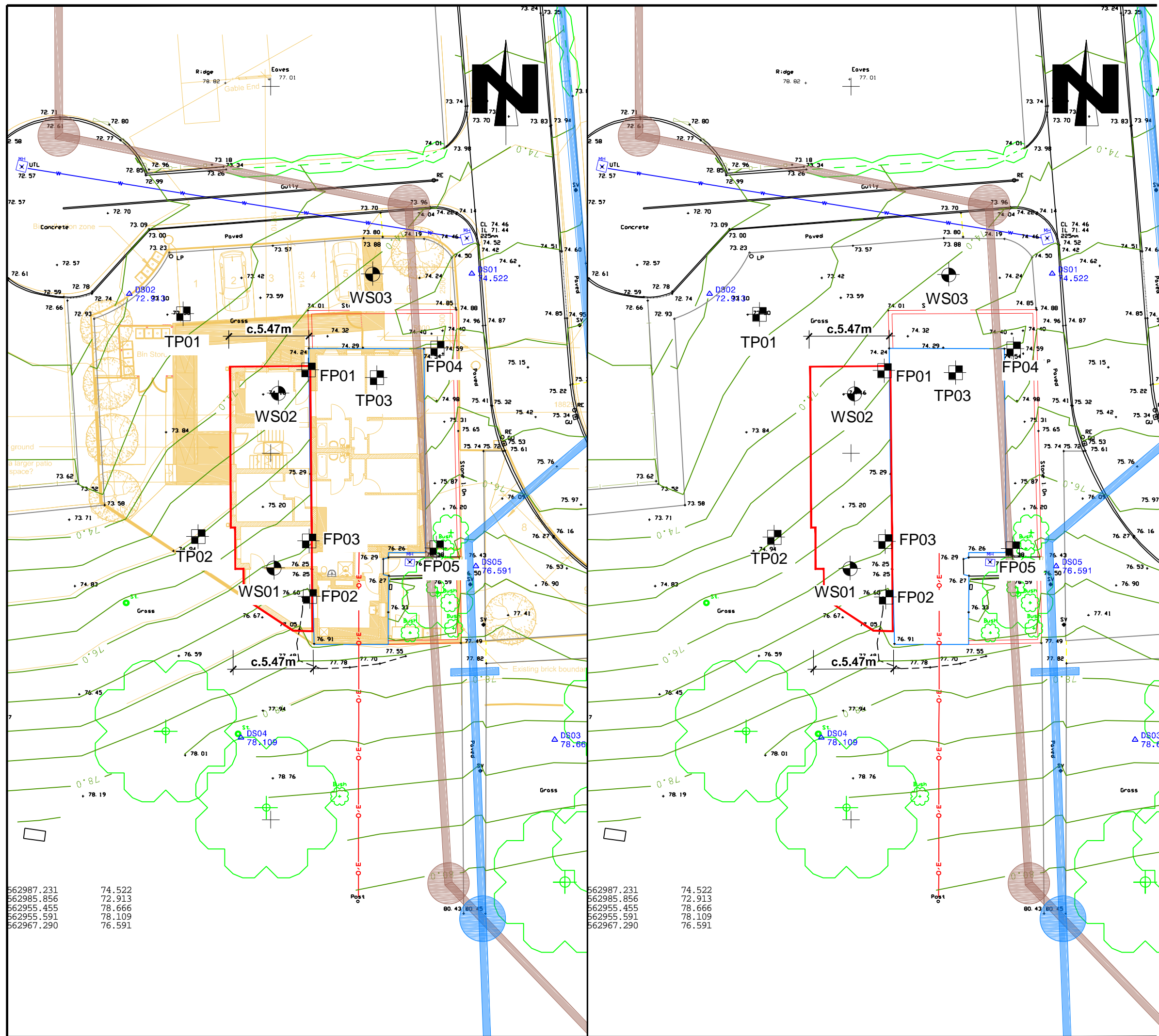
Drawing Title:
 Proposed Development Layout Plan

Scale at A3: 1:200 @ A3	Date: 03.02.23	Drawn by: P.D	Approved by: M.P.B
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Job Ref: 22-1151	Drg no: -	Rev: -
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APPENDIX II

Investigation Location Plan, Borehole and Trial Pit Record Sheets &
Foundation Photo Record Sheets



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rev.	date	amendments	drawn	chckd

Client:
PORTLAND CONSULTING

Project Title:
 Proposed Residential Development
 Ebenezer Chapel, Scales Crescent
 Prudhoe, NE42 5DW

Drawing Title:
 Investigation Location Plan

Scale at A3: | Date: | Drawn by: | Approved by:
 1:250 @ A3 | 03.02.23 | P.D | M.P.B

Job Ref: | Drg no: | Rev:
 22-1151 | - | -



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BOREHOLE LOG

Project Ebenezer Chapel, Prudhoe				BOREHOLE No WS01	
Job No 22-1151	Date 10-02-23	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Limited				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.00-0.24	B				0.24	Grass over soft dark brown sandy gravelly clayey soil (TOPSOIL).			
0.24-0.70	B				(0.46) 0.70	Medium brown silty clayey SAND with some fine to coarse sandstone gravel (GLACIOFLUVIAL).			
0.70-1.00	B				1.00	Loose medium brown silty fine SAND with some pockets of soft clay (GLACIOFLUVIAL).			
1.00-1.40	B	N=9			(0.90)	Firm brown very sandy gravelly CLAY with some thin fine sand lenses (GLACIOFLUVIAL).			
1.00-1.45	SPT								
1.40-1.90	B								
1.90-2.10	B	N=11			1.90	Soft brown sandy SILT (GLACIOFLUVIAL).			
2.00-2.45	SPT								
2.10-2.50	B								
3.00	B	N=21			3.30	Stiff brown sandy gravelly CLAY (GLACIOFLUVIAL).			
3.00-3.45	SPT								
3.30-3.50	B								
4.00	B	N=25			(1.20)	Medium dense brown clayey sandy GRAVEL (GLACIOFLUVIAL).			
4.00-4.45	SPT								
4.50-4.70	B								
5.00	B	N=24			(0.95)	Stiff brown sandy gravelly CLAY (GLACIOFLUVIAL).			
5.00-5.45	SPT								
Borehole terminated at 5.45m.									

