soils LIMITED

Main Investigation Report

at
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

for
Cinnamon Retirement Living Limited and Highwood Homes

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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

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Executive Summary

Site Details	**Site Address**	Stoneham Continuing Care retirement Community (Stoneham CCRC), Stoneham, Eastleigh, Hampshire SO50 9HS
	Grid Reference	SU 438 175
	Site Area	4.44Ha
	Proposed Development	The proposed development was to comprise construction of Care Village Apartments to the west of the site consisting of 13No. up to 2.5-storey accommodation blocks and refurbishment of Coach House and development of Landmark Building Care Home, understood to include whole or partial footprint basement to include 53No. apartments. The proposed development was to include areas soft landscaping / communal open space
Site Works	**Scope of Works**	The site investigation comprised: • 4No. cable percussive boreholes to a maximum depth of 25m bgl; • 17No. dynamic boreholes to a maximum depth of 4.00m bgl; • 11No. super heavy dynamic probes to a maximum depth of 6.00m bgl; • 23No. machine excavated trial pits; • 11No. DCP TRL probes; • Installation of dual-purpose soil gas and groundwater monitoring wells; • Contamination sampling of debris stockpiles and surface materials; • Contamination laboratory testing; • Geotechnical laboratory testing.
	Ground Conditions	• Topsoil/Made Ground to depths of between 0.10m and 2.20m (deep in isolated areas) comprising dark brown sandy silty GRAVEL comprising fragments of flint, brick, metal, ceramics, ash and glass. • River Terrace Deposits to depths ranging between 1.10m to 5.80m bgl, comprising interbedded orangish brown slightly silty sandy GRAVEL and slightly gravelly slightly sandy CLAY. • Granular London Clay Formation immediately underlying the River Terrace Deposits and proven to depths ranging between 9.60m and 12.90m bgl, comprising light orangish brown and yellow silty to very silty fine to medium SAND. • Cohesive London Clay Formation immediately underlying the granular stratum and persisted to the full investigation depth of 25.00m bgl, comprising dark grey slightly (fine) sandy CLAY.

Geotechnical Considerations	**Foundations**	Given the variable ground conditions underlying the site, a varied approach to foundations was considered applicable for the proposed development, incorporating both traditional strip foundations within suitable soils of the River Terrace Deposits and, where suitable bearing values are not possible or where differential settlements are considered too great, piled foundations into the London Clay Formation. Four indicative foundation "zones" were defined across the site. Shallow groundwater was encountered across parts of the site at depths of <2.50m bgl. Where groundwater is encountered during excavation, dewatering may be required to produce a dry and stable environment for construction. Ground improvement techniques could be considered to increase the bearing capacity in defined areas of the site and/or where risk of differential and total settlements exceed tolerable limits. Consideration to the use of ground improvement techniques can only be made once final finished level information is available as this could negate the requirement or benefit of such techniques.
	Floor Slabs	Considering that the depths of Made Ground were variable across the site and frequently in excess of 600mm, the adoption of suspended floor slabs must be considered. Ground floor slabs can, however, potentially be considered on a local basis following further, specific assessment / information on proposed final levels
	Subsurface Concrete	Design Sulphate Class of DS-1 and ACEC Class AC-1 was defined for soils of Made Ground and River Terrace Deposits. Design Sulphate Class of DS-2 and ACEC Class AC-2 was defined for soils of the London Clay Formation
	Excavations	Shallow excavations in the Made Ground/Topsoil are likely to be marginally stable in the short term at best. Deeper excavations taken into the River Terrace Deposits and London Clay Formation are likely to be unstable in both the short and the long term, depending on the thickness of overlying Made Ground/Topsoil and the likely presence of both groundwater and perched water. Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose before excavations are entered by personnel. Excavations beneath the groundwater table are likely to be unstable and dewatering of foundation trenches may be necessary.
	Pavements	CBR value of 6% was considered suitable for design purposes for the majority of the road layout. The cohesive soils of the River Terrace Deposits would not be frost susceptible as plasticity indexes were typically >20%. The granular soils of the River Terrace Deposits would not be frost susceptible, as percentage of fines was <10%.
	Soakaways	Granular soils of the River Terrace Deposits were considered suitable for the adoption of a soakaway where an indicative infiltration rate of 1.10×10^{-5}m/s can be taken for design purposes. The results from groundwater monitoring must be taken into account as the base of any soakaway must be seated a minimum 1m above the phreatic zone.

Environmental Considerations	**Human Health**	The Tier 1 Quantitative risk assessment established that there is a theoretical risk to the human health receptors of construction workers or future end-users, but a site-specific assessment is likely to consider that this risk is not significant in the context of the proposed development and does not currently present a risk. The analysis to date also confirms that there is no evidence of any systematic contamination present in the below ground level materials and none of the noted elevated outliers are significant. A risk from the presence of asbestos within stockpiled materials onsite and potential other sources not yet identified and unknow risk present from the above ground physical site wastes onsite such as concentrated areas of glass, metals, oils and physical contaminants persisted onsite. As such the presence of these materials could present a potentially significant risk to workers, the development, adjacent properties and future users of the site. As such and to comply with the requirements of H&S at Work Act, CAR2012 and duty of care in relation to the above, the employment of a suitably qualified asbestos specialist to advise on these matters is very strongly advised.
	Groundwater	The Groundwater Risk Assessment established that there was a low risk to the groundwater receptor as there were minor concentrations of determinants in excess of their relevant Environmental Quality Standards (EQS). However, the risk to site users or general local groundwater resources given the underlying geology, the highly variable depth to groundwater encountered on site pre and post development, its probable perched nature and seeming lack of connectivity, is considered low to negligible in context, but would require regulatory confirmation.
	Soil Gas	Soil gas monitoring of the standpipes installed onsite was undertaken on a total of nine occasions between 25th May 2019 and 30th September 2019 at approximately fortnightly intervals, in line with the clients specification. The results of the characterisation of the sites gassing regime following review of the dataset collected classified the site as Characteristic Situation 1, where no soil gas protection is considered necessary and the risk is considered low to negligible. However, an underlying piston effect at depth has been noted in BH02(D) and due care should be given to any works which may provide a linkage, access or breach into this lower regime.
	Waste Disposal	The waste acceptance criteria results and consideration of the general soils results in a waste context both strongly indicate that the majority of the materials analysed and encountered are most likely suitable for disposal to an inert landfill. However, the spoil may require further analysis depending on the disposal or recycling route chosen and may require further health and safety consideration by a suitable qualified competent person due to the noted presence of asbestos as ACM and ACS in the spoil. To comply with current guidance, the waste materials may also require some form of segregation and separation prior to final disposal and a competent waste advisor should be appointed to assist with this.

Commission

Soils Limited was commissioned by Cinnamon Retirement Living Limited and Highwood Homes to undertake an intrusive ground investigation and produce a Main Investigation Report on land at Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS. The scope of the investigation was outlined in the Soils Limited quotation reference Q21317, dated 9th April 2019.

This document comprises the Main Investigation Report and incorporates the results, discussion and conclusions to this intrusive works. Report revision 1.02 incorporates an update to the report following completion of the post-works soil gas and groundwater monitoring undertaken at the site and supersedes all previous revisions.

This Main Investigation Report must be read in conjunction with the Geotechnical and Geoenvironmental Desk Study prepared for the site by Ramboll, report reference 1620005365-RAM-X-XX-RP-YE-01 Rev 02, dated November 2018.

Standards

The site works, soil descriptions and geotechnical testing was undertaken in accordance with the following standards:

- BS 5930:2015 and BS EN ISO 22476-2&3:2005+A1:2011
- BS EN 1997-1:2004+A1:2013
- BS EN ISO 14688-1:2002+A1:2013
- BS EN ISO 14688-2:2004+A1:2013
- BS 10175:2011+A1:2013

The geotechnical laboratory testing was performed by GEO Site & Testing Services Ltd (GSTL) in accordance with the methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accredited test methods.

For the preparation of this report, the relevant BS code of practice was adopted for the geotechnical laboratory testing technical specifications, in the absence of the relevant Eurocode specifications (ref: ISO TS 17892).

The chemical analyses were undertaken by DETS Environmental Limited in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs.

Trial hole is a generic term used to describe a method of direct investigation. The term

trial pit, borehole or window sample borehole implies the specific technique used to produce a trial hole.

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Section 1 Introduction

1.1 Objective of Investigation

Soils Limited was commissioned by Cinnamon Retirement Living Limited and Highwood Homes to undertake an intrusive ground investigation and produce a Main Investigation Report to supply the client and their designers with information regarding ground conditions, to assist in preparing a foundation scheme for development that was appropriate to the settings present on the site.

The investigation was to be undertaken to provide comment on appropriate foundation options for the proposed development. The investigation was to be made by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the trial holes.

In addition, soil samples were taken for chemical laboratory testing to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any contamination identified as dictated by the Conceptual Site Model (CSM) presented in the Geotechnical and Geoenvironmental Desk Study developed by Ramboll (report ref.: 1620005365-RAM-X-XX-RP-YE-01 Rev 02, dated November 2018).

1.2 Location

The site was located at Stoneham Continuing Care Retirement Community (Stoneham CCRC), Stoneham, Eastleigh, Hampshire SO50 9HS and had an approximate O.S Land Ranger Grid Reference of SU 438 175.

The site location plan is given in Figure 1.

1.3 Site Description

At the time of reporting the site spanned approximately 4.44Ha and was observed to comprise and area of open pastureland to the east, woodland to the south and semi-derelict industrial land to the west.

Stockpiled and scattered waste material was noted to be in abundance within the semi-derelict industrial land to the west and the derelict former residential building in the eastern centre of the site. The waste material was noted to typically comprise demolition waste, tyres, propane cylinders, wood, plastics, glass, metals, household wastes, oil containers, electronics and asbestos.

The northwest corner of the site was noted to be impacted by Japanese Knotweed, which was the subject of separate investigation, control and remediation by PBA.

At the time of the investigation, the site undulated with a shallow overall dip down to the

southeast. Woodland occupied the south of the site with several mature trees / vegetation bisecting the site centrally, north to south.

The site was surrounded by a new build residential development under construction to the north, recreational facilities and Shrubbery Pond to the south, agricultural land to the east and a private residence with walled garden to the west. The boundary wall that separated the site from the walled garden was subject to a preservation order.

An aerial photograph has been included in Figure 2.

1.4 Proposed Development

The proposed development was to comprise construction of Care Village Apartments to the west of the site consisting of 13No. up to 2.5-storey accommodation blocks, spa/gym, parking and communal gardens; and refurbishment of Coach House and development of Landmark Building Care Home to the east comprising terrace, plant room, communal facilities and 53No. apartments. The proposed development was to comprise areas of hard landscaping including pavements, access roads and parking and areas soft landscaping including communal open space but no private domestic gardens.

In compiling this report reliance was placed on drawing number 11042 FE SK004, dated March 2019, prepared by PRC Group. Any change or deviation from the scheme outlined in the drawing could invalidate the foundation design and remediation recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix E.

1.5 Anticipated Geology

The 1:50,000 BGS map showed the site to be located upon bedrock of the London Clay Formation, with overlying superficial deposits of River Terrace Deposits anticipated to the west of the site and superficial deposits of Head anticipated to the east of the site.

1.5.1 Head

Head deposits are drifts produced by solifluxion, the downslope movement of debris outwash during the periglacial period, and characteristically comprise poorly sorted sands gravels and chalk of local derivation.

1.5.2 River Terrace Deposits

The rivers Test and Itchen have deposited extensive spreads of River Terrace Deposits in the Southampton area, representative of ancient floodplains. In total, eleven terraces have been recorded. The River Terrace Deposits consist predominantly of gravels made up of subangular to subrounded flints with a significant sand component locally with lenses of silt, clay or peat.

The five highest terraces have appreciable clay content. Poorly sorted, clayey and

sandy silts and silty clays overlie the 1st, 3rd, 5th and 6th terraces and locally at above terrace gravels.

River Terrace Deposits 1 was mapped to the west of the site.

1.5.3 London Clay Formation

The London Clay Formation in the Hampshire region comprises silty and sandy clay, clayey and sandy silt, silty sand; sporadic claystones and thin beds of flint pebbles. The formation includes the Bognor Sand, Whitecliff Sand, Durley Sand, Portsmouth Sand and Nursling Sand Members. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.

Outcrops of the Whitecliff Sand were noted on BGS Geology Maps approximately 2.5km northeast and 3.5km west of the site.

The lowest part of the London Clay Formation rests on the Reading Formation (Lambeth Group).

1.6 Limitations and Disclaimers

This Main Investigation Report relates to the site located at Stoneham CCRC, Stoneham, Eastleigh, Hampshire SO50 9HS and was prepared for the sole benefit of Cinnamon Retirement Living Limited and Highwood Homes (The “Client”). The report was prepared solely for the brief described in Section 1.1 of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Conditions of Contract of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot by plot basis prior to the construction of foundations. Supplied site surveys may not include substantial shrubs or bushes and is also unlikely to have data or any trees, bushes or shrubs removed prior to or following the site survey.

Where trees are mentioned in the text this means existing trees, substantial bushes or shrubs, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping).

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. “Contaminated Land” is defined in Section 57 of the Environment Act 1995 as:

“Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being or is likely to be caused”.

The investigation, analysis or recommendations in respect of contamination are made solely in respect of the prevention of harm to vulnerable receptors, using where possible best practice at the date of preparation of the report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets remains with Soils Limited. License is for the sole use of the client and may not be assigned, transferred or given to a third party.

Section 2 Site Works

2.1 Proposed Project Works

The proposed intrusive investigation was designed to provide information on the ground conditions and to aid the design of foundations for the proposed development. The intended investigation, as outlined within the Soils Limited quotation (Q21317, dated 9th April 2019) was therefore to comprise the following items:

- 1No. 25m and 2No. 15m deep cable percussive boreholes with alternate SPT/U100 testing at 1m centres for the top 5m bgl and 1.5m centres thereafter
- 11No. 6m deep dynamic boreholes
- 11No. 6m deep dynamic probes
- In-situ CBR tests (DCP- TRL)
- 7No. machine excavated trial pits
- 4No. hand excavated trial pits
- Installation of soil gas and groundwater monitoring wells
- Groundwater sampling and monitoring
- Soil gas monitoring
- Contamination laboratory testing
- Geotechnical laboratory testing

2.1.1 Actual Project Works

The actual project works were undertaken between 23rd April and 2nd May 2019 and comprised:

- 1No. 25m (BH01) and 2No. 15m (BH02 – BH03) deep cable percussive boreholes with alternate SPT/U100 testing at 1m centres for the top 5m bgl and 1.5m centres thereafter
- 1No. 6m (BH04) deep cable percussive borehole in area of encountered deep Made Ground, with alternate SPT/U100 testing at 1m centres
- 17No. dynamic boreholes
- 11No. super heavy dynamic probes
- 23No. machine excavated trial pits
- 11No. DCP TRL probes
- Installation of soil gas and groundwater monitoring wells
- Contamination sampling of debris stockpiles and surface material onsite
- Groundwater sampling and monitoring, where encountered
- Soil gas monitoring
- Contamination laboratory testing
- Geotechnical laboratory testing

Additional exploratory holes were undertaken, as discussed with the client at the time, at locations determined by the conditions identified at the time of the intrusive works to provide greater understanding of the ground conditions present at the site.