AGS3 UK BH LOGS 22-1151.GPJ AGS3_ALL.GDT 17/2/23

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	
											Dry.
All dimensions in metres Scale 1:50			Client Portland			Method/ Plant Used Dynamic Sampling			Logged By		



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BOREHOLE LOG

Project Ebenezer Chapel, Prudhoe				BOREHOLE No WS02	
Job No 22-1151	Date 10-02-23	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Limited				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.62	B					(0.62)	Grass over black sandy clayey gravel. Gravel is fine to coarse comprising fragments of brick and sandstone. Cobbles noted (MADE GROUND).		
0.62-0.74	B					(0.38)	Medium brown silty clayey SAND (GLACIOFLUVIAL).		
0.74-1.00	B					1.00			
1.00-1.25	B					1.25	Firm brown very sandy silty CLAY with some gravel (GLACIOFLUVIAL).		
1.00-1.45	SPT	N=7				(1.00)	Loose brown medium to coarse SAND with some sandstone gravel (GLACIOFLUVIAL).		
1.25-2.10	B								
2.00-2.45	SPT	N=4				2.25			
2.10-2.25	B					(0.57)	Brown silty clayey SAND with some gravel (GLACIOFLUVIAL).		
2.25-2.82	B					2.82			
2.82-3.00	B					(0.73)	Soft dark brown sandy CLAY with some gravel (GLACIOFLUVIAL).		
3.00-3.50	B					3.55			
3.00-3.45	SPT	N=1				(1.45)	Firm dark brown sandy CLAY with some fine to medium gravel (GLACIOFLUVIAL).		
3.50-4.00	B					5.00			
4.00-4.45	SPT	N=10				5.30	Firm brown very sandy silty CLAY with some gravel (GLACIOFLUVIAL).		
4.50	B				(1.15)	Firm to stiff brown sandy CLAY with some gravel (GLACIOFLUVIAL).			
5.00	B				6.45				
5.00-5.45	SPT	N=25							
5.30-5.60	B								
6.00	B								
6.00-6.45	SPT	N=23							
							Borehole terminated at 6.45m.		

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	
											Water strike at 2.00m.

All dimensions in metres Scale 1:50	Client Portland	Method/ Plant Used Dynamic Sampling	Logged By
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BOREHOLE LOG

Project Ebenezer Chapel, Prudhoe				BOREHOLE No WS03	
Job No 22-1151	Date 10-02-23	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Limited				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.08-1.00	B		↓		(1.00)	Grass over black sandy clayey gravel. Gravel is fine to coarse comprising fragments of brick and sandstone. Cobbles noted (MADE GROUND).			
1.00-1.40	B	N=5		(0.40)		Soft medium brown and grey silty sandy CLAY with some gravel (GLACIOFLUVIAL).			
1.00-1.45	SPT				1.40		Soft locally firm brown and grey silty sandy CLAY / very clayey SAND (GLACIOFLUVIAL).		
1.40-2.10	B			(0.70)		Soft locally very soft brown and grey sandy silty CLAY with some gravel (GLACIOFLUVIAL).			
2.00-2.45	SPT	N=5		(0.60)		Loose brown silty SAND with some gravel (GLACIOFLUVIAL).			
2.10-2.70	B				2.70		Loose medium brown SAND with some fine silt lenses (GLACIOFLUVIAL).		
2.70-3.00	B			(1.20)		Soft (low strength) dark brown sandy CLAY with some gravel (GLACIOFLUVIAL).			
3.00-3.90	B	N=4		(0.90)		Becoming firm (medium strength).			
3.00-3.45	SPT				3.90		Borehole terminated at 6.45m.		
3.90-4.20	B	N=7		(2.65)					
4.00-4.45	SPT			4.80					
4.50-4.80	B								
4.80-5.00	B								
5.00	V	21kN/m ²							
5.60-5.80	B	41kN/m ²							
5.60	V								
6.00	B	N=13							
6.00-6.45	SPT								
7.00	B	N=17							
7.00-7.45	SPT								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											Water strike at 2.70m.

All dimensions in metres Scale 1:50	Client Portland	Method/ Plant Used Dynamic Sampling	Logged By
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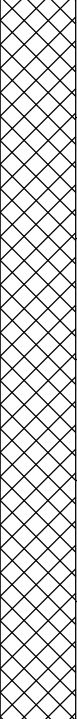


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BOREHOLE LOG

Project Ebenezer Chapel, Prudhoe				BOREHOLE No TP01	
Job No 22-1151	Date 10-02-23	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Limited				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.30	J/D				(0.60)	Grass over black sandy clayey gravel. Gravel is fine to coarse comprising fragments of brick and sandstone. Cobbles noted (MADE GROUND).			
					(0.10)			Firm medium brown very sandy gravelly CLAY / very clayey gravelly SAND. Gravel is fine to coarse of sandstone (GLACIOFLUVIAL).	
					0.70			Trial pit terminated at 0.70m.	

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	
											Dry.

All dimensions in metres Scale 1:6.25	Client Portland	Method/ Plant Used Manual Excavation	Logged By MPB
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BOREHOLE LOG

Project Ebenezer Chapel, Prudhoe				BOREHOLE No TP02	
Job No 22-1151	Date 10-02-23	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Limited				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.00-0.10	J/D				(0.10) 0.10	Grass over brown clayey sandy TOPSOIL			
					(0.30) 0.40	Firm medium brown very sandy gravelly CLAY / very clayey gravelly SAND. Gravel is fine to coarse of sandstone (GLACIOFLUVIAL).			
						Trial pit terminated at 0.40m.			

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	
											Dry.

All dimensions in metres Scale 1:6.25	Client Portland	Method/ Plant Used Manual Excavation	Logged By MPB
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AGS3 UK BH LOGS 22-1151.GPJ AGS3_ALL.GDT 3/4/23



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BOREHOLE LOG

Project Ebenezer Chapel, Prudhoe				BOREHOLE No TP03	
Job No 22-1151	Date 23-02-28	Ground Level (m)	Co-Ordinates ()		
Contractor Arc Environmental Limited				Sheet 1 of 1	

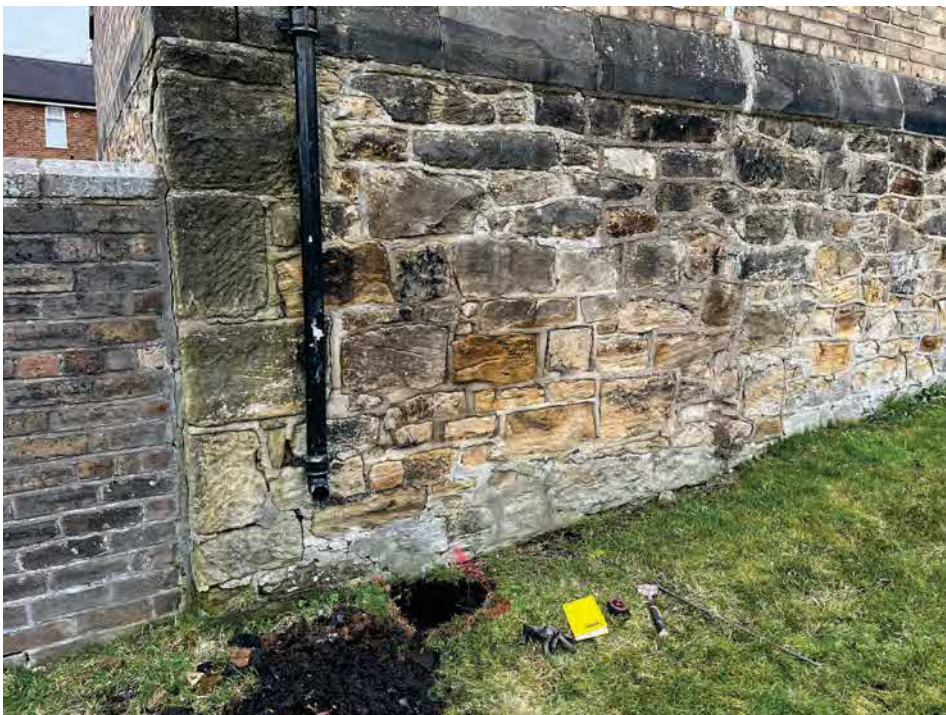
SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)		
				[Cross-hatch pattern]	(0.05) 0.05	Brick paviments (MADE GROUND).		[Cross-hatch pattern]
				[Cross-hatch pattern]	(0.05) 0.10	Brown sand (MADE GROUND).		[Cross-hatch pattern]
				[Dotted pattern]	(0.80)	Medium brown slightly gravelly SAND. Locally clayey (GLACIOFLUVIAL).		[Dotted pattern]
					0.90	Trial pit terminated at 0.70m.		

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	
											Dry.

All dimensions in metres Scale 1:6.25	Client Portland	Method/ Plant Used Manual Excavation	Logged By MPB
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AGS3 UK BH LOGS 22-1151.GPJ AGS3_ALL.GDT 3/4/23

FP01



FP02



FP03



FP04



FP05





APPENDIX III

DCP Test Reports

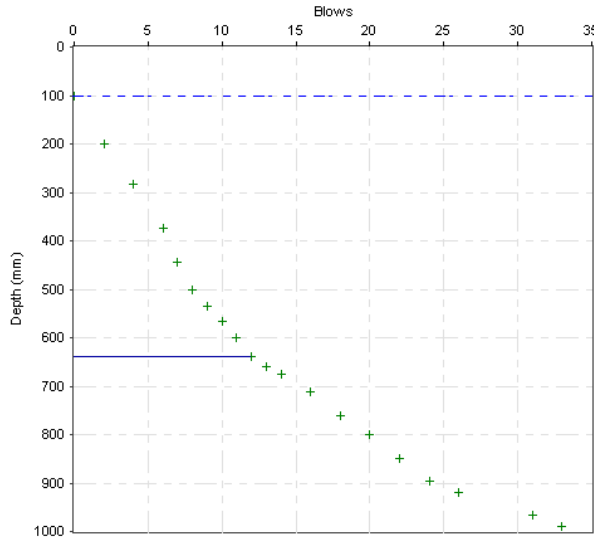
DCP Layer Strength Analysis Report

Project Name: DCP01

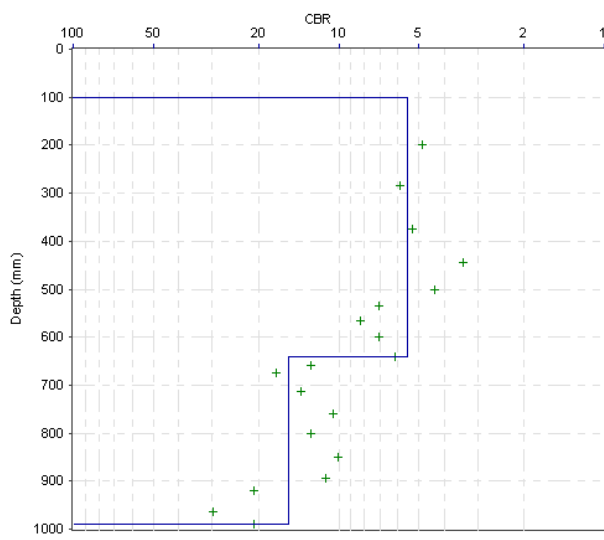
Chainage (km): DCP01
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 28/02/2023

Surface Type: Hot Mixed Asphalt
 Thickness (mm): 100
 Strength Coeff.: 0.40
 Base Type:
 Thickness (mm):
 Strength Coeff.:

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	44.00	6	540	640
2	16.67	15	350	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: DCP01

Chainage (km): DCP01
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 28/02/2023

Surface Type: Hot Mixed Asphalt
 Thickness (mm): 100
 Strength Coeff.: 0.40
 Base Type:
 Thickness (mm):
 Strength Coeff.:

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	100	0.00					
2	2	2	200	50.00					
3	2	4	283	41.50					
4	2	6	375	46.00					
5	1	7	445	70.00					
6	1	8	500	55.00					
7	1	9	535	35.00					
8	1	10	565	30.00					
9	1	11	600	35.00					
10	1	12	640	40.00					
11	1	13	660	20.00					
12	1	14	675	15.00					
13	2	16	712	18.50					
14	2	18	760	24.00					
15	2	20	800	20.00					
16	2	22	850	25.00					
17	2	24	895	22.50					
18	2	26	920	12.50					
19	5	31	965	9.00					
20	2	33	990	12.50					