Soil gas and groundwater monitoring wells were installed within trial holes BH01 – BH04, WS01, WS03, WS08, WS12, WS101 and WS102 comprising 50mm pipework with response zone comprising slotted pipe with non-calcareous gravel pack surround with bentonite seal above. The headworks comprised a single gas tap within metal stopcock cover set in concrete. A dual standpipe install was installed within BH02. Details of the installations have been presented in Table 2.1. These locations were selected to provide general coverage of the site as well as to target potential sources observed during site reconnaissance and intrusive works.

Table 2.1 Well Installation Details

Well Ref.	Response Zone (m bgl)	Well Diameter (mm)	Stratum
BH01	1.00 – 10.00	50	RTG/LCF
BH02(S)	1.00 – 3.00	50	RTG
BH02(D)	5.00 – 11.00	50	LCF
BH03	1.00 – 10.00	50	RTG/LCF
BH04	1.00 – 6.00	50	RTG/LCF
WS01	1.00 – 4.00	50	RTG/LCF
WS03	1.00 – 3.50	50	RTG/LCF
WS08	1.00 – 3.50	50	RTG/LCF
WS12	1.20 – 2.00	50	RTG
WS101	0.80 – 1.30	50	RTG
WS102	0.70 – 1.70	50	RTG

Five infiltration test pits were undertaken within the application site in November 2018 as part of a wider site investigation. The results have been included within this report.

All trial hole locations have been presented in Figure 3 to Figure 8.Figure 7

Trial hole co-ordinates and elevations, where available, are presented within the engineers logs included as Appendix A.1. At the time of the survey, geolocation of trial holes TP101 – TP104 and TP106 was not possible due to the dense overhead tree canopy.

Following completion of site works, soil cores were logged and sub sampled so that samples could be sent to the laboratory for both contamination and geotechnical testing.

2.2 Ground Conditions

Four cable percussive boreholes were drilled to depths ranging between 6.00m and 25.00m bgl at locations selected by the client. Alternate SPT/U100 testing was undertaken at 1m intervals for the first 5m bgl and at 1.5m intervals thereafter.

A total of seventeen windowless sampler boreholes (WS01 – WS12 and WS101 – WS105), including five additional, were drilled to depths ranging between 0.55m and

4.00m bgl at locations selected by Soils Limited and confirmed by the client. The construction of WS05 was terminated at a depth of 0.55m bgl due to the presence of dense soils which could not be safely penetrated with the equipment available.

Eleven (WS01 – WS11) super heavy dynamic probes were driven prior and adjacent to their corresponding windowless sampler borehole, to depths ranging between 0.80m and 6.00m bgl. DP05 was terminated on contact with dense soils.

A total of eleven standpipes were installed in ten locations within cable and windowless sampler boreholes (BH01 – BH04, WS01, WS03, WS08, WS12, WS101 – WS102) to allow for continued monitoring of both groundwater and soil gas, where present. Details of the well installation are presented in Table 2.1.

A total of twenty-three trial pits, including twelve additional, were machine excavated to depths ranging between 0.60m and 2.10m bgl at locations selected by Soils Limited and confirmed by the client.

Eleven TRL-DCP (DCP01 – DCP11) probes were undertaken at locations selected by Soils Limited using a development plan provided by the client.

The maximum depths of trial holes have been included in Table 2.2.

All trial holes were scanned with a Cable Avoidance Tool (C.A.T.) and signal generator (Genny) prior to excavation to ensure the health and safety of the operatives.

Table 2.2 Final Depth of Trial Holes

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)	Probe Hole	Depth (m bgl)
BH01 [W]	25.00	TP01	1.80	DP01	6.00
BH02 [D/W]	15.00	TP02	1.20	DP02	6.00
BH03 [W]	15.00	TP03	1.70	DP03	6.00
BH04 [W]	6.00	TP04	1.30	DP04	5.80
WS01 [W]	4.00	TP05	1.10	DP05	0.80
WS02	3.00	TP06	1.00	DP06	4.80
WS03 [W]	3.50	TP07	1.00	DP07	3.50
WS04	3.00	TPADD1	2.00	DP08	6.00
WS05	0.55	TPADD2	2.10	DP09	4.70
WS06	2.00	TPADD3	0.60	DP10	6.00
WS07	3.00	TPADD4	0.60	DP11	6.00
WS08 [W]	3.80	TPADD5	0.60	DCP01	0.92
WS09	3.00	TPADD6	1.70	DCP02	0.86
WS10	3.00	HP01	0.50	DCP03	0.92
WS11	3.50	HP02	1.20	DCP04	0.90
WS12 [W]	2.40	HP03	0.60	DCP05	0.92
WS101 [W]	2.70	HP04	0..50	DCP06	0.91
WS102 [W]	2.80	TP101	1.40	DCP07	0.35
WS103	3.40	TP102	1.35	DCP08	0.91
WS104	4.00	TP103	0.95	DCP09	0.91

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)	Probe Hole	Depth (m bgl)
WS105	4.00	TP104	1.50	DCP10	0.90
		TP105	1.90	DCP11	0.91
		TP106	0.90		

Note: w - well installation. D/W – dual well installation

The approximate trial hole locations are shown on Figure 3.

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the trial hole logs and quoted in this report were measured from ground level.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots or has been identified as part of the in-situ weathering profile, it has been described as Topsoil both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered, with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the log and within this report.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for the purposes of discussion, the succession of conditions encountered in the trial holes in descending order can be summarised:

Made Ground/Topsoil (MG/TS)
River Terrace Deposits (RTD)
London Clay Formation (LCF)

The ground conditions encountered in the trial holes are summarised in Table 2.3.

Table 2.3 Ground Conditions

Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
MG/TS	Anthropocene	0.00	0.10–2.20	0.50	**TS**: Dark brown slightly sandy slightly gravelly CLAY with frequent roots/rootlets. **MG**: Dark brown sandy silty GRAVEL comprising fragments of flint, brick, metal, ceramics, ash and glass.
RTD	Quaternary	0.10–2.20	1.10–5.80[2]	4.00	**Interbedded** orangish brown slightly silty sandy GRAVEL and slightly gravelly slightly sandy CLAY.
LCF	Eocene	1.10–5.80[2]	>25.00[1]	Not proven[3]	**Granular**: Light orangish brown and yellow silty to very silty fine to medium SAND. **Cohesive**: Dark grey slightly (fine) sandy CLAY.

Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		

Note: [1] Final depth of trial hole. [2] Inferred depth from dynamic probe. [3] Base of strata not encountered. 0.00 denotes ground level.

2.3 Ground Conditions Encountered in Trial Holes

The ground conditions encountered in trial holes have been described below in descending order. The engineering logs are presented in Appendix A.1.

2.3.1 Made Ground and Topsoil

Soils described as Made Ground were encountered in forty-one of the forty-four trial holes from ground level and persisted to depths ranging between 0.10m and up to 2.20m bgl in the area around BH04.

The Made Ground typically comprised dark brown sandy silty GRAVEL. Gravel typically comprised fragments of flint, brick, metal, ceramics, ash and glass.

Trial pits (HP1 & HP4) were undertaken, and samples obtained from surface (SP1, S1 – S3), from stockpiled waste materials present onsite. The stockpiled waste materials were described as dark brown and greyish brown slightly sandy gravelly SILT. The gravel typically comprised fragments of flint, brick, metal, glass, plastic, wood, tile, fibreglass and Asbestos Containing Materials (ACM). Samples S1, S2 and S3 were noted to contain visible strands and roots likely pertaining to knotweed.

Soils described as Topsoil were encountered in three of the forty-four trial holes from ground level and persisted to depths ranging between 0.10m and 0.30m bgl.

The Topsoil comprised dark brown slightly sandy slightly gravelly CLAY with frequent roots/rootlets. Gravel was fine subangular clasts of flint.

The final depths of the Made Ground and Topsoil have been included in Table 2.4.

Table 2.4 Final Depth of Made Ground/Topsoil

Trial Hole	Strata	Depth (m bgl)	Trial Hole	Strata	Depth (m bgl)
BH01	MG	1.60	TP01	MG	0.30
BH02	MG	0.10	TP02	MG	0.30
BH03	MG	0.60	TP03	MG	0.30
BH04	MG	2.20	TP04	MG	0.90
WS01	MG	1.10	TP05	MG	0.30
WS02	MG	0.55	TP06	MG	0.40
WS03	MG	0.55	TP07	MG	0.50
WS04	MG	1.40	TPADD1	MG	0.30
WS05	MG	0.40	TPADD2	MG	0.30
WS06	MG	0.65	TPADD3	MG	0.30

Trial Hole	Strata	Depth (m bgl)	Trial Hole	Strata	Depth (m bgl)
WS07	TS	0.10	TPADD4	MG	0.30
WS08	TS	0.30	TPADD5	MG	0.30
WS09	MG	0.95	TPADD6	MG	1.70[1]
WS10	TS	0.30	HP01[2]	MG	0.50[1]
WS11	MG	0.70	HP02[2]	MG	1.20[1]
WS12	MG	0.70	HP03[2]	MG	0.30
WS101	MG	0.60	HP04[2]	MG	0.50[1]
WS102	MG	0.40	TP101	MG	0.30
WS103	MG	0.60	TP102	MG	0.70
WS104	MG	0.85	TP103	MG	0.80
WS105	MG	0.50	TP104	MG	0.65
			TP105	MG	0.55
			TP106	MG	0.70

Note: [1] Final depth of trial hole. [2] Trial hole undertaken in stockpiled and bunded waste materials.

2.3.2 River Terrace Deposits

Soils described as River Terrace Deposits were encountered underlying the Made Ground/Topsoil and proven to depths ranging between 1.10m and 5.45m bgl and inferred to a maximum depth of 5.80m bgl from dynamic probes.

The River Terrace Deposits comprised interbedded orangish brown slightly silty very sandy GRAVEL and slightly gravelly slightly sandy CLAY. Gravel was typically medium to coarse subangular to rounded clasts of flint. Sand was typically medium to coarse.

The final depths of River Terrace Deposits have been included in Table 2.5.

Table 2.5 Final Depth of River Terrace Deposits

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
BH01	4.50	TP01	1.80[1]
BH02	5.45	TP02	1.20[1]
BH03	2.40	TP03	1.70[1]
BH04	5.00	TP04	1.30[1]
WS01	3.40	TP05	1.10[1]
WS02/DP02	3.00[1]/5.50	TP06	1.00[1]
WS03	2.80	TP07	1.00[1]
WS04/DP04	3.00[1]/5.80[1]	TPADD1	2.00[1]
WS05/DP05	0.55[1]/0.80[1]	TPADD2	2.10[1]
WS06/DP06	2.00[1]/4.30	TPADD3	0.60[1]
WS07	1.10	TPADD4	0.60[1]
WS08	1.60	TPADD5	0.60[1]
WS09	2.10	TPADD6	Not encountered
WS10	1.80	HP01	Not encountered
WS11	2.90	HP02	Not encountered
WS12	2.40[1]	HP03	0.60[1]
WS101	2.70[1]	HP04	Not encountered
WS102	2.80[1]	TP101	1.40[1]
WS103	2.90	TP102	1.35[1]

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
WS104	3.00	TP103	0.95[1]
WS105	3.70	TP104	1.50[1]
		TP105	1.90[1]
		TP106	0.90[1]

Note: [1] Final depth of trial hole.

2.3.3 London Clay Formation

Soils described as the London Clay Formation were encountered sixteen of the forty-four trial holes immediately underlying the River Terrace Deposits and persisted to the full investigatory depth of 25.00m bgl.

Soils of the London Clay Formation were encountered as granular soils overlying cohesive soils. The granular soils can potentially be attributed to the Whitecliff Sand Member, which forms part of the extended London Clay unit, and is characterised with a basal band of “black pebbles”, as encountered between the granular and cohesive units in BH02. Notwithstanding this, the Whitecliff Sand Member was not mapped to be present onsite on BGS Geology Maps, with outcrops shown approximately 2.5km northeast and 3.5km west; and the soils had a higher fines content than would typically be characteristic of the Whitecliff Sand Member. Therefore, the predominantly granular stratum has been referred to as granular London Clay Formation throughout this report.

The granular soils of the London Clay Formation were proven to a depth of between 9.60m and 12.90m bgl within the deep boreholes and comprised light yellow silty to very silty fine to medium SAND with partings of light orangish brown (fine to medium) sandy silt and clay. In BH02, the base of the granular unit was characterised by a thin layer of black coarse rounded flint GRAVEL with rounded flint cobbles.

The final depths of the granular London Clay Formation, where encountered, have been included in Table 2.6.

The cohesive soils of the London Clay Formation were encountered underlying the granular soils, from depths ranging between 9.60m and 12.90m bgl and persisted to the full investigatory depth of 25.00m bgl.

The cohesive London Clay Formation comprised dark grey slightly (fine) sandy CLAY. Occasional gravel sized calcareous shell fragments were recorded within the upper horizon of the cohesive unit in BH01.

The final depth of the cohesive London Clay Formation, where achieved, have been included in Table 2.7.

Table 2.6 Final Depth of Granular London Clay Formation

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
BH01	11.20	TP01	Not encountered
BH02	12.90	TP02	Not encountered
BH03	9.60	TP03	Not encountered
BH04	6.00[1]	TP04	Not encountered
WS01/DP01	4.00[1]/6.00[1]	TP05	Not encountered
WS02/DP02	N.E /6.00[1]	TP06	Not encountered
WS03/DP03	3.50[1]/6.00[1]	TP07	Not encountered
WS04/DP04	Not encountered	TPADD1	Not encountered
WS05/DP05	Not encountered	TPADD2	Not encountered
WS06/DP06	N.E. /5.80[1]	TPADD3	Not encountered
WS07/DP07	3.00[1]/3.50[1]	TPADD4	Not encountered
WS08/DP08	3.80[1]/6.00[1]	TPADD5	Not encountered
WS09/DP09	3.00[1]/5.80[1]	TPADD6	Not encountered
WS10/DP10	3.00[1]/6.00[1]	HP01	Not encountered
WS11/DP11	3.50[1]/6.00[1]	HP02	Not encountered
WS12	Not encountered	HP03	Not encountered
WS101	Not encountered	HP04	Not encountered
WS102	Not encountered	TP101	Not encountered
WS103	3.40[1]	TP102	Not encountered
WS104	4.00[1]	TP103	Not encountered
WS105	4.00[1]	TP104	Not encountered
		TP105	Not encountered
		TP106	Not encountered

Note: [1] Final depth of trial hole. N.E – not encountered

Table 2.7 Final Depth of Cohesive London Clay Formation

Trial Hole	Depth (m bgl)
BH01	25.00[1]
BH02	15.50[1]
BH03	15.00[1]

Note: [1] Final depth of trial hole.

2.4 Roots

Roots/rootlets were encountered in thirty-eight trial holes, persisting to depths ranging between 0.25m bgl, and maximum investigatory depth of 1.90m bgl. The depths of root penetration have been included in Table 2.8.

Table 2.8 Depth of Root / Rootlet Penetration

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
BH01	1.60	TP01	1.80[1]
BH02	None observed	TP02	1.20[1]
BH03	0.60	TP03	0.30
BH04	1.10	TP04	0.30
WS01	1.10	TP05	0.30
WS02	1.00	TP06	0.40
WS03	1.00	TP07	0.50
WS04	0.40	TPADD1	0.30
WS05	0.55[1]	TPADD2	0.30
WS06	1.00	TPADD3	None observed
WS07	1.65	TPADD4	None observed
WS08	0.75	TPADD5	None observed
WS09	1.60	TPADD6	None observed
WS10	0.90	HP01	0.50[1]
WS11	1.10	HP02	None observed
WS12	1.15	HP03	0.60[1]
WS101	0.60	HP04	0.50[1]
WS102	1.00	TP101	1.40[1]
WS103	0.60	TP102	1.35[1]
WS104	0.25	TP103	0.95[1]
WS105	0.75	TP104	1.50[1]
		TP105	1.90[1]
		TP106	0.90[1]

Note: [1] Final depth of trial hole.

Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole is low. A direct observation such as from within a trial pit is necessary to gain a better indication of the maximum root depth.

Numerous mature trees were present at the south of the site comprising sycamore, ash, horse chestnut, holly and elm. The majority of the trees in proximity to the proposed structures will be removed as part of the development. A Tree Retention and Removal Plan provided by the client is presented in Appendix E.

2.5 Groundwater

During construction of the trial holes, groundwater “strikes” were recorded within nineteen of the trial holes, at depths ranging between 1.20m and 3.30m bgl. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in April/May (2019) when groundwater levels should be reducing from their annual maximum (highest) elevation, which typically occurs around March.

Information on the groundwater strikes recorded at the time of the intrusive works is given in Table 2.9.

Table 2.9 Record of Groundwater "Strikes" During Intrusive Works

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
BH01	1.80	TP01	Not observed
BH02	2.50	TP02	Not observed
BH03	2.00	TP03	Not observed
BH04	1.70	TP04	1.30
WS01	3.00	TP05	Not observed
WS02	1.80	TP06	Not observed
WS03	1.80	TP07	Not observed
WS04	2.70	TPADD1	Not observed
WS05	Not observed	TPADD2	Not observed
WS06	Not observed	TPADD3	Not observed
WS07	Not observed	TPADD4	Not observed
WS08	3.00	TPADD5	Not observed
WS09	3.00	TPADD6	1.50
WS10	1.70	HP01	Not observed
WS11	3.30	HP02	Not observed
WS12	Not observed	HP03	Not observed
WS101	1.20	HP04	Not observed
WS102	1.50	TP101	Not observed
WS103	2.50	TP102	Not observed
WS104	1.50	TP103	Not observed
WS105	2.50	TP104	Not observed
		TP105	Not observed
		TP106	Not observed

Note: [1] Final depth of trial hole.

Details of the well installations are given in Table 2.1. Soil gas monitoring was undertaken in conjunction with the groundwater level readings as discussed in Section 6.5.3.

Nine visits had been undertaken in line with the client's specification, the results of which are presented in Table 2.10.

Table 2.10 Groundwater Monitoring – Posts Intrusive Works

Trial Hole	Depth to Water m bgl [m AOD]						Well Depth (m bgl)
	16/05/2019	20/05/2019	23/05/2019	05/06/2019	20/06/2019	10/07/2019	
BH01	4.04 [13.47]	5.90 [11.61]	5.91 [11.60]	5.95 [11.56]	5.12 [12.39]	n/a[1]	10.00
BH02(S)	2.34 [18.50]	2.14 [18.70]	2.11 [18.73]	1.12 [19.72]	1.78 [19.06]	2.86 [17.98]	3.00
BH02(D)	8.55 [12.29]	9.24 [11.60]	9.28 [11.56]	9.32 [11.52]	9.34 [11.50]	9.47 [11.37]	11.00
BH03	3.31 [10.65]	3.35 [10.61]	3.36 [10.60]	3.50 [10.46]	3.41 [10.55]	n/a[1]	10.00
BH04	1.66 [17.42]	1.62 [17.46]	1.60 [17.48]	1.62 [17.46]	1.60 [17.48]	1.64 [17.44]	6.00
WS01	2.06 [19.32]	2.16 [19.22]	2.18 [19.20]	2.24 [19.14]	2.08 [19.30]	2.25 [19.13]	4.00
WS03	1.68 [18.92]	1.86 [18.74]	1.90 [18.70]	1.98 [18.62]	1.52 [19.08]	1.84 [18.76]	3.50
WS08	0.73 [12.74]	2.97 [10.50]	2.80 [10.67]	DRY	DRY	n/a[1]	3.50
WS12	DRY	DRY	DRY	DRY	DRY	DRY	2.00
WS101	1.03 [17.54]	0.93 [17.64]	1.00 [17.57]	0.97 [17.60]	0.92 [17.65]	0.94 [17.63]	1.20
WS102	1.09 [17.76]	1.04 [17.81]	1.16 [17.69]	1.20 [17.65]	2.94 [15.91]	1.13 [17.72]	1.70

Note: [1] Equipment failure.

Trial Hole	Depth to Water m bgl [m AOD]					Well Depth (m bgl)
	23/07/2019	08/08/2019	21/08/2019	19/09/2019	30/09/2019	
BH01	4.69 [12.82]	4.61 [12.90]	4.33 [13.18]	3.26 [14.25]	3.40 [14.11]	10.00
BH02(S)	2.37 [18.47]	2.28 [18.56]	2.16 [18.68]	2.54 [18.30]	1.50 [19.34]	3.00
BH02(D)	9.60 [11.24]	9.46 [11.38]	9.50 [11.34]	9.45 [11.39]	5.93 [14.91]	11.00
BH03	3.50 [10.46]	3.55 [10.41]	3.98 [9.98]	3.64 [10.32]	3.55 [10.41]	10.00
BH04	1.83 [17.25]	1.65 [17.43]	1.63 [17.45]	1.65 [17.43]	1.42 [17.66]	6.00
WS01	2.27 [19.11]	2.30 [19.08]	2.35 [19.03]	2.40 [18.98]	1.92 [19.46]	4.00
WS03	1.79 [18.81]	1.90 [18.70]	1.68 [18.92]	2.12 [18.48]	1.12 [19.48]	3.50
WS08	3.00 [10.47]	3.09 [10.38]	DRY	3.16 [10.31]	3.15 [10.33]	3.50
WS12	DRY	DRY	DRY	DRY	DRY	2.00
WS101	0.93 [17.64]	0.93 [17.64]	0.88 [17.69]	0.90 [17.67]	0.70 [17.87]	1.20
WS102	1.15 [17.70]	1.10 [17.75]	1.05 [17.08]	1.02 [17.83]	0.70 [18.15]	1.70

Note: [1] Equipment failure.

Groundwater equilibrium conditions may only be conclusively established, if a series of observations are made via groundwater monitoring wells over a long period.

Section 3 Discussion of Geotechnical In-Situ and Laboratory Testing

3.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) were undertaken in each cable percussive borehole (BH01 – BH04). The results were interpreted based on the classifications outlined in Appendix B.1.

The SPT "N60" values presented have been corrected in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the 'N' values should therefore not be necessary. The energy ratio of the equipment used was 73%.

The River Terrace Deposits recorded SPT "N60" values between 18 and 23 in cohesive beds and between 13 and 50+ in granular beds. The cohesive beds were classified as high strength with inferred undrained cohesive strengths between 90kPa and 115kPa. The granular beds were classified as medium dense to very dense relative density.

The London Clay Formation recorded SPT "N60" values between 21 and 50+ within granular beds and 50+ within the underlying cohesive beds. The granular beds were classified as medium dense to very dense relative density. The cohesive beds were classified as very high strength with inferred undrained cohesive strength of >250kPa.

A full interpretation of the SPT results are outlined in Appendix B.2, Table B.2.1.

3.2 Dynamic Probe Tests

Dynamic probing (DPSH) was undertaken at eleven locations (DP01 to DP11) adjacent and prior to the drilling of their corresponding windowless sampler borehole WS1 and WS3 to depths ranging between 0.80m and 6.00m bgl. The results were converted to equivalent SPT "N60" values based on dynamic energy using commercial computer software (Geostru). The results were then interpreted based on the classifications outlined in Appendix B.1.The energy ratio for the rigs used is presented within the DPSH logs.

The SPT "N60" values presented have been corrected in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the 'N' values should therefore not be necessary

The River Terrace Deposits recorded equivalent SPT "N60" values between 4 and 27 within cohesive beds and between 8 and 50+ in granular beds. The cohesive beds were classified as low to high strength with inferred undrained cohesive strength of 20kPa to 135kPa. The granular beds were classified as loose to very dense relative density.

The London Clay Formation recorded equivalent SPT "N60" values between 11 and 50+ within the predominantly granular soils, classified as medium dense to very dense

relative density.

A full interpretation of the DPSH tests are outlined in Appendix B.2, Table B.2.2.

3.3 Dynamic Cone Penetrometer Tests

The Transport Research Laboratory (TRL), Dynamic Cone Penetrometer (DCP) was undertaken at eleven locations (DCP01 – DCP11). The results were interpreted based on the classification outlined in Appendix B.1.

The results from DCP testing indicated CBR values of between 3% and 162% for the soils encountered in the top 1.00m bgl. The higher CBR values encountered were anticipated to be large gravel clasts struck during the test.

The DCP results are presented in Appendix B.3.

3.4 Infiltration Tests

As part of a site investigation undertaken for a wider development, five trial pits were excavated on 15th November 2018 for purposes of infiltration testing within soils of the River Terrace Deposits following the principles of BRE DG 365:2016 by Soils Limited. Trial pits were referenced SL8 – SL12. BRE 365 states that for an accurate infiltration rate to be obtained a soakage pit needs to be filled three times in quick succession. Each test can only be ended once 75% of the water present has drained away.

Three infiltration tests were undertaken in trial holes SL8 and SL10 – SL12 ending once 75% of the water had drained away.

A single test was undertaken in SL9, which did not complete within the observation period.

In-house software was used to calculate infiltration rates and the results are outlined in Table 3.1.

Table 3.1 Infiltration Rates

Trial Hole	Test No.	Pit Depth (m bgl)	Water level at start (m bgl)	Infiltration Rate (m/s)	Comments
SL8	1	2.10	1.03	3.68×10^{-5}	
	2	2.00	1.00	1.10×10^{-5}	Data extrapolated after 90 mins
	3	2.00	1.00	3.07×10^{-5}	
SL9	1	1.20	0.60	n/a	Head loss of 90mm over 347 mins
SL10	1	1.10	0.29	2.93×10^{-5}	
	2	1.10	0.31	2.07×10^{-5}	
	3	0.90	0.29	2.51×10^{-5}	
SL11	1	1.10	0.64	6.81×10^{-5}	
	2	1.10	0.59	5.07×10^{-5}	

Trial Hole	Test No.	Pit Depth (m bgl)	Water level at start (m bgl)	Infiltration Rate (m/s)	Comments
	3	0.95	0.50	4.09×10^{-5}	
SL12	1	1.10	0.61	3.27×10^{-5}	
	2	1.00	0.45	4.79×10^{-5}	
	3	1.00	0.43	6.05×10^{-5}	

Field data from the infiltration tests are presented in Appendix B.3.

3.5 Quick Unconsolidated Undrained Triaxial Compression Tests

Quick Unconsolidated Undrained Triaxial Compression (QUU) tests were performed on two samples obtained from the cohesive London Clay Formation. The strength interpretation was based on the classification outlined in Table B.1.1.

The triaxial tests undertaken returned undrained shear strengths ranging between 134kPa and 203kPa, classifying the cohesive soils as high to very high strength.

A full interpretation of the triaxial tests are outlined in Table B.2.3, Appendix B.2 and the laboratory report in Appendix B.3.

3.6 Consolidated Undrained Triaxial Compression Tests

Consolidated Undrained Triaxial Compression (CU) tests (multistage) were performed on two samples obtained from the cohesive London Clay Formation.

The samples were subjected to multistage testing, with the results plotted in terms of Mohr's circles of effective stresses, included in the laboratory report.

A full interpretation of the triaxial tests are outlined in Table B.2.4, Appendix B.2 and the laboratory report is presented in Appendix B.3.

3.7 Quick Shearbox Test

Quick Shearbox testing was undertaken on one remoulded sample from granular soils of the River Terrace Deposits over three normal pressures (100kPa, 200kPa, 300kPa).

The Shearbox test undertaken on the granular soils of the River Terrace Deposits gave an angle of shearing resistance (Φ') of 30.3 degrees and effective cohesion (c') of 3kPa.

The laboratory report is presented in Appendix B.3.

3.8 Atterberg Limit Tests

Atterberg Limit tests were undertaken on eight samples obtained from the cohesive parts of the River Terrace Deposits and twelve samples obtained from the from the cohesive

parts of the London Clay Formation. The results were classified in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

The cohesive River Terrace Deposits was classified as low to medium volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2. Two of the eight samples were classified as non-plastic.

The London Clay Formation was classified as low to medium volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2. Five of the twelve samples were classified as non-plastic and pertain to the granular unit of the London Clay Formation.

A full interpretation of the Atterberg Limit tests are outlined in Table B.2.5, Appendix B.2 and the laboratory report in Appendix B.3.

3.9 Particle Size Distribution Tests

Particle Size Distribution (PSD) tests were performed on five samples from the granular River Terrace Deposits and five samples from the granular London Clay Formation.

The PSD testing showed two (BH03:0.60-1.00 & BH04:3.00-3.50) of the five samples from the granular River Terrace Deposits had a volume change potential in accordance with BRE Digest 240. Atterberg Limit testing undertaken on one of the samples (BH03:0.60-1.00) classified the soil as non-plastic. None of the samples had a volume change potential in accordance with NHBC Standards Chapter 4.2.

The PSD testing showed two of the five samples from the granular London Clay Formation as having a volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2, and an additional two in accordance with BRE Digest 240 only. Two (BH02:6.50-7.00 & BH02:8.50-9.00) of the five samples were determined to comprise of SILT. Atterberg Limit tests on the two silt samples showed one of them to have a low volume change potential in accordance with BRE Digest 240 and neither had a volume change potential in accordance with NHBC Standards Chapter 4.2.