Remarks: DCP01

APPENDIX IV

Laboratory Results (Ground Contamination & Geotechnical)



LABORATORY REPORT



Contract Number: PSL23/0901

Report Date: 22 February 2023
Client's Reference: 22-1151
Client Name: Arc Environmental
Solum House
Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham
DH7 8PN

For the attention of: Matt Bradford

Contract Title: Ebenezer Chapel, Prudhoe
Date Received: 15/2/2023
Date Commenced: 15/2/2023
Date Completed: 21/02/2023

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
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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS01		B	0.70	1.00	Brown clayey silty SAND & GRAVEL.
WS01		B	3.30	3.50	Brown very sandy clayey silty GRAVEL.
WS02		B	1.25	2.00	Brown very sandy clayey silty GRAVEL.
WS02		B	2.82	3.00	Brown sandy clayey silty GRAVEL.
WS03		B	2.10	2.70	Brown mottled grey gravelly very sandy CLAY.



Ebenezer Chapel, Prudhoe

Contract No:
PSL23/0901
Client Ref:
22-1151

PARTICLE SIZE DISTRIBUTION TEST

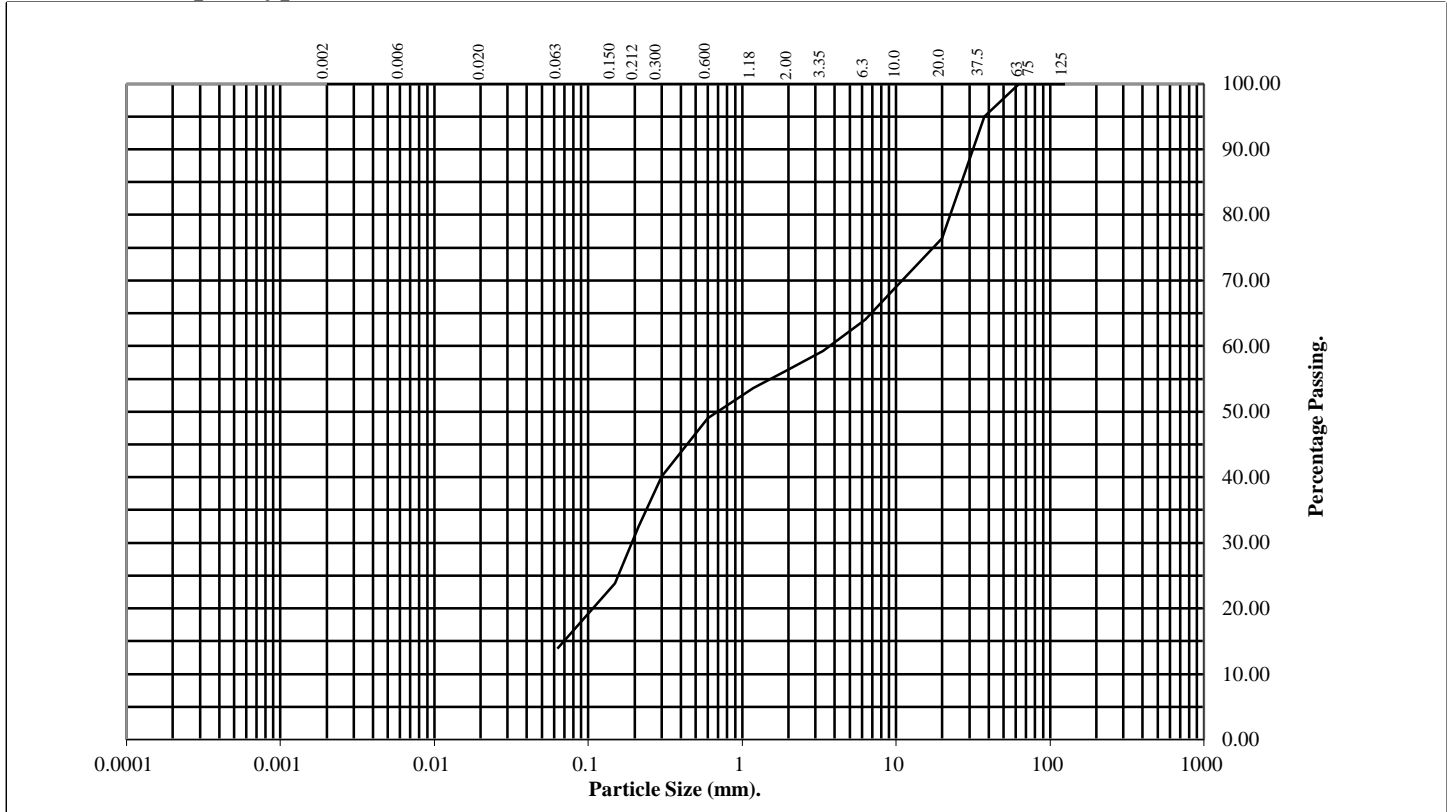
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS01** Top Depth (m): **0.70**

Sample Number: Base Depth(m): **1.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	95
20	76
10	69
6.3	64
3.35	59
2	56
1.18	54
0.6	49
0.3	40
0.212	32
0.15	24
0.063	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	44
Sand	42
Silt/Clay	14