Note that a cohesive soil is only classified as having a volume change potential if it is also plastic and an Atterberg Limit test can be conducted on the strata.

A full interpretation of the PSD tests are outlined in Table B.2.6, Appendix B.2 and the laboratory report in Appendix B.3.

3.10 Sulphate and pH Tests

Four samples from deposits of Made Ground, six from the River Terrace Deposits and nine from the London Clay Formation were taken for water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment Special Digest 1, 2005, ‘Concrete in Aggressive Ground’.

The results have been summarised in Table 3.2.

Table 3.2 Sulphate Content

Stratum	No. of Tests	W/S Sulphate (mg/l)	pH
Made Ground	4	10 – 191	6.6 – 7.2
River Terrace Deposits	6	10 – 43	6.5 – 9.4
London Clay Formation	9	10 – 1030	7.2 – 8.4

The significance of the sulphate and pH test results are discussed in Section 4.5 and the laboratory report in Appendix B.3.

Section 4 Foundation Design

4.1 General

An engineering appraisal of the soil types encountered during the site investigation and likely to be encountered during the redevelopment of this site is presented. Soil descriptions are based on analysis of disturbed samples taken from the trial holes.

4.1.1 Made Ground and Topsoil

The terms *Fill* and *Made Ground* are used to describe material, which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, the Fill and/or Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

The BSI Code of Practice for Foundations, BS 8004:1986, Clause 2.2.2.3.5 Made Ground and Fill, includes the caveat that *'all Topsoil should be treated as suspect, because of the likelihood of extreme variability'*.

Soils described as Made Ground were encountered in forty-one of the forty-four trial holes from ground level and persisted to depths ranging between 0.10m and 2.20m bgl. The Made Ground typically comprised dark brown sandy silty GRAVEL. Gravel was fragments of flint, brick, metal, ceramics, ash and glass. The depths of Made Ground have been included in Table 2.4.

Soil obtained from waste materials onsite were determined to comprise dark brown and greyish brown slightly sandy gravelly SILT. The gravel typically comprised fragments of flint, brick, metal, glass, plastic, wood, tile, fibreglass and Asbestos Containing Materials (ACM). Samples S1, S2 and S3 were noted to contain visible strands and roots likely pertaining to knotweed.

Soils described as Topsoil were encountered in three of the forty-four trial holes from ground level and persisted to depths ranging between 0.10m and 0.30m bgl. The Topsoil comprised dark brown slightly sandy slightly gravelly CLAY with frequent roots/rootlets. Gravel was fine subangular clasts of flint. The depth of Topsoil has been included in Table 2.4.

A result of the inherent variability, particularly of uncontrolled Topsoil, Fill and/or Made Ground is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Topsoil and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

4.1.2 River Terrace Deposits

Soils described as River Terrace Deposits were encountered underlying the Made Ground/Topsoil and proven to depths ranging between 1.10m and 5.45m bgl and inferred to a maximum depth of 5.80m bgl from dynamic probes. The River Terrace Deposits comprised interbedded orangish brown slightly silty very sandy GRAVEL and slightly gravelly slightly sandy CLAY. Gravel was typically medium to coarse subangular to rounded clasts of flint. Sand was typically medium to coarse.

The results from SPT testing the cohesive soils of the River Terrace Deposits were classified as high strength with inferred undrained cohesive strengths of between 90kPa and 115kPa. The granular beds were classified as medium dense to very dense relative density.

The results from DPSH testing classified the cohesive soils of the River Terrace Deposits as low to high strength with undrained cohesions of between 20kPa and 135kPa. The granular beds were classified as lose to very dense relative density.

The results from Quick Shearbox testing on the granular soils of the River Terrace Deposits gave an angle of shearing resistance of 30.3 degrees and effective cohesion of 3kPa.

The results from Atterberg Limit tests showed the cohesive soils of the River Terrace Deposits had a low to medium volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

The results from PSD tests showed, for the granular soils of the River Terrace Deposits, two of the five samples tested had a volume change potential in accordance with BRE Digest 240 with a fines content >15%. Atterberg Limit testing undertaken on one of the samples classified the soil as non-plastic. None of the samples tested had a volume change potential in accordance with NHBC Standards Chapter 4.2.

Soils of the River Terrace Deposits are normally consolidated and are expected to display low to moderate bearing capacities with moderate to high settlement characteristics. The soils of the River Terrace Deposits were considered suitable for the proposed development, subject to proposed finished levels and providing adequate bearing and settlement characteristics can be proven on a local basis. Extremely soft to soft cohesive beds encountered within the unit were not considered suitable for the proposed development due to likely variability and potential for large load induces settlements both total and differential.

4.1.3 London Clay Formation

Soils described as the London Clay Formation were encountered in sixteen of the forty-four trial holes immediately underlying the River Terrace Deposits and persisted to the full investigatory depth of 25.00m bgl.

Soils of the London Clay Formation were encountered as granular soils overlying cohesive soils. The granular soils can possibly be attributed to the Whitecliff Sand Member, which forms part of the extended London Clay unit, and is characterised with a basal band of “black pebbles”, as encountered between the granular and cohesive units in BH02.

The granular soils of the London Clay Formation were proven to a depth of between 9.60m and 12.90m bgl within the deep boreholes and comprised light yellow silty to very silty fine to medium SAND with partings of light orangish brown (fine to medium) sandy silt and clay. In BH02, the base of the granular unit was characterised by a thin layer of black coarse rounded flint GRAVEL with rounded flint cobbles.

The cohesive soils of the London Clay Formation were encountered underlying the granular soils, from depths ranging between 9.60m and 12.90m bgl and persisted to the full investigatory depth of 25.00m bgl. The cohesive London Clay Formation comprised dark grey slightly (fine) sandy CLAY. Occasional gravel sized calcareous shell fragments were recorded within the upper horizon of the cohesive unit in BH01.

The results from SPT testing classified the granular soils of the London Clay Formation as medium dense to very dense relative density. The underlying cohesive soils were classified as very high strength, with undrained cohesions >250kPa.

The results from Unconsolidated Undrained Triaxial Compression tests classified the cohesive soils of the London Clay Formation as high to very high strength, with undrained shear strengths ranging between 134kPa and 203kPa.

The results from Atterberg Limit testing showed the cohesive soils of the London Clay Formation had low to medium volume change potential in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

The results from PSD testing on granular soils of the London Clay Formation showed two of the five samples had a volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2, and an additional two in accordance with BRE Digest 240 only. Two of the samples were characterised as SILT, and Atterberg Limit tests on the silt samples showed one of them to have a low volume change potential in accordance with BRE Digest 240 and neither had a volume change potential in accordance with NHBC Standards Chapter 4.2.

The soils of the London Clay Formation are heavily overconsolidated and expected to exhibit moderate to high bearing capacities with moderate settlement characteristics. The London Clay Formation is considered a suitable bearing stratum for the adoption of a deep foundation solution, subject to any proposed level changes, given the typical depth to its upper horizon.

4.1.4 Roots

Roots / rootlets were encountered in thirty-eight trial holes, persisting to depths ranging between 0.25m bgl, and maximum investigatory depth of 1.90m bgl. Roots / rootlets may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

Numerous mature trees were present at the south of the site comprising sycamore, ash, horse chestnut, holly and elm. The majority of the trees in proximity to the proposed structures will be removed as part of the development.

4.1.5 Groundwater

During construction of the trial holes, groundwater “strikes” were recorded within nineteen of the trial holes, at depths ranging between 1.20m and 3.30m bgl. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in April/May (2019) when groundwater levels should be reducing from their annual maximum (highest) elevation, which typically occurs around March.

Nine post-works groundwater monitoring visits were undertaken in line with the clients specification. The results obtained to date have been presented in Table 2.10.

4.2 Foundation Scheme General

The proposed development was to comprise construction of Care Village Apartments to the west of the site consisting of 13No. up to 2.5-storey accommodation blocks, spa/gym, parking and communal gardens; and refurbishment of Coach House and development of Landmark Building Care Home, understood to include a part or full footprint basement, to the east comprising terrace, plant room, communal facilities and 53No. apartments. The proposed development was to comprise areas of hard landscaping including pavements, access roads and parking and areas soft landscaping including communal open space but no private domestic gardens.

In compiling this report reliance was placed on drawing number 11042 FE SK004, dated March 2019, prepared by PRC Group. Any change or deviation from the scheme outlined in the drawing could invalidate the foundation design and remediation recommendations presented within this report. Soils Limited must be notified about any such changes.

At the time of reporting, no plans were available that presented proposed finished levels or details of the proposed basement. Foundation recommendations made within the report may need to be revisited once the information has been made available.

Development plans provided by the client are presented in Appendix E.

4.2.1 Guidance on Shrinkable Soils

The Building Research Establishment (BRE) Digests 240, 241 and 242 provide guidance on 'best practice' for the design and construction of foundations on shrinkable soils.

The results from Particle Size Distribution tests showed that the granular beds of River Terrace Deposits had no volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2, as non-plastic and an Atterberg Limit test could not be conducted on the samples.

The results from Particle Size Distribution tests showed that the granular beds of London Clay Formation locally had a low volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2. Some of the samples tested, however, showed no volume change potential.

The results from Atterberg Limits Tests showed that the cohesive beds of River Terrace Deposits had low to medium volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

The results from Atterberg Limits Tests showed that the cohesive beds of London Clay Formation had low to medium volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Medium volume change potential must therefore be adopted where foundations pass through the River Terrace Deposits or the London Clay Formation, as the granular and cohesive beds of the two units are interbedded and the presence of soils having a volume change potential cannot be excluded.

The BRE Digest 241 states: "An increasingly common, potentially damaging situation is where trees or hedges have been cut down prior to building. The subsequent long-term swelling of the zone of clay desiccated by the roots, as moisture slowly returns to the ground, can be substantial. The rate at which the ground recovers is very difficult to predict and if there is any doubt that recovery is complete then bored pile foundations with suspended beams and floors should be used".

The stated intention of the NHBC is to ensure that shrinkage and swelling of plastic soils does not adversely affect the structural integrity of foundations to such a degree that remedial works would be required to restore the serviceability of the building. It must be borne in mind that adherence to the NHBC tables and design recommendations may not, in all cases, totally prevent foundation movement and cracking of brickwork might occur.

The BRE Digest 240 suggests: *"Two courses of action are open:*

Estimate the potential for swelling or shrinkage and try to avoid large changes in

the water content, for example by not planting trees near the foundations.

Accept that swelling or shrinkage will occur and take account of it. The foundations can be designed to resist resulting ground movements or the superstructure can be designed to accommodate movement without damage."

The design of foundations suitable to withstand movements is presented in BRE Digest 241 "Low-rise buildings on shrinkable clay soils: Part 2"

4.3 Foundation Scheme

Foundations **must not** be constructed within any Made Ground/Topsoil and extremely soft to soft cohesive beds of the River Terrace Deposits due to the likely variability and potential for large load induced settlements both total and differential.

Roots / rootlets were encountered in thirty-eight trial holes, persisting to depths ranging between 0.25m bgl and maximum investigatory depth of 1.90m bgl, with depths in excess of 1.10m bgl frequently observed. Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

Numerous mature trees were present at the south of the site comprising sycamore, ash, horse chestnut, holly and elm. The majority of the trees in proximity to the proposed structures will be removed as part of the development and their on-going influence on the ground should be taken into consideration during the foundation design. A Tree Retention and Removal Plan provided by the client is presented in Appendix E.

If roots / rootlets are encountered during the construction phase foundations **must not be placed within any live root penetrated** or desiccated **cohesive soils or those with a volume change potential**. Should the foundation excavations reveal such materials, the excavations **must** be extended to greater depth in order to bypass these unsuitable soils. Excavations must be checked by a suitable person prior to concrete being poured.

The results of the intrusive investigation undertaken showed significant variability of the properties of the interbedded cohesive and granular beds of the River Terrace Deposits both on the horizonal and with depth.

Considering the type of development, shallow foundations can be considered at the site, with bearing capacity values to be defined on a plot by plot basis.

Four main areas were defined across the site for the proposed development and shown in Figure 9. Suitable mechanical behaviour for the adoption of shallow foundations was identified to the east of the site, within the area for the proposed main building (Zone 1) and within the area to the centre-west of the site (Zone 3).

Zones 2 and 4, respectively located to the centre-east and to the west of the site could

still be considered for the adoption of shallow foundations, but with reduced bearing capacity values due to the presence of softer soil layers which could lead to the development of potentially large settlements, both total and differential.

Differential settlements represent a serious concern on a site characterised by the abundant presence of predominantly granular materials unpredictably interbedded with cohesive beds of variable thickness. The bearing capacity values for the four areas identified must therefore be defined taking into account the potential for the development of large settlements, with the recommendation to avoid overstressing the soils at formation level due to the likely presence of softer soils immediately beneath.

Ground improvements methods could be considered for increasing the bearing capacity, particularly within areas at risk of both differential and total settlements, and thereby reducing the likelihood of potentially large settlements. Consideration to the use of ground improvement techniques must only be given once final finished level information is available as it is possible that such finished levels could negate the requirement or benefit of such techniques.

Piled foundations can also be considered as a valid foundation option in areas where large applied loads are expected, or where potential differential settlements may be too large for the proposed development.

The proposed development is likely to be both light and brittle. It is therefore considered that foundation design is undertaken using NHBC Standards Chapter 4.2. Where applicable, different foundation types could be considered within a single structure providing movement joints are adopted.

At the time of reporting, it was understood that the majority of the development was to be of timber framed construction with the main building expected to be of traditional construction.

4.3.1 Shallow Foundations into the River Terrace Deposits

Based on a 5.00 by 0.75m strip foundation, using commercial software Table 4.1 to Table 4.4 show the calculated bearing values and anticipated settlement characteristics for the four main zones identified at the site.

The depths of Made Ground/Topsoil were variable across the site. Although generally not deeper than 1.00m bgl, the maximum encountered depths were encountered locally exceeding that depth (e.g. up to 2.20m bgl in the area of BH04). Due to the overall size of the site, bearing capacities were calculated below depths of 1.00m bgl, however, the bearing values presented must be reviewed, prior to excavation, following receipt of more precise information regarding proposed finished levels and proposed loadings. Foundations must be formed within a consistent founding stratum. If the excavation at formation level reveals variable ground conditions, the excavation must be taken further into more consistent, suitable strength soils.

Table 4.1 Allowable Bearing Capacities within the River Terrace Deposits – Zone 1

Depth (m bgl)	Size (m)	Bearing Capacity (kPa)	Anticipated Settlement (mm)
1.00	5.00 x 0.75	140	20
1.50		150	20
2.00		150	25

Note: Made Ground observed to 1.60m bgl within BH1.

Table 4.2 Allowable Bearing Capacities within the River Terrace Deposits – Zone 2

Depth (m bgl)	Size (m)	Bearing Capacity (kPa)	Anticipated Settlement (mm)
1.00	5.00 x 0.75	90	20
1.50		110	25
2.00		120	25

Note: Made Ground typically observed to <1.00m bgl.