Remarks:
See Summary of Soil Descriptions



Ebenezer Chapel, Prudhoe

Contract No:
PSL23/0901
Client Ref:
22-1151

PARTICLE SIZE DISTRIBUTION TEST

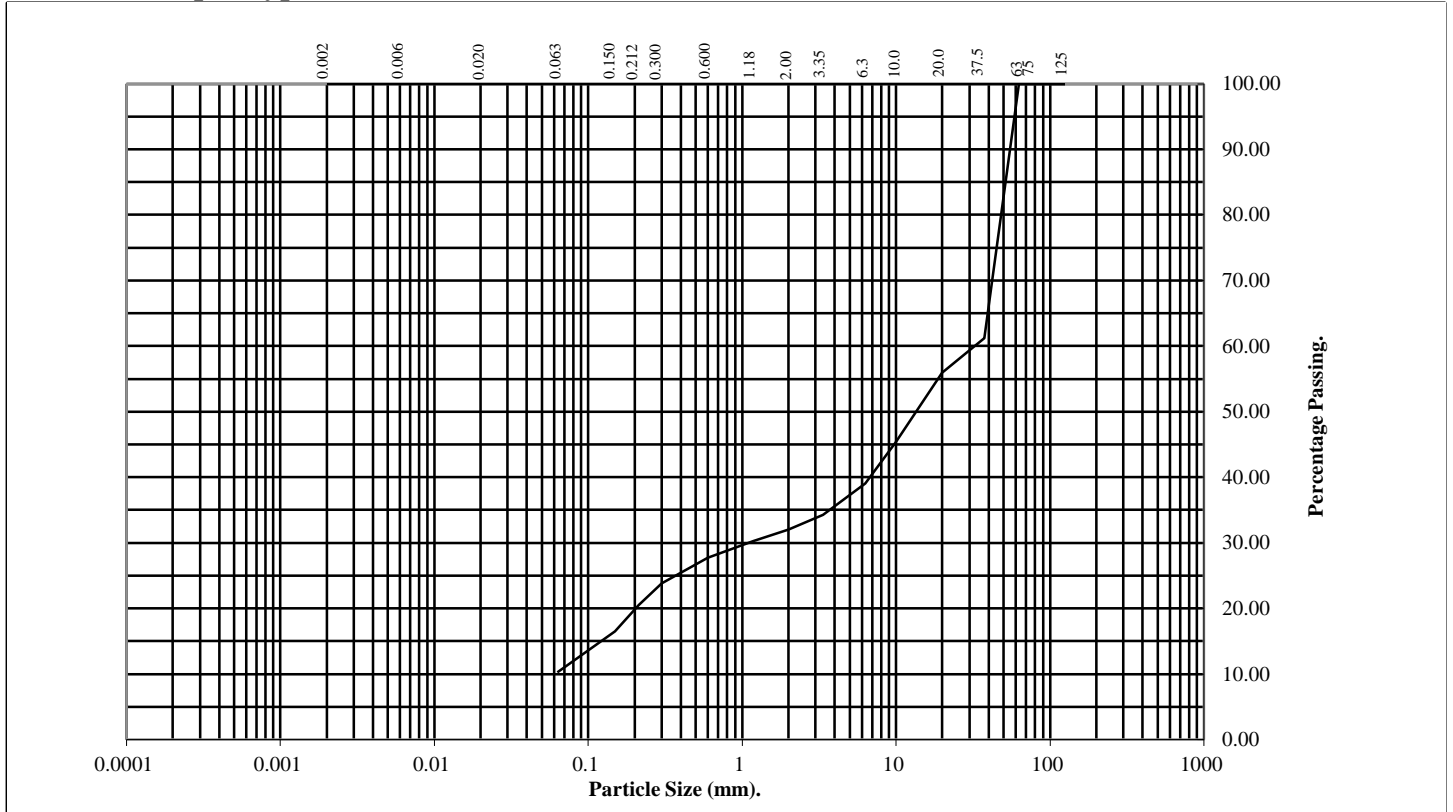
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS01** Top Depth (m): **3.30**

Sample Number: Base Depth(m): **3.50**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	61
20	56
10	45
6.3	39
3.35	34
2	32
1.18	30
0.6	28
0.3	24
0.212	21
0.15	16
0.063	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	68
Sand	22
Silt/Clay	10

Remarks:
See Summary of Soil Descriptions



Ebenezer Chapel, Prudhoe

Contract No:
PSL23/0901
Client Ref:
22-1151

PARTICLE SIZE DISTRIBUTION TEST

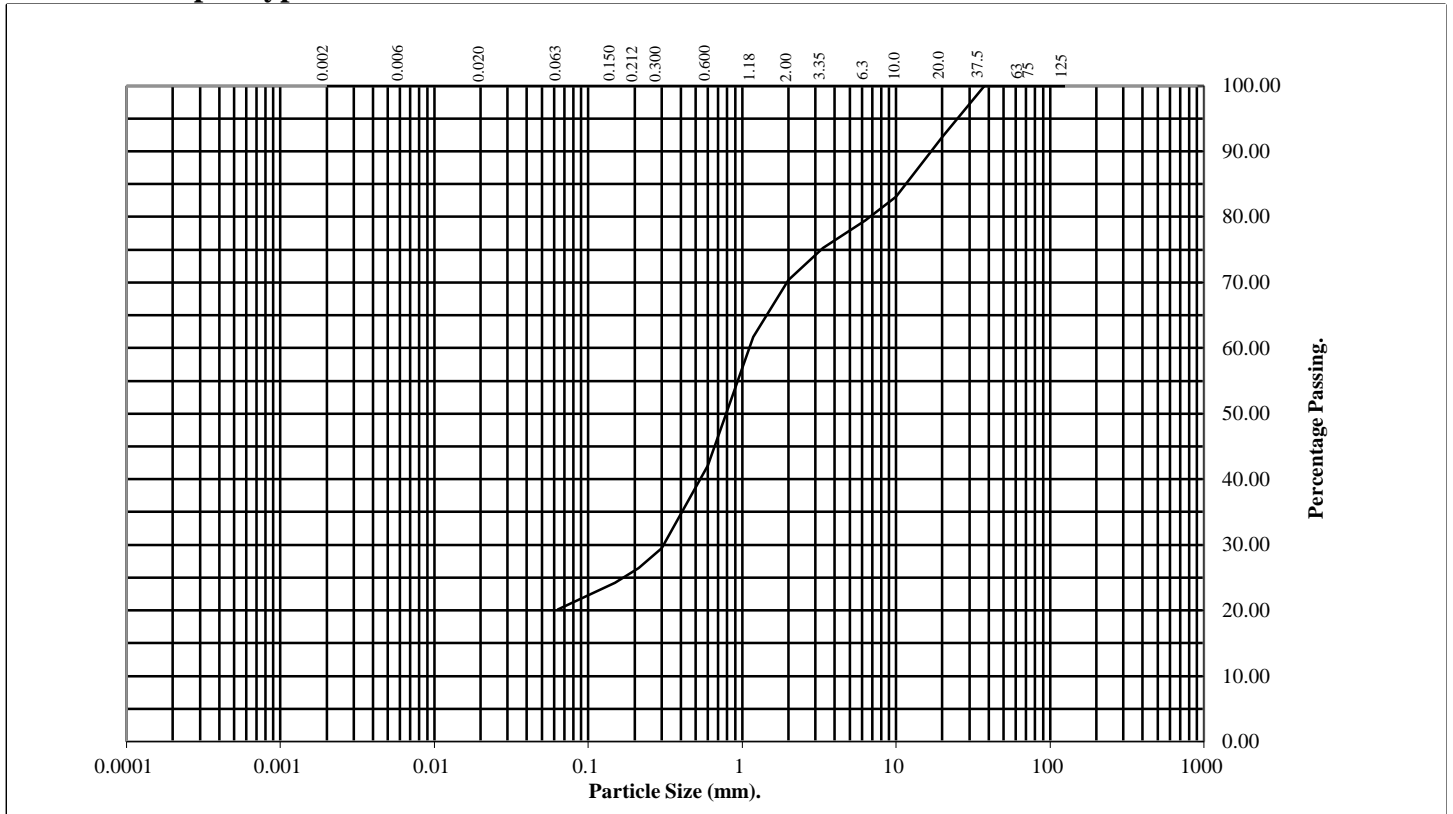
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS02** Top Depth (m): **1.25**