Table 4.3 Allowable Bearing Capacities within the River Terrace Deposits – Zone 3

Depth (m bgl)	Size (m)	Bearing Capacity (kPa)	Anticipated Settlement (mm)
1.00	5.00 x 0.75	60	25
1.50		110	20
2.00		120	25

Note: Made Ground observed to 1.10m bgl within WS1 and to 1.40m bgl within WS4.

Table 4.4 Allowable Bearing Capacities within the River Terrace Deposits – Zone 4

Depth (m bgl)	Size (m)	Bearing Capacity (kPa)	Anticipated Settlement (mm)
1.00	5.00 x 0.75	100	20
1.50		100	25
2.00		90	25

Note: Made Ground typically observed to <1.00m bgl.

Given the extent of the site and the observed variability of soil composition and deposition thickness it is strongly recommended to carry out further in-situ testing in the form of windowless sampler boreholes and dynamic probes to confirm the suitability of the soils for the use of shallow type foundations within the footprint of the proposed buildings and a more precise definition of foundations formation levels.

It was understood that a partial or full basement was proposed within part of the footprint of the main building (Zone 1), albeit full details were not available at the

time of reporting. Given the variable depths for the foundations of the proposed building, the expected variability in the depths of Made Ground/Topsoil, the changeability of the soils of River Terrace Deposits and the absence of information about the likely dimensions of the basement, the above bearing capacity and settlements values must be considered as indicative at this stage and to be confirmed when suitable cross sections are available.

At the time of investigation groundwater was encountered within nineteen of the trial holes, with strikes recorded at depths ranging between 1.20m and 3.30m bgl, indicating possible groundwater presence within the exaction depth of the proposed basement.

Furthermore, the adoption of settlements joints is recommended because of the likelihood in the development of differential settlements due to the variability of building geometry and loads interacting with changeable soil conditions.

The development of potentially large differential settlements was considered possible across the site and the adoption of ground improvement techniques is recommended especially where softer soils are encountered (in particular within Zone 2 and Zone 4). Further consideration to ground improvement should be made once more accurate information about the proposed development is available.

Where shallow foundations are to be adopted, the use of reinforced trench fill foundations would simplify construction and reduce the possibility of differential settlement affecting the foundations.

For the allowable bearing value given above, settlements should not exceed the presented values, provided that excavation bases are carefully bottomed out and blinded or concreted as soon after excavation as possible and kept dry.

Foundations must not be constructed over former structures and other hard spots. The foundation design must be suitable for the conditions present at the site.

The anticipated settlement includes both elastic settlement and long-term drained settlement (in the case of cohesive soils).

Anticipated settlements may be taken as proportional to the bearing capacity adopted (for the same configuration of foundation), therefore if the bearing value is halved the anticipated settlement will halve.

All loose material and soft spots must be removed from the base of the excavations, these excavations then being either concreted or blinded as soon after excavation as possible. Failure to do so could results in increased settlements. It has been assumed that the foundations to the existing structures are to be grubbed out. Foundations must not be cast over such hard points without this being considered in the foundation design. Where foundations have been grubbed

out the new foundation must be taken through the backfill material into the natural ground. All foundation excavations must be inspected by a qualified geotechnical engineer prior to casting.

4.3.2 Ground Improvement

The preliminary advice of a specialist contractor was considered with regards to the use of ground improvement techniques in the areas identified as characterised by poor mechanical properties within the depths usually considered for the construction of shallow type foundations.

Taking into account the results of the intrusive investigation, with particular reference to the soil types encountered, the depths of groundwater and the structural and architectonical characteristics of the proposed development, the adoption of vibro-stone columns was considered a valid solution for improving the bearing capacity of the soils within indicative foundation Zone 2 and Zone 4, limiting the risk for potentially large settlements, both total and differential, subject to proposed finished levels and final loadings.

The consulted specialist contractor had experience in the area and in the treatment of the soil types encountered and anticipated that an indicative bearing capacity of the order of 125kPa can be considered for the proposed development with the adoption of the recommended improvement method.

The adoption of the mentioned ground improvement method particularly focused on the reduction of the risks of developing potentially large and uncontrolled settlements, both total and differential, deriving from the changeability of soil conditions and from the variability of structural loads and geometry.

The above information on potential use of ground improvement techniques must presently be considered as indicative only. Further appraisal of the suitability of ground improvement techniques at this site can only be given following the undertaking of a site-specific assessment and further to the advice of a ground improvement specialist.

4.3.3 Shallow Foundations within Basement

Preliminary information provided by the client suggested that a partial or full basement was proposed underneath the main building, approximately occupying the east/south-east area of the entire site.

No final basement layout or detailed information was available at the time of reporting with regards to the expected basement formation level(s), therefore the following information has been developed assuming the maximum depths of the excavations ranging between 3.00m and 4.00m bgl.

Foundations constructed within the basement excavation could be considered and the bearing capacity of such foundations, based on the above assumptions, is

given below. If the foundation is to include lateral load from retained soil, then the distribution of loads on the foundation will be trapezoidal and the maximum pressure will be at the toe of the foundation. In such cases additional information must be provided by the client to allow for appropriate analysis to be undertaken.

If any basement wall is to have backfill placed on both sides, the backfill must be placed in shallow rises on both sides to maintain similar lateral forces on both sides of the wall.

A proposed basement excavation 3.00m deep would remove an overburden pressure of 54kPa, based on a unit weight of 18kN/m^3, for the overlying soil.

An "**net**" allowable bearing capacity of **>110kPa** was calculated, founding at a minimum depth of 3.00m bgl within the River Terrace Deposits, based on a 5m by 0.75m strip foundation.

Taking account of the removed overburden pressure the "**gross**" bearing value could be taken as **>160kPa**.

The calculated net bearing capacity was limited to the mentioned values considering the uncertainties in the layout and excavation depths and must be revised when more detailed information is available. Considering the extension of the main building, however, it is recommended, in the absence information of proposed cross sections and finish levels, to carry out additional testing in the form of windowless sampler boreholes and dynamic probes in order to assess in greater detail the nature of the soils encountered within the area of interest, to avoid the risk for soft spots and the local reduction of the mechanical properties that could induce the development of unwanted differential settlements.

For the allowable bearing value given above, settlements **should not** exceed **25mm**, provided that excavation bases are carefully bottomed out and blinded or concreted as soon after excavation as is possible and kept dry. Settlements may be taken as proportional to the applied foundation pressure for the given size of the foundations.

The use of reinforced trench fill foundations must be used to reduce the potential of differential settlement across foundations, which was anticipated to be up to 15mm.

Settlements may be taken as proportional to the bearing capacity given for the same configuration of foundation i.e. a foundation line load of 80kPa settlement = 18mm.

Special care **must** be taken during foundation excavation in order to establish that any soft/loose spots found within the soils are removed from the base of excavations.

Foundations must not be cast over foundations of former structures and other hard spots.

4.3.4 Basement and Stability Requirements

This report does not comprise a basement impact assessment (BIA) and no calculations of the impact of the proposed works on the surrounding ground and/or structures was requested by the client. The following comments are of a very general non-specific nature. Should lateral and vertical ground movements and the damage category resulting works be required this can be undertaken by Soils Limited.

The excavation of the proposed basement was estimated at 3.00-4.00m bgl. At the time of investigation groundwater was encountered within nineteen of the trial holes, with strikes recorded at depths ranging between 1.20m and 3.30m bgl.

Groundwater levels could rise, particularly after prolonged periods of wet weather.

If the construction works take place during the winter months or during/after prolonged periods of wet weather perched water could accumulate or groundwater could be found migrating through the granular deposits of the River Terrace Deposits and/or London Clay Formation. If any water ingress is not prevented by dewatering, the basement slab could become “buoyant” whilst empty. This must be taken into account in the design. Support of excavation and dewatering with pumps from sumps introduced into the floor of the excavation must be considered.

In the absence of robust long-term groundwater monitoring data from the well installed, full hydrostatic pressure (worst credible case) **must** be taken into account for the design of the proposed basement slab/walls or the worst credible levels as defined by EC – 7.

4.3.5 Anticipated Heave

Given the anticipated volume of soil being excavated, abundant presence of granular materials and loads applied, long term heave would be minimal, anticipated to be <5mm. Immediate heave is likely to have a minimal effect as it would take place soon after excavation and any immediate heave is likely to be removed during the excavation of the basement slab in order to achieve the correct dig level prior to casting the slab.

It **must** be mentioned that it was assumed that excavations will be kept dry and either concreted or blinded as soon after excavation. If water is allowed for even a short time to enter excavations, not only will a greater heave be experiencing owing to the soil increasing in volume by taking up water, but the shear strength, and hence the bearing capacity, will also be reduced.

Notes: For the calculations of the immediate heave, the Ey (Young's Modulus) for uploading was taken as equal to the Ey for loading, which is considered to be a conservative approach. For the calculations of the long term swelling, the ratio of swelling index (Cs) compression index (Cc) was taken as Cs=Cc/5 *(Reference: Simon & Menzies, Foundation Engineering)*

4.3.6 Ground Floor Slab

NHBC Standards 2018, Chapter 5.2, Suspended Ground Floors, states:

- *"Ground floors should be constructed as suspended floors where the depth of fill exceeds 600mm".*
- *"Suspended slabs should be adopted where the foundation depth dictated by the NHBC Standards 2018, Chapter 4.2, Appendix 4.2-C would exceed 1.5m bgl."*

Considering that the depths of Made Ground were variable across the site and frequently in excess of 600mm, the adoption of ground floor slabs cannot be recommended as a general occurrence.

Ground floor slabs can, however, potentially be considered on a local basis following further, specific assessment / information on proposed final levels.

4.3.7 Piled Foundations

If adopted the piled foundations must be taken through any Made Ground and River Terrace Deposits into suitable strength soils of the London Clay Formation.

The construction of a piled foundation is a specialist job with the actual pile working load depending on the particular type pile and installation method. Prior to finalising the foundation design the advice from a reputable contractor who is familiar with the ground and groundwater conditions present at the site should be sought.

The load capacities are provided for varying diameters and lengths of bored piles taken into the London Clay Formation, based on SPT "N60" values and must only be used for preliminary design purposes. These values have been calculated for the worst-case scenario, which modelled the River Terrace Deposits and the London Clay Formation as interbedded cohesive and granular over the full borehole length. 9 and 0.45 were used as the Nc and alpha values respectively for the cohesive soils. A factor of safely of three was applied to both the shaft and base and depicted by the design line outlined in Appendix C.1.

The bearing values given in Appendix C.1. are applicable to single piles. Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

From ground level the upper 4m of the pile shaft has been ignored in the preliminary pile design given.

To prevent necking of the green concrete, temporary casing may be required where the pile passes through the Made Ground, River Terrace Deposits or London Clay Formation and below the groundwater table (if encountered). To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

No allowance has been made for negative skin friction that could be generated where piles pass through Made Ground and River Terrace Deposits underlying the site. The negative skin friction must be applied to the pile working load and must not be factored.

4.4 Retaining Wall

The design and construction of substantial retaining walls was not anticipated by the Client at the time of reporting. It was considered, however, that retaining structures could be needed along the north-west boundary and design parameters for retaining wall design were defined considering the results of in-situ and laboratory tests carried out in the area of interest. The design parameters are reported in Table 4.5.

Table 4.5 Soil Parameters for Retaining Wall Design

Strata	Unit Weight (kN/m^3)		Undrained Cohesion (kPa)	Effective Cohesion (kPa)	Friction Angle (°)
	Natural	Saturated			
MG	18.00	21.00	30	0	22
RTD – granular			-	-	32
RTD - cohesive			30	0	22
LCF – granular	19.00	21.50	-	-	30
LCF - cohesive			50	0	23

A slight improvement of the properties of the cohesive beds of River Terrace Deposits was observed at depths in excess of 4.00m bgl. The undrained strength of the soils below 4.00m bgl can be increased to 50kPa.

The friction angle of the granular beds of River Terrace Deposits was provided with reference to predominantly sandy soils. In the case where sandy GRAVEL is encountered at the time of the excavations the value of the friction angle can potentially be increased, indicatively to 35° - 37°, subject to further assessment carried out by an experienced geotechnical engineer.

It was considered unlikely that both the granular and cohesive beds of London Clay Formation would be encountered within the depths anticipated from the construction of traditional retaining walls along the north-west boundary. The related values provided in Table 4.5 were therefore derived considering information from other areas of the site.

If the foundation is to include lateral load from retained soil, then the distribution of loads on the foundation will be trapezoidal and the maximum pressure will be at the toe of the

foundation. The foundation has to resist both overturning and sliding forces. The overturning forces are derived from the loads imposed both by the soils retained, by any line loads from structures to the rear of the wall and by groundwater.

To calculate the lateral loads from the soils their coefficient of active earth pressure must be calculated from the effective stress testing undertaken as part of the geotechnical laboratory testing.

For the allowable bearing value given above, settlements should not exceed the presented values, provided that excavation bases are carefully bottomed out and blinded or concreted as soon after excavation as possible and kept dry. Foundations must not be constructed over former structures and other hard spots. The foundations design must be suitable for the conditions present at the site.

The anticipated settlement includes both elastic settlement and long-term drained settlement (in the case of cohesive soils).

4.5 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts from the Made Ground/Topsoil and River Terrace Deposits fell into Class **DS-1** of the BRE Special Digest 1 2005, *'Concrete in Aggressive Ground'.* Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classifications of **AC-1**. The pH of the soils tested ranged between 8.5 and 8.8.

Sulphate concentration measured in 2:1 water/soil extracts from the London Clay Formation fell into Class **DS-2** of the BRE Special Digest 1 2005, *'Concrete in Aggressive Ground'.* Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classifications of **AC-2**. The pH of the soils tested ranged between 8.5 and 8.8.

The DS and ACEC classifications are summarised in Table 4.6.

Table 4.6 Aggressive Chemical Environment Concrete Classification

Stratum	DS	ACEC
Made Ground	DS-1	AC-1
River Terrace Deposits	DS-1	AC-1
London Clay Formation	DS-2	AC-2

The classification given was determined using the mobile groundwater case, due to groundwater encountered at the time of the intrusive investigation and to the abundant presence of granular beds from all the soil units identified at the site. The laboratory results are presented in Appendix B.3.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special

Digest 1 2005, *'Concrete in Aggressive Ground'* taking into account any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

4.6 Excavations

Shallow excavations in the Made Ground/Topsoil are likely to be marginally stable in the short term at best.

Deeper excavations taken into the River Terrace Deposits and London Clay Formation are likely to be unstable in both the short and the long term, depending on the thickness of overlying Made Ground/Topsoil and the likely presence of both groundwater and perched water. Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose before excavations are entered by personnel.

Excavations beneath the groundwater table are likely to be unstable and dewatering of foundation trenches may be necessary.

4.7 Pavements

The Transport Research Laboratory (TRL) Dynamic Cone Penetrometer (DCP) was undertaken at eleven locations on site (DCP01 – DCP11). The results from dynamic cone penetrometer tests indicated **CBR values of between 3% and 162%** for the soils encountered in the top 1.00m bgl. The higher CBR values encountered were anticipated to be gravel clasts struck during the test.

When removing 400mm of either Made Ground or Topsoil the worst case CBR value was 6% which was considered suitable for design purposes for the majority of the road layout.

As CBR values were highly variable due to changes in moisture content and ground conditions, **in-situ testing must be undertaken** immediately prior to the installation of pavements/roads. Any soft spots at formation level should be dug out and replaced with a suitably compacted granular fill. Prior to construction the formation level should be proof rolled.

The cohesive soils of the River Terrace Deposits would not be frost susceptible as plasticity indexes were typically >20%. The granular soils of the River Terrace Deposits would not be frost susceptible, as percentage of fines was <10%.

4.8 Soakaways

Infiltration testing in accordance with the principles of BRE DG 365:2016 were undertaken within five trial pits, four of which reached full compliance within the

observation period, yielding indicative infiltration rates ranging between 6.84 $x10^{-5}$m/s and 1.10 $x10^{-5}$m/s.

The results suggest that the granular soils of the River Terrace Deposits may be suitable for the adoption of a soakaway, where an indicative design infiltration rate of 1.10 $x10^{-5}$m/s would be appropriate. The results of the groundwater monitoring must be taken into account as the base of any soakaway structure must be seated a minimum 1m above the phreatic zone.

Section 5 Determination of Chemical Analysis

5.1 Site Characterisation and Revised Conceptual Site Model

The Geotechnical and Geoenvironmental Desk Study undertaken by Ramboll (report ref: 1620005365, dated 27th November 2018) and provided to Soils Limited by the Client identified a low to high risk of ground contamination from pervious usage of the site and offsite sources (Ramboll report: Section 8 and Preliminary Risk Register Table 9.1), most notably from historic landfilling on and off site as well as wastes and Made Ground located on site. The report also references more general investigation works undertaken in 2015 by Soils Limited and Ramboll.

The Main Investigation Report identified Made Ground to depths of over 2.00m at one location (TPADD6/BH04), though an average of roughly 0.30-0.40m was more usually encountered in the rest of the open areas of the site. This sometimes comprised Topsoil, as generally found underlying the field to the east and re-worked local materials (including construction wastes) underlying the occupied working and building areas to the west. Potential hydrocarbon staining and odours were identified in BH2 and a filled waste pit of ashy material roughly 5m in diameter was encountered to depth at TPADD6/BH04.

Superficial soils of the River Terrace Deposits were encountered underlying the Made Ground. Shallow groundwater was encountered within the Made Ground and River Terrace Deposits. The conceptual site model was updated to take account of the shallow groundwater encountered at the site and is presented in Appendix D.1.

The results from post-works groundwater monitoring appeared to confirm the prevalence of isolated shallow groundwater in various areas of the site within both the underlying cohesive and granular River Terrace Deposits and within the Made Ground, with only limited connectivity, overlying a presumed regional groundwater lying at greater depth.

5.2 Soil Sampling

A non-targeted sampling strategy is appropriate when there is:

- No adequate information available regarding the likely locations of contamination;
- No sensitive areas where there is a need for a high degree of confidence.

A targeted sampling strategy is appropriate when there is:

- Adequate information available regarding the likely locations of contamination
- Sensitive areas where there is a need for a high degree of confidence.

The Ramboll CSM identified no significant individual potential on-site sources or processes and so a generally non-targeted sampling pattern and general analytical screening suite was adopted across the whole site. Further locations such as HP01-04

and TPADD1-6 were iteratively modified over several stages of investigation by a combination of previous findings, responses to specific requests from the Client and their advisors, site and investigator observations and consideration of previous results.

Samples were also taken of the noted waste stockpiles at surface in the north west and centre of the site, especially those thought to be derived from construction and demolition materials (HP01-HP04) and burnt or partially collected surface stockpile remains such as that at SP1. In addition, and upon the request of the Client during siteworks, samples were also collected from an area that had been subject to treatment for Japanese Knotweed, by PBA. These samples (S1-S3) were required to provide advice on waste characterisation should waste disposal of the material off-site be considered as an option.

It must be noted that investigation of the part of the site that had undergone treatment for Japanese Knotweed by PBA, did not form part of the overall Soils Limited ground investigation. This area is illustrated in Figure 10. Additional areas of environmental concern identified during the works are noted in Figure 11.

5.3 Determination of Chemical Analysis

The driver for determination of the analysis suite was the information obtained from the Geotechnical and Geoenvironmental Desk Study undertaken by Ramboll (report ref.: 1620005365, dated 27th November 2018) and observations during the intrusive site investigation phase. With no specific individual contaminants of concern having been positively identified from previous works, but the site evidencing a varied history of potential industrial, commercial and agricultural uses, all samples were analysed for a standard screening suite of Industrial Metals, Asbestos and Organic materials including PAH's, phenols and banded hydrocarbons. Certain samples were additionally analysed for other determinants such as sulphates, cyanide, speciated hydrocarbons (TPHCWG), PCB's and Waste Acceptance Criteria (WAC) analysis as appropriate to their locations, surroundings and projected uses.

In summary, the development is proposed to be a combination of a large multi-storey building, public open space, access/roadways and individual dwellings. No private garden areas are proposed.

At certain locations sampled during the investigation (TPADD3, HP01 and HP04), samples of possible Asbestos Containing Material (ACM) were identified during the investigation by a Soils Limited asbestos aware engineer or technician, collected and subjected to specific asbestos analysis. In addition, Soils Limited was tasked with undertaking a number of samples (S1-S3) within the knotweed area to the north west for additional testing for a general suite and WAC analysis to characterise the material for potential disposal as part of the knotweed remediation, undertaken by PBA at the locations marked on Figure 10. These results have also been included in the statistical analysis and copies are included in Appendix D.2.

Section 6 Qualitative Risk Assessment

6.1 Assessment Criteria

The assessment criteria used to determine risks to human health are derived and explained within Appendix D.3.

6.2 Representative Contamination Criteria – Soil

At the time of reporting the site spanned approximately 4.44Ha and was observed to comprise and area of open pastureland to the east, woodland to the south and semi-derelict industrial land to the west.

Stockpiled and scattered waste material was noted to be in abundance within the semi-derelict industrial land to the west and the derelict former residential building in the eastern centre of the site. The waste material was noted to typically comprise demolition waste, tyres, propane cylinders, wood, plastics, glass, metals, household wastes, oil containers, electronics and asbestos.

The northwest corner of the site was noted to be impacted by Japanese Knotweed, which was the subject of separate investigation, control and remediation by PBA. Whilst this area lay outside of the overall ground investigation undertaken by Soils Limited, following a request by the Client, samples were taken in this area by Soils Limited under the guidance of PBA to allow characterisation of potential waste materials for subsequent off-site disposal during the remediation.

The site undulated with a shallow overall dip down to the southeast. Woodland occupied the south of the site and several mature trees and vegetation bisected the site centrally north to south.

The site was surrounded by a new build residential development under construction to the north, recreational facilities and Shrubbery Pond to the south, agricultural land to the east and a private residence with walled garden to the west. It was understood that the brick wall of the walled garden was subject to a preservation order.

In compiling this report reliance was placed on drawing number 11042 FE SK004, dated March 2019, prepared by PRC Group. Any change or deviation from the scheme outlined in the drawing could invalidate both the foundation design and remediation recommendations presented within this report. Soils Limited must be notified about any such changes.

Samples were taken during several discrete but related phases of investigation as new information was revealed. Observation indicated and analysis confirmed the presence of two distinct populations of material across the site, those from below ground and those from surface wastes, locally reworked and stockpiled materials. A total of 58no samples were taken of typical shallow soils from below ground level across the site and 9no. from

above ground stockpiles, including the PBA samples S1-S3. Figure 11 graphically notes those areas of concern identified during the works including areas of hydrocarbon odours, relict tanks and deep Made Ground.

The chemical laboratory results were compared against the representative contaminants concentration for human health receptor to Soil Guideline Values (SGV), Category 4 Screening Levels (C4SL's) or Suitable 4 Use Level (S4UL).

Table 6.1 and Table 6.2 outline the samples that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix D.2. Samples have been divided into two data groups on the basis of the physical and chemical differences between the two groups. Table 6.1 details those from below current ground level i.e. shallow soils and Table 6.2 those from the noted site stockpiles and other above surface ACM samples.

Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance Below Current Ground Level

Substance	Sample locations where positive identification was recorded
Asbestos	Positive identification at WS03:0.20m as Microscopic Cement comprising Chrysotile and at WS105:0.10m as Bundles of Chrysotile

The guideline values for the 58no samples in this data set were assessed against the "Public Open Space Residential" land-use scenario, as no private garden areas were planned within the development as currently proposed. As such it was considered the most appropriate land-use scenario in this case.

However, comparison with more conservative land use exposure scenarios such as "Residential with Plants" indicated occasional outliers and minor exceedances for Lead, Zinc, select PAH's and hydrocarbons. These outliers are usually confined to the upper regions of the Made Ground and highly localised both laterally and vertically. By their specific nature they appear to be reflective of wastes from previous historical and current use of the site as anticipated in the original Conceptual Site Model. For example, building and demolition materials (glass, pipework, flashing, etc.) in the case of Lead and Zinc, burning of organic wastes, wood and coal in the case of the PAH's and fuel storage and maintenance of vehicles in the case of hydrocarbons.

Statistical analysis of the results of the below ground dataset indicated several outliers to 99% confidence, but even when these are included in the data set, neither the calculated US95, the average or any individual result exceeds the relevant screening values. This confirms the null hypothesis that there is no evidence of systematic contamination across the site and no hotspots (areas of elevated concentration) of significance.

To assess the potential toxicity to the human health receptor from the concentrations of organic compounds tested for, Soil Organic Matter (SOM) tests were undertaken on the samples submitted for chemical testing, which revealed SOM values of between < 0.1% and 6.6%. Due to the wide variation and number of samples a conservative average of

2.5% was assumed for each soil sample tested and used to derive the appropriate guideline value for organic determinants.

In summary, none of the samples tested in the below ground data set showed concentrations in excess of the relevant C4SL for a Public Open Space Residential land-use scenario. Asbestos, as a physical contaminant non-threshold substance, currently has no such guidance value for comparison.

Table 6.2 Summary of Chemical Analysis of Soils Sample Exceedance Above Current Ground Level and in Stockpiles

Substance	Sample locations where SGV, C4SL or S4UL adopted were exceeded for the 'Public Open Space Residential' land-use scenario
Di-benzo(a,h)anthracene	0.91mg/kg against 0.57mg/kg - HP04:0.30m (S4UL)
Substance	**Sample locations where positive identification was recorded**
Asbestos	Positive identification as ACM in surface materials and spoil at TPADD3, HP01 and HP04 as Cement bound Chrysotile. Positive identification as ACS in spoil at HP01:0.30m as Bundles of Chrysotile

The guideline values for the 6no samples in the above ground data set are individually assessed against the "Public Open Space Residential" land-use scenario, as no private garden areas are planned within the development as currently proposed. As such it was considered the most appropriate land-use scenario in this case.

Comparison with more conservative land use exposure scenarios such as "Residential with Plants" indicated outliers and exceedances for Lead and Arsenic, select PAH's and hydrocarbons. By their specific nature they appear to be reflective of wastes from previous historical and current use of the site as anticipated in the original Conceptual Site Model, modified to some extent by the concentration and possible importation form other areas on or off-site. For example, building and demolition materials (glass, pipework, flashing, etc.) in the case of Lead with the single Arsenic outlier possibly reflective of this and/or local chemical deposition of poison or preservative, burning of organic wastes, wood and coal in the case of the PAH's and fuel storage and maintenance of vehicles in the case of hydrocarbons. The PBA sample S2 also indicated elevated outlier levels of Chromium, Copper, Lead and Zinc, usually indicative of structural and plated materials.

Statistical analysis of the results of the above ground dataset is not possible as the data set is less than 10no. However, the nature of the outliers indicates a highly variable set of materials and the relatively low levels overall suggests that at least some of this material may be recoverable subject to appropriate screening.

To assess the potential toxicity to the human health receptor from the concentrations of organic compounds tested for, Soil Organic Matter (SOM) tests were undertaken on the samples submitted for chemical testing, which revealed SOM values of between 3.0% and 6.9%. As such, and to maintain consistency with the larger data set, a conservative average of 2.5% was assumed for each soil sample tested and used to derive the

appropriate guideline value for organic determinants.

In summary, only one of the samples tested in the above ground data set showed concentrations in excess of the relevant S4UL for a Public Open Space Residential land-use scenario. In HP04 at 0.30m Di-benzo(a,h)anthracene was recorded at a concentration of 0.91mg/kg against the public open space residential end-use S4UL of 0.57mg/kg.

Asbestos, as a physical contaminant non-threshold substance, currently has no such guidance value for comparison.

6.2.1 Asbestos

Asbestos Containing Material (ACM) was detected within one below ground sample from WS03 at 0.20m bgl. The ACM was determined to comprise Microscopic fragments of Asbestos Cement comprising Chrysotile probably quantifiable to less than 0.1%. Bundles of Chrysotile in Asbestos Containing Soil (ACS) was also noted at WS105 at 0.10m bgl, though this is probably at a level close to or below the current quantification threshold of 0.001%.

Above ground samples of visible ACM were noted in several locations including TPADD3, HP01 and HP04 and were shown to contain Chrysotile. Typical quantification of such solid materials by authoritative sources would usually indicate percentages of between 3 and 5% which would classify them as hazardous. The ACS from HP01 at 0.30m again contained bundles of Chrysotile probably close to the detection limit of quantification and may be indicative of breakdown of surrounding materials due to weathering of local host materials in the stockpiled demolition material.

Given that asbestos was positively identified in several samples as both ACM and ACS, it is probable that asbestos is present in and across other areas of the site to shallow depth but especially in the above surface piles of demolition-based materials in the northern areas of the site. If encountered, care must be taken to ensure any such material is separated and disposed of in an appropriate manner to a licensed waste facility.

6.3 Risk to Groundwater

Given the suspected perched nature of the majority of the underlying groundwater encountered at this site, samples were recovered following development and purging from 10no standpipes across the site to establish whether local groundwater had been impacted by on or off-site activities and further to determine if any connectivity could be established between locations. This later element is also the subject of on-going water level monitoring at the time of reporting as is the determination and quantification of any localised hydrocarbon based free product.