Sample Number: Base Depth(m): **2.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	92
10	83
6.3	79
3.35	75
2	70
1.18	62
0.6	42
0.3	29
0.212	26
0.15	24
0.063	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	30
Sand	50
Silt/Clay	20

Remarks:
See Summary of Soil Descriptions



Ebenezer Chapel, Prudhoe

Contract No:
PSL23/0901
Client Ref:
22-1151

PARTICLE SIZE DISTRIBUTION TEST

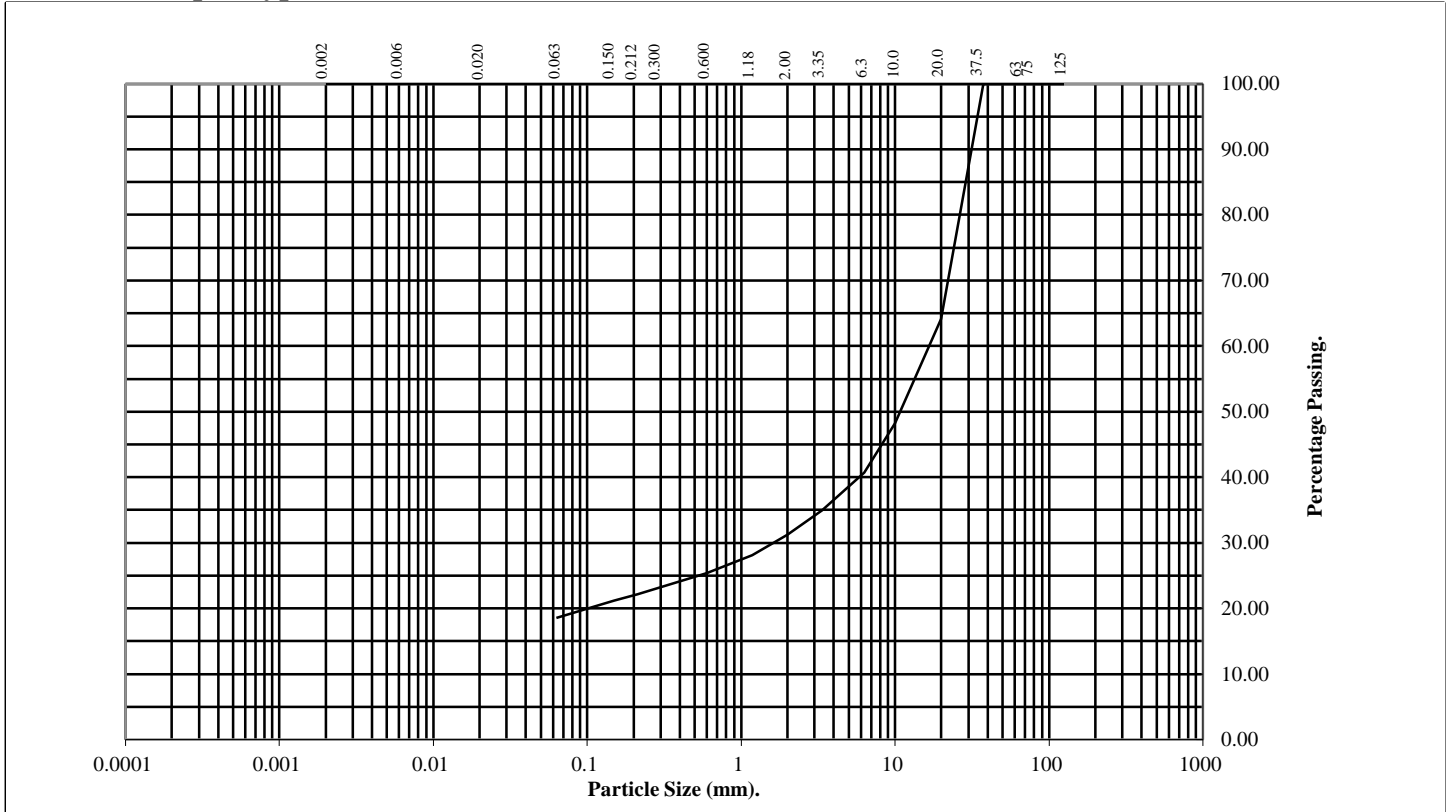
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS02** Top Depth (m): **2.82**

Sample Number: Base Depth(m): **3.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	64
10	48
6.3	41
3.35	35
2	31
1.18	28
0.6	25
0.3	23
0.212	22
0.15	21
0.063	19