As the initial CSM identified no particular significant water risks, a general screening

suite was devised consisting of typical industrial contaminants and general indicators of groundwater quality. This included metals and pH on all samples with additional inorganic and organic determinants added where appropriate, i.e. where works to date had indicated potential issues. This included the oily odours noted in BH02 during drilling which was subsequently installed at both deep (D) and shallow (S) levels and additional locations undertaken in the surrounding area (TPADD1 and 2). Likewise, an unknown tank was encountered close to the area of WS03 during the site investigation phase and subsequently installed to allow sampling and monitoring.

The chemical laboratory results were compared initially against the UK Drinking Water Standard (DWS). If no DWS was available, standards from the World Health Organisation (WHO) were used.

Table 6.3 outlines the samples that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix D.2

Table 6.3 Summary of Chemical Analysis for Groundwater Sample Exceedances

Substance	Units	EQS Source / Threshold	EQS Concentration recorded	Sample where EQS Level was exceeded
Total PAHs[1]	µg/l	DWS / 0.2	10.2	BH02(S):2.90m
TPH Aromatic C12-C16	µg/l	WHO / 90	320	BH02(S):2.90m
TPH Aromatic C16-C21	µg/l	WHO / 90	130	BH02(S):2.90m
Nickel	µg/l	DWS / 50	73	WS01:3.60m

Note: [1]Total PAH for comparison with DWS is the sum of several specific PAH's.

The groundwater chemical testing has identified a range of substances primarily in BH02, which were in excess of their guideline threshold. These included total PAH and TPH CWG Aromatic Fractions C12-C16 and C16-C21. A separate dissolved Nickel outlier was also noted in WS01. None of the other substances tested recorded concentrations above the groundwater screening values.

6.4 Soil Gas Risk Assessment

The Geotechnical and Geoenvironmental Desk Study undertaken by Ramboll (report ref.:1620005365, dated November 2019) identified a low risk of soil gas associated with the underlying terrace gravels and areas of Made Ground on or adjacent to the site due to the potential for elevated levels of carbon to be present in such materials.

In line with the clients specification, monitoring of the standpipes installed onsite was undertaken on a total of nine occasions between 25th May 2019 and 30th September 2019 at approximately fortnightly intervals.

The concentration of methane (both total and LEL), hydrogen sulphide, carbon monoxide, carbon dioxide and oxygen were measured using a portable infrared monitor. Readings of flowrate were taken with a differential manometer calibrated to five flow rate.

A Photo Ionisation Detector (PID) was used to detect for Volatile Organic Compounds (VOCs).

The results from the soil gas monitoring undertaken to date is presented in Table 6.4.

Table 6.4 Soil Gas Monitoring Results

Date	Trial Hole	CH_4 (%)	CO_2 (%)	O_2 (%)	H_2S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	H_2O (m bgl)	VOC (ppm)	Dp	Characteristic Situation BS8485 & C665	
													CH_4	CO_2
25/05/2019	ATM	0.0	0.0	20.8	0.0	0.0	0.0	1010	-	-	0	-	-	-
	BH01	0.0	5.2	11.0	0.0	0.0	0.0	1010	0.0	5.90	0	0.0	CS1	CS1
	BH02(S)	0.0	1.9	16.3	0.0	4.2	0.0	1010	0.0	2.14	0	0.0	CS1	CS1
	BH02(D)	0.0	7.3	5.5	0.0	0.0	0.0	1010	<<<	9.24	1	<<<	n/a	n/a
	BH03	0.0	4.6	17.6	0.0	0.0	0.0	1010	0.0	3.35	3	0.0	CS1	CS1
	BH04	0.0	4.6	16.6	0.0	0.0	0.0	1010	0.0	1.62	0	0.0	CS1	CS1
	WS01	0.0	0.2	20.4	0.0	0.0	0.0	1010	0.0	2.16	0	0.0	CS1	CS1
	WS03	0.0	4.7	15.1	0.0	0.0	0.0	1010	0.0	1.86	1	0.0	CS1	CS1
	WS08	0.0	2.4	19.3	0.0	0.0	0.0	1010	0.0	2.79	0	0.0	CS1	CS1
	WS12	0.0	2.4	19.6	0.0	0.0	0.0	1010	0.0	DRY	0	0.0	CS1	CS1
	WS101	0.0	0.0	21.0	0.0	0.0	0.0	1012	0.0	0.93	0	0.0	CS1	CS1
	WS102	0.0	2.6	20.0	0.0	0.0	0.0	1012	0.0	1.04	2	0.0	CS1	CS1
06/06/2019	ATM	0.0	0.0	20.6	0.0	0.0	0.0	1004	-	-	0	-	-	-
	BH01	0.0	5.4	11.2	0.0	0.0	0.0	1004	0.0	5.95	0	0.0	CS1	CS1
	BH02(S)	0.0	2.4	16.0	0.0	1.0	0.0	1004	0.0	1.12	2	0.0	CS1	CS1
	BH02(D)	0.0	5.7	7.0	0.0	0.0	0.0	1004	<<<	9.32	2	<<<	n/a	n/a
	BH03	0.0	3.8	18.4	0.0	0.0	0.0	1004	0.0	3.50	1	0.0	CS1	CS1
	BH04	0.0	5.2	16.5	0.0	0.0	0.0	1004	0.0	1.62	0	0.0	CS1	CS1
	WS01	0.0	0.1	21.0	0.0	0.0	0.0	1005	0.0	2.24	0	0.0	CS1	CS1
	WS03	0.0	4.1	16.4	0.0	0.0	0.0	1004	0.0	1.98	0	0.0	CS1	CS1
	WS08	0.0	2.3	19.4	0.0	0.0	0.0	1004	0.0	DRY	0	0.0	CS1	CS1
	WS12	0.0	2.4	19.5	0.0	0.0	0.0	1004	0.0	DRY	0	0.0	CS1	CS1
	WS101	0.0	0.0	20.7	0.0	0.0	0.0	1004	0.0	0.97	0	0.0	CS1	CS1
	WS102	0.0	3.4	18.9	0.0	0.0	0.0	1004	0.0	1.20	0	0.0	CS1	CS1
20/06/2019	ATM	0.0	0.0	21.1	0.0	0.0	0.0	1012	-	-	0	-	-	-
	BH01	0.0	6.4	3.5	0.0	0.0	0.0	1012	0.0	5.12	0	0.0	CS1	CS1
	BH02(S)	0.0	3.6	1.9	0.0	0.0	0.0	1012	0.0	1.78	0	0.0	CS1	CS1

Date	Trial Hole	CH_4 (%)	CO_2 (%)	O_2 (%)	H_2S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	H_2O (m bgl)	VOC (ppm)	Dp	Characteristic Situation BS8485 & C665	
													CH_4	CO_2
	BH02(D)	0.0	5.7	3.9	0.0	2.0	0.0	1012	<<<	9.34	3	<<<	n/a	n/a
	BH03	0.0	5.4	15.9	0.0	0.0	0.0	1012	0.0	3.41	1	0.0	CS1	CS1
	BH04	0.0	5.6	14.1	0.0	0.0	0.0	1011	0.0	1.60	0	0.0	CS1	CS1
	WS01	0.0	0.0	20.6	0.0	0.0	0.0	1011	0.0	2.08	0	0.0	CS1	CS1
	WS03	0.0	2.6	18.0	0.0	0.0	0.0	1011	0.0	1.52	0	0.0	CS1	CS1
	WS08	0.0	3.3	18.4	0.0	0.0	0.0	1012	0.0	DRY	0	0.0	CS1	CS1
	WS12	0.0	3.5	18.5	0.0	0.0	0.0	1010	0.0	DRY	0	0.0	CS1	CS1
	WS101	0.0	0.0	20.7	0.0	0.0	0.0	1011	0.0	0.92	0	0.0	CS1	CS1
	WS102	0.0	2.7	18.5	0.0	0.0	0.0	1012	0.0	2.94	0	0.0	CS1	CS1
10/07/2019	ATM	0.0	0.0	20.7	0.0	0.0	0.0	1014	-	-	0	-	-	-
	BH01	0.0	5.9	8.9	0.0	0.0	0.0	1014	0.0	n/a[1]	0	0.0	CS1	CS1
	BH02(S)	0.0	4.1	0.0	0.0	0.0	0.0	1017	0.0	2.86	3	0.0	CS1	CS1
	BH02(D)	0.0	5.9	2.6	0.0	1.0	0.0	1017	0.0	9.47	3	0.0	CS1	CS1
	BH03	0.0	5.0	17.0	0.0	0.0	0.0	1014	0.0	n/a[1]	2	0.0	CS1	CS1
	BH04	0.0	5.8	15.1	0.0	0.0	0.0	1014	0.0	1.64	1	0.0	CS1	CS1
	WS01	0.0	1.5	20.0	0.0	0.0	0.0	1017	0.0	2.25	0	0.0	CS1	CS1
	WS03	0.0	2.7	17.9	0.0	0.0	0.0	1017	0.0	1.84	1	0.0	CS1	CS1
	WS08	0.0	3.3	18.4	0.0	0.0	0.0	1014	0.0	n/a[1]	0	0.0	CS1	CS1
	WS12	0.0	3.0	18.7	0.0	0.0	0.0	1014	0.0	DRY	1	0.0	CS1	CS1
	WS101	0.0	0.0	20.6	0.0	0.0	0.0	1014	0.0	0.94	0	0.0	CS1	CS1
	WS102	0.0	4.2	18.4	0.0	0.0	0.0	1014	0.0	1.13	0	0.0	CS1	CS1
23/07/2019	ATM	0.0	0.0	20.5	0.0	0.0	0.0	1010	-	-	0	-	-	-
	BH01	0.0	5.6	10.1	0.0	0.0	0.0	1010	0.0	4.69	0	0.0	CS1	CS1
	BH02(S)	0.0	4.3	0.1	0.0	0.0	0.0	1012	0.0	2.37	2	0.0	CS1	CS1
	BH02(D)	0.0	6.5	3.5	0.0	0.0	0.0	1012	23.8	9.60	2	101	CS1	CS3
	BH03	0.0	4.3	17.5	0.0	0.0	0.0	1010	0.0	3.50	0	0.0	CS1	CS1
	BH04	0.0	5.4	15.8	0.0	0.0	0.0	1010	0.0	1.83	0	0.0	CS1	CS1
	WS01	0.0	4.0	16.6	0.0	0.0	0.0	1012	0.0	2.27	0	0.0	CS1	CS1
	WS03	0.0	5.2	14.6	0.0	0.0	0.0	1010	0.0	1.79	0	0.0	CS1	CS1

Date	Trial Hole	CH_4 (%)	CO_2 (%)	O_2 (%)	H_2S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	H_2O (m bgl)	VOC (ppm)	Dp	Characteristic Situation BS8485 & C665	
													CH_4	CO_2
	WS08	0.0	2.0	19.4	0.0	0.0	0.0	1010	0.0	3.00	0	0.0	CS1	CS1
	WS12	0.0	2.8	18.4	0.0	0.0	0.0	1010	0.0	DRY	1	0.0	CS1	CS1
	WS101	0.0	0.0	20.1	0.0	0.0	0.0	1010	0.0	0.93	0	0.0	CS1	CS1
	WS102	0.0	4.1	18.1	0.0	0.0	0.0	1010	0.0	1.15	0	0.0	CS1	CS1
08/08/2019	ATM	0.0	0.0	20.7	0.0	0.0	0.0	1004	-	-	0	-	-	-
	BH01	0.0	5.5	10.5	0.0	0.0	0.0	1004	0.0	4.61	0	0.0	CS1	CS1
	BH02(S)	0.0	4.9	0.0	0.0	0.0	0.0	1004	0.0	2.28	0	0.0	CS1	CS1
	BH02(D)	0.0	7.4	3.2	0.0	2.0	0.0	1004	0.0	9.46	2	0.0	CS1	CS1
	BH03	0.0	4.0	18.4	0.0	0.0	0.0	1005	0.0	3.55	0	0.0	CS1	CS1
	BH04	0.0	5.6	16.1	0.0	0.0	0.0	1004	0.0	1.65	0	0.0	CS1	CS1
	WS01	0.0	0.4	20.3	0.0	0.0	0.0	1004	0.0	2.30	0	0.0	CS1	CS1
	WS03	0.0	6.0	13.0	0.0	0.0	0.0	1004	0.0	1.90	0	0.0	CS1	CS1
	WS08	0.0	1.5	19.9	0.0	0.0	0.0	1004	0.0	3.09	0	0.0	CS1	CS1
	WS12	0.0	2.5	19.0	0.0	0.0	0.0	1004	0.0	DRY	1	0.0	CS1	CS1
	WS101	0.0	0.0	20.5	0.0	0.0	0.0	1004	0.0	0.93	0	0.0	CS1	CS1
	WS102	0.0	3.4	18.8	0.0	0.0	0.0	1004	0.0	1.10	0	0.0	CS1	CS1
21/08/2019	ATM	0.0	0.0	21.2	0.0	0.0	0.0	1025	-	-	0	-	-	-
	BH01	0.0	5.3	11.8	0.0	0.0	0.0	1025	0.0	4.33	0	0.0	CS1	CS1
	BH02(S)	0.2	4.8	0.1	0.0	0.0	2.0	1025	0.0	2.16	0	0.0	CS1	CS1
	BH02(D)	0.0	6.8	4.0	0.0	0.0	0.0	1025	<<<	9.50	2	<<<	n/a	n/a
	BH03	0.0	2.8	18.9	0.0	0.0	0.0	1025	0.0	3.98	0	0.0	CS1	CS1
	BH04	0.0	5.4	14.1	0.0	0.0	0.0	1023	0.0	1.63	0	0.0	CS1	CS1
	WS01	0.0	0.0	20.3	0.0	0.0	0.0	1022	0.0	2.35	0	0.0	CS1	CS1
	WS03	0.0	0.3	20.2	0.0	0.0	0.0	1022	0.0	1.68	0	0.0	CS1	CS1
	WS08	0.0	2.5	19.1	0.0	0.0	0.0	1025	0.0	DRY	0	0.0	CS1	CS1
	WS12	0.0	2.5	19.0	0.0	0.0	0.0	1022	0.0	DRY	0	0.0	CS1	CS1
	WS101	0.0	0.0	20.5	0.0	0.0	0.0	1023	0.0	0.88	0	0.0	CS1	CS1
	WS102	0.0	2.9	18.3	0.0	0.0	0.0	1023	0.0	1.05	0	0.0	CS1	CS1