Soil Fraction	Total Percentage
Cobbles	0
Gravel	69
Sand	12
Silt/Clay	19

Remarks:
See Summary of Soil Descriptions



Ebenezer Chapel, Prudhoe

Contract No:
PSL23/0901
Client Ref:
22-1151

PARTICLE SIZE DISTRIBUTION TEST

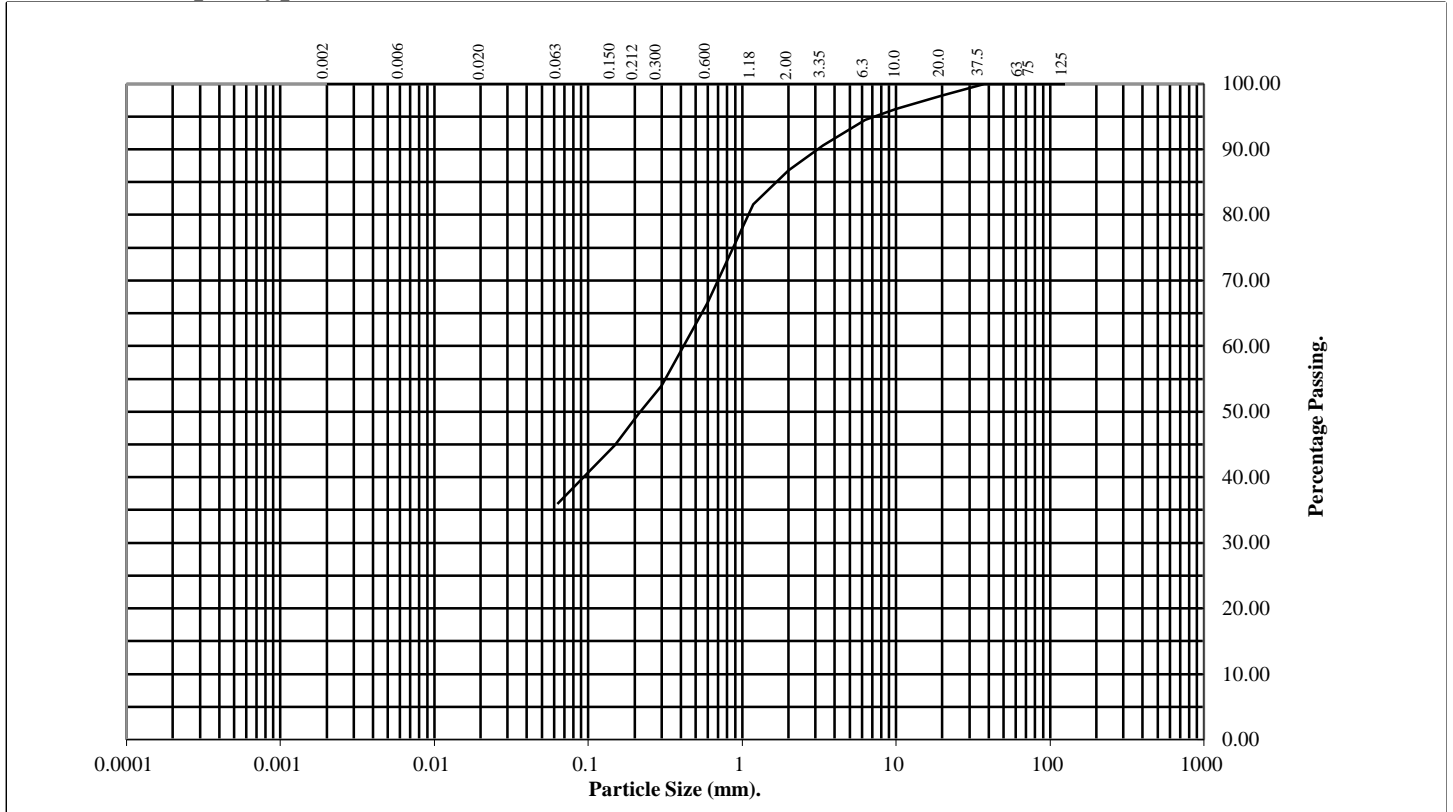
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS03** Top Depth (m): **2.10**

Sample Number: Base Depth(m): **2.70**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	98
10	96
6.3	94
3.35	91
2	87
1.18	82
0.6	67
0.3	54
0.212	50
0.15	45
0.063	36

Soil Fraction	Total Percentage
Cobbles	0
Gravel	13
Sand	51
Silt/Clay	36

Remarks:
See Summary of Soil Descriptions



Ebenezer Chapel, Prudhoe

Contract No:
PSL23/0901
Client Ref:
22-1151



ANALYTICAL TEST REPORT

Contract no: 119107

Contract name: Ebenezer Chapel, Prudhoe

Client reference: 22-1151

Clients name: ARC Environmental

Clients address: Solum House, Unit 1 Elliott Court
St Johns Road
Meadowfield
DH7 8PN

Samples received: 14 February 2023

Analysis started: 14 February 2023

Analysis completed: 23 February 2023

Report issued: 23 February 2023

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:

Abbie Neasham-Bourn
Senior Reporting Administrator

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.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
119107-1	TP01	0.10-0.30	Sandy Clay with Gravel	-	-	12.7
119107-2	TP02	0.00-0.10	Loamy Clay with Gravel	-	-	15.7
119107-3	WS01	0.00-0.24	Loamy Clay with Gravel	-	-	13.4
119107-4	WS01	1.00-1.40	Sandy Clay	-	-	12.9
119107-5	WS02	2.25-2.82	Sandy Clay	-	-	17.7
119107-6	WS03	0.80-1.00	Sandy Clay with Gravel	-	-	16.1

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SOILS

Lab number			119107-1	119107-2	119107-3	119107-4	119107-5	119107-6
Sample id			TP01	TP02	WS01	WS01	WS02	WS03
Depth (m)			0.10-0.30	0.00-0.10	0.00-0.24	1.00-1.40	2.25-2.82	0.80-1.00
Date sampled			13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023
Test	Method	Units						
Moisture Content	CE001	% w/w	12.7	15.7	13.4	-	-	16.1
Arsenic (total)	CE127 ^M	mg/kg As	8.5	5.4	6.9	-	-	6.8
Cadmium (total)	CE127 ^M	mg/kg Cd	0.4	<0.2	0.2	-	-	0.2
Chromium (total)	CE127 ^M	mg/kg Cr	32	33	174	-	-	36
Chromium (III)	CE208	mg/kg CrIII	32	33	174	-	-	36
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	-	-	<1
Copper (total)	CE127 ^M	mg/kg Cu	32	19	25	-	-	31
Lead (total)	CE127 ^M	mg/kg Pb	65	61	67	-	-	56
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5	-	-	<0.5
Nickel (total)	CE127 ^M	mg/kg Ni	27	16	89	-	-	25
Selenium (total)	CE127 ^M	mg/kg Se	1.6	1.4	1.3	-	-	1.5
Zinc (total)	CE127 ^M	mg/kg Zn	139	72	96	-	-	100
pH	CE004 ^M	units	7.4	6.7	6.7	6.2	6.0	8.0
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	31	10	10	20	31	31
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	-	-	<1
Total Organic Carbon (TOC)	CE197	% w/w C	6.7	2.6	5.3	-	-	9.6
PAH								
Acenaphthene	CE087 ^M	mg/kg	0.02	<0.02	0.03	-	-	0.04
Acenaphthylene	CE087 ^M	mg/kg	0.08	<0.02	0.04	-	-	0.05
Anthracene	CE087 ^U	mg/kg	0.13	0.03	0.14	-	-	0.19
Benzo(a)anthracene	CE087 ^U	mg/kg	0.78	0.16	0.83	-	-	0.60
Benzo(a)pyrene	CE087 ^U	mg/kg	0.72	0.16	0.70	-	-	0.50
Benzo(b)fluoranthene	CE087 ^M	mg/kg	1.10	0.21	1.07	-	-	0.66
Benzo(ghi)perylene	CE087 ^M	mg/kg	0.47	0.09	0.44	-	-	0.29
Benzo(k)fluoranthene	CE087 ^M	mg/kg	0.45	0.11	0.39	-	-	0.31
Chrysene	CE087 ^M	mg/kg	0.92	0.21	0.90	-	-	0.59
Dibenz(ah)anthracene	CE087 ^M	mg/kg	0.13	0.03	0.11	-	-	0.07
Fluoranthene	CE087 ^M	mg/kg	1.47	0.32	1.43	-	-	1.12
Fluorene	CE087 ^U	mg/kg	0.05	<0.02	0.05	-	-	0.07
Indeno(123cd)pyrene	CE087 ^M	mg/kg	0.46	0.11	0.46	-	-	0.29
Naphthalene	CE087 ^M	mg/kg	0.06	<0.02	0.03	-	-	0.02
Phenanthrene	CE087 ^M	mg/kg	0.65	0.13	0.58	-	-	0.70
Pyrene	CE087 ^M	mg/kg	1.17	0.25	1.09	-	-	0.86
PAH (total of USEPA 16)	CE087	mg/kg	8.68	1.83	8.28	-	-	6.36
BTEX & TPH								
Benzene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-	-	<0.01
Toluene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-	-	<0.01
Ethylbenzene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-	-	<0.01
m & p-Xylene	CE192 ^U	mg/kg	<0.02	<0.02	<0.02	-	-	<0.02
o-Xylene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-	-	<0.01
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	-	-	<0.1

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SOILS

Lab number			119107-1	119107-2	119107-3	119107-4	119107-5	119107-6
Sample id			TP01	TP02	WS01	WS01	WS02	WS03
Depth (m)			0.10-0.30	0.00-0.10	0.00-0.24	1.00-1.40	2.25-2.82	0.80-1.00
Date sampled			13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023	13/02/2023
Test	Method	Units						
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	-	-	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	-	-	<0.1
EPH Aliphatic (>C10-C12)	CE250	mg/kg	<6	<6	<6	-	-	<6
EPH Aliphatic (>C12-C16)	CE250	mg/kg	<6	<6	<6	-	-	<6
EPH Aliphatic (>C16-C35)	CE250	mg/kg	<15	<15	<15	-	-	<15
EPH Aliphatic (>C35-C44)	CE250	mg/kg	<10	<10	<10	-	-	<10
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	-	-	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	-	-	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	-	-	<0.01
EPH Aromatic (>EC10-EC12)	CE250	mg/kg	<10	11	14	-	-	13
EPH Aromatic (>EC12-EC16)	CE250	mg/kg	<10	14	27	-	-	15
EPH Aromatic (>EC16-EC21)	CE250	mg/kg	<1	11	16	-	-	14
EPH Aromatic (>EC21-EC35)	CE250	mg/kg	<1	14	94	-	-	72
EPH Aromatic (>EC35-EC44)	CE250	mg/kg	<1	<1	29	-	-	28
Subcontracted analysis								
Asbestos (qualitative)	\$	-	NAD	NAD	NAD	-	-	NAD

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE001	Moisture Content	Gravimetry	As received		0.1	% w/w
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
CE208	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
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	U	10	mg/l SO ₄
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE087	Acenaphthene	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	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Benzo(b)fluoranthene	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	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluoranthene	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	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Phenanthrene	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	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
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
CE250	EPH Aliphatic (>C10-C12)	Solvent extraction, GCxGC-FID	As received		6	mg/kg
CE250	EPH Aliphatic (>C12-C16)	Solvent extraction, GCxGC-FID	As received		6	mg/kg
CE250	EPH Aliphatic (>C16-C35)	Solvent extraction, GCxGC-FID	As received		15	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE250	EPH Aliphatic (>C35-C44)	Solvent extraction, GCxGC-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
CE250	EPH Aromatic (>EC10-EC12)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC12-EC16)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC16-EC21)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC21-EC35)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
CE250	EPH Aromatic (>EC35-EC44)	Solvent extraction, GCxGC-FID	As received		1	mg/kg
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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)
119107-1	TP01	0.10-0.30	N	
119107-2	TP02	0.00-0.10	N	
119107-3	WS01	0.00-0.24	N	
119107-4	WS01	1.00-1.40	N	
119107-5	WS02	2.25-2.82	N	
119107-6	WS03	0.80-1.00	N	

Chemtech Environmental Limited

ADDITIONAL INFORMATION

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 4 weeks from initial receipt unless otherwise instructed.

BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

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, where applicable.