Date	Trial Hole	CH_4 (%)	CO_2 (%)	O_2 (%)	H_2S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	H_2O (m bgl)	VOC (ppm)	Dp	Characteristic Situation BS8485 & C665	
													CH_4	CO_2
19/09/2019	ATM	0.0	0.0	20.9	0.0	0.0	0.0	1026	-	-	0	-	-	-
	BH01	0.0	5.7	6.2	0.0	0.0	0.0	1026	0.0	3.26	0	0.0	CS1	CS1
	BH02(S)	0.6	5.1	0.2	0.0	0.0	4.0	1026	0.0	2.54	1	0.0	CS1	CS1
	BH02(D)	0.0	0.0	20.5	0.0	0.0	0.0	1026	<<<	9.45	0	<<<	n/a	n/a
	BH03	0.0	2.0	19.8	0.0	0.0	0.0	1026	0.0	3.64	0	0.0	CS1	CS1
	BH04	0.0	4.8	17.1	0.0	0.0	0.0	1028	0.0	1.65	0	0.0	CS1	CS1
	WS01	0.0	0.6	20.0	0.0	0.0	0.0	1025	0.0	2.40	0	0.0	CS1	CS1
	WS03	0.0	5.4	14.7	0.0	0.0	0.0	1027	0.0	2.12	0	0.0	CS1	CS1
	WS08	0.0	1.65	20.0	0.0	0.0	0.0	1026	0.0	3.16	0	0.0	CS1	CS1
	WS12	0.0	2.2	19.6	0.0	0.0	0.0	1028	0.0	DRY	0	0.0	CS1	CS1
	WS101	0.0	0.1	20.5	0.0	0.0	0.0	1029	0.0	0.90	0	0.0	CS1	CS1
	WS102	0.0	2.6	19.8	0.0	0.0	0.0	1029	0.0	1.02	0	0.0	CS1	CS1
30/09/2019	ATM	0.0	0.0	21.1	0.0	0.0	0.0	1010	-	-	0	-	-	-
	BH01	0.2	2.5	15.1	0.0	0.0	5.0	1010	0.0	3.40	0	0.0	CS1	CS1
	BH02(S)	0.0	5.0	0.1	0.0	0.0	0.0	1009	0.4	1.50	0	1.0	CS1	CS1
	BH02(D)	0.0	7.3	4.8	0.0	0.0	0.0	1008	<<<	5.93	2	<<<	n/a	n/a
	BH03	0.0	3.0	18.2	0.0	0.0	0.0	1010	0.0	3.55	0	0.0	CS1	CS1
	BH04	0.0	5.0	14.4	0.0	0.0	0.0	1010	0.0	1.42	0	0.0	CS1	CS1
	WS01	1.1	10.0	0.9	0.0	0.0	8.0	1008	0.0	1.92	0	0.0	CS1	CS1
	WS03	0.0	0.0	21.0	0.0	0.0	0.0	1010	0.0	1.12	0	0.0	CS1	CS1
	WS08	0.0	1.7	19.9	0.0	0.0	0.0	1010	0.0	3.14	0	0.0	CS1	CS1
	WS12	0.0	3.4	18.7	0.0	0.0	0.0	1010	0.0	DRY	0	0.0	CS1	CS1
	WS101	0.0	0.1	20.6	0.0	0.0	0.0	1010	0.0	0.70	0	0.0	CS1	CS1
	WS102	0.0	0.0	20.8	0.0	0.0	0.0	1010	0.0	0.70	0	0.0	CS1	CS1
Minimum		0.0	0.0	0.0	0.0	0.0	0.0	1004	0.0	-	0	0.0		
Maximum		1.1	10.0	21.0	0.0	4.2	8.0	1029	23.8	-	3	101		

Note: reading of 0.0 = not detected (below detection level). VOC=Volatile Organic Compounds. Dp=Pressure Difference. [1] Equipment failure. <<< = exceeds equipment detection limit.

Methane was recorded above detection level on three occasions, recorded at a maximum concentration of 1.1% v/v in WS01 on 30th September 2019 with LEL measured at 8.0% v/v.

Carbon dioxide was recorded at a maximum concentration of 10% v/v in WS01 on 30th September 2019. Carbon monoxide was recorded at a maximum concentration of 4.2ppm in BH02(S) on 25th May 2019.

No concentrations of hydrogen sulphide were recorded above detection level.

Oxygen was measured at concentrations between below detection level (0.1% v/v) and 21.0% v/v, with the depleted levels largely associated with elevated carbon dioxide.

VOC was recorded at a maximum concentration of 3ppm.

Flow rate was measured at a maximum of 23.8l/hr in BH02(D) on 23rd July 2019. Flow rate was recorded at below detection level on all other monitoring wells on the majority of monitoring visits. Flow rates exceeding equipment detection level were recorded within BH02(D) on the majority of occasions and is attributed to a piston effect artefact developed within the granular soils present within the well response zone reacting to changes in water level and pressure within a limited environment capped by the cohesive soils present at the base of the River Terrace Deposits encountered in this area. The piston effect is developed by fluctuations in the underlying water level within the water bearing granular soils present at the response zone of the monitoring standpipe, which were capped by cohesive soils. The fluctuations in water level forces air under pressure out of the standpipe resulting in the elevated flow rates recorded.

On the basis that no similar trends were observed within BH02(S) in relation to gas or flow from a response zone located within the overlying River Terrace Deposits, and given the logs indicate a significant layer of impermeable clay between the two installations, the underlying gas flow noted in BH02(D) is considered an artefact and therefore not significant in context in relation to the proposed development due to depth, the artefact nature of the effect and the presence of the noted capping layer which both protects from and creates the artefact.

Hazardous gas flow rates for methane and carbon dioxide of between 0.0001l/hr and 1.547l/hr were calculated for the dataset. Hazardous gas flow rate was recorded above the 0.07l/hr threshold for Characteristic Situation 1 on one occasion, in BH02(D) on 23rd July 2019. The adoption of this value as a Gas Screening Value would designate the site as Characteristic Situation 3, however, considering this outlier can be attributed to piston flow not considered significant in context, this is unlikely to be representative of the gassing regime for the site as a whole. The remaining hazardous gas flow rates were calculated at <0.02l/hr and designate the site as Characteristic Situation 1 (<0.07).

BS8485 and CIRIA C665 state that where concentrations of carbon dioxide are consistently recorded over 5% v/v (and/or methane in excess of 1%), consideration should be given to increasing the Characteristic Situation to 2 and consideration should also be given to the model as to which is more appropriate.
Given that no significant methane, flow, trace gases or VOCs were recorded within the standpipes as a whole and none have given any indication of active gas production to date, it is considered that this precautionary approach is not necessary for the site and characterisation of the of the site's gassing regime can be designated as Characteristic Situation 1, where no soil gas protection measures are considered necessary and the risk is considered low to negligible.

6.5 Tier 1 Quantitative Risk Assessment

Quantitative risk assessments are undertaken for the soil, groundwater and soil gas. The CSM has been revised and updated to take account of the assessments below and is presented in Appendix D.1. The full laboratory chemical report is presented in Appendix D.2.

6.5.1 Soils

None of the 58 no. samples from the below ground data set showed concentrations in excess of the relevant C4SL/S4UL for a Public Open Space Residential land-use scenario.

One sample in the above ground and stockpile data set did show concentrations in excess of the relevant C4SL/S4UL for a Public Open Space Residential land-use scenario. In HP04 at 0.30m Di-benzo(a,h)anthracene was recorded at a concentration of 0.91mg/kg against the public open space residential end-use S4UL of 0.57mg/kg.

This is clearly an outlier value and given its location within an above-ground stockpile it not considered a significant risk in its current state to site users. However, this could change if the material was used on site and became available to site end-users.

Evidence in the re-evaluation of Benzo-a-Pyrene risk to determine suitability of use (S4UL) has shown that generic risk values of 5-10mg/kg are probably more suitable and appropriate as guidance values for these particular substances in Public Open Space Residential settings based on clay rich materials.

ACM and ACS were detected as both solid materials and bundles of Chrysotile asbestos. This is mainly associated with the demolition-based spoil piles in the northern area of the site but is also present in several shallow isolated locations across the site.

The Tier 1 Quantitative risk assessment has therefore established that there is a theoretical risk to the human health receptors of construction workers or future end-

users, but a site-specific assessment is likely to consider that this risk is not significant in the context of the proposed development and does not currently present a risk. The analysis to date also confirms that there is no evidence of any systematic contamination present in the below ground level materials and none of the noted elevated outliers are significant.

However, a clear risk in the form of asbestos is present from the stockpiled materials and potentially from other sources not yet identified, though it is not currently possible to quantify this risk in the longer term in terms of soils. As such the presence of this materials could present a potentially significant risk to workers, the development, adjacent properties and future users of the site. As such and to comply with the requirements of H&S at Work Act, CAR2012 and duty of care in relation to the above, the employment of a suitably qualified asbestos specialist to advise on these matters is very strongly advised.

An unknown risk may also be present from the numerous other physical wastes noted on site such as concentrated areas of glass, metals, oils and other physical contaminants present in the above ground site wastes. If incorporated into site materials these may present a direct hazard to workers and the development. All such materials encountered should be removed ideally through the use and on the advice of a suitably qualified and experienced waste specialist. Such a competent person should also be able to advise on and assess potential segregation, separation, recycling, re-use or disposal of such materials including those from the knotweed area to the north west. Removal of such surface materials and wastes will by default significantly reduce the potential for harm to the site and thereby the associated risk.

An area of dark disturbed ground was noted in the area of TPADD6 of an approximate diameter of 3-4m radius to a depth of at least 1.70m below current ground levels. Described as black slightly sandy silty Gravel, the gravel was fine to coarse angular to rounded flint, brick, concrete (occasionally to cobble size) with occasional glass, ceramic, metal and rare plastic and was clearly Made Ground. Whilst slightly elevated in certain industrial metals and containing several types of physical wastes, the material itself was not contaminated in the context of the proposed development, however, it may present a potential geotechnical hazard.

6.5.2 Groundwater

The Groundwater Risk Assessment established that there was a low risk to the groundwater receptor as there were minor concentrations of determinants in excess of their relevant Environmental Quality Standards (EQS). However, the risk to site users or general local groundwater resources given the underlying geology, the highly variable depth to groundwater encountered on site pre and post development, its probable perched nature and seeming lack of connectivity, is considered low to negligible in context, but would require regulatory confirmation.

6.5.3 Soil Gas

The Geotechnical and Geoenvironmental Desk Study undertaken by Ramboll (report ref.:1620005365, dated November 2019) identified a low risk of soil gas associated with the underlying terrace gravels and areas of Made Ground on or adjacent to the site due to the potential for elevated levels of carbon to be present in such materials. The organic matter content of the underlying below ground soils is generally low with an average of 1.95% and a US95 of 2.3%. Gas is considered liable to be minimal and of low to very low risk if the underlying organic matter concentrations are less than 2.5% according to research by CLAire (Contaminated Land, Applications in Real Environments).

Soil gas monitoring of the standpipes installed onsite was undertaken on a total of nine occasions between 25th May 2019 and 30th September 2019 at approximately fortnightly intervals, in line with the clients specification.

The results of the characterisation of the sites gassing regime following review of the dataset collected classified the site as Characteristic Situation 1, where no soil gas protection is considered necessary and the risk is considered low to negligible. However, an underlying piston effect at depth has been noted in BH02(D) and due care should be given to any works which may provide a linkage, access or breach into this lower regime.

6.6 Remedial Objective

Soil chemical analysis from below ground level recorded none of the samples analysed had substance levels in excess of their representative guideline values. Above ground materials (from stockpiles) only exceeded their guidance values on one singular occasion and a site-specific assessment following suitable for use principles would probably reduce this to a low to negligible risk. However, a risk is present in relation to asbestos, especially from the piles of surface materials to the north of the site. Unfortunately, this risk is unquantifiable in the longer term as there is no currently agreed UK contaminated land methodology and as such it is not possible to determine the actual risks if such material was incorporated into the development and specialist advice should be sought form a suitably qualified and competent person. Likewise, a risk is also present from above surface physical wastes should they be allowed to remain on site in their current form.

Groundwater chemical analysis recorded elevated levels of total PAHs and TPHs in BH02(S) at 2.90m clearly related to the hydrocarbon odour observed during the main investigation. Preliminary gas results from this location do not show significant levels of VOC's to date, which corelates well with the CWG hydrocarbon profile which shows elevated levels restricted to the aromatic C12+ range. The reason for the isolated elevated concentration of Nickel in the water sample from WS01 remains unknown and does not appear to be related to the associated soil analysis. Overall groundwater risk is considered low to minimal.

Site generation of soil gas given the relatively low concentrations of organic matter noted, was considered low to minimal and additional monitoring was on-going at time of reporting.

Therefore, there was an identified potential risk to the Human Health which would require a remediation strategy of some form. The remedial objective for the site is to ensure site clean-up removes any unacceptable risk to the identified receptors. In essence the remedial objective should sever any source-pathway-receptor pollutant linkages that have been established. Once this has been achieved, by whatever means, there can theoretically be no risk.

6.7 Development of Soil Remediation Strategy

Production of a remediation strategy report was not part of the brief for this Main Investigation Report Intrusive Investigation. However, a number of example remedial options are outlined below.

6.7.1 Further Chemical Testing and Human Health Risk Assessment

In light of the extensive testing and analysis already undertaken, confidence in the current Conceptual Site Model (CSM) is considered high and the two data sets reasonably defined. However, it is recommended that further testing is undertaken on any obviously deleterious materials encountered once the site strip, waste removal and demolition has been completed, as additional areas and concentrations of other waste materials may be located below the remaining building slabs. On the basis of the works to date and the CSM, the most likely such materials to be encountered will be oils and fuels, solid and burned wastes and asbestos. A precautionary discovery strategy, as outlined below, should be emplaced during the demolition, site strip and clearance phases of the development.

6.7.2 Adoption of Cover System in Soft Landscaped Areas

The BRE *"Cover Systems For Land Regeneration, Thickness Design of Cover Systems for Contaminated Land, BRE, March 2004",* allows for the design of cover systems to impacted soils where the concentration of substances within the ground does not exceed any of the respective SGV, C4SL or S4UL by more than six times. In such a situation, a maximum cover thickness of 600mm is given. However, the concentration of substances within the certified clean soil/topsoil, which comprises the cover system, determines the overall thickness of the system and can reduce the required thickness markedly below 600mm and in this case would probably be acceptable half that depth.

Where the concentration of substances within the ground does exceed any of the respective SGV, C4SL or S4UL by more than six then an engineered capping system would be required. The concentrations of elevated contaminants outlined in above did not show any substances, which were greater than six times their respective guideline value.

6.7.3 Excavation of Impacted Soil

It could be proposed to excavate and stockpile the impacted material on the site in preparation for classification and subsequent disposal off-site to a suitable licensed facility.

The initial excavations should be centred on any areas with impacted soil and then extended in all directions, so that the impacted soils can be 'chased' out. Once excavation has been completed, validation would be required to prove all impacted soil has been removed. Validation would involve taking a representative number of samples from the sides and base of any excavation sent off for appropriate chemical analysis.

The stockpiled soils must be placed on an impermeable liner with raised edges. During periods of rainfall, the stockpile must be covered over to minimise leaching and run-off into the underlying soils. Covering of the stockpile may also be required to prevent fumes (from hydrocarbon and solvent based contaminants) and possible asbestos fibres from impacting off-site receptors off-site specialist competent waste and asbestos advice should be sought.

Any remedial works undertaken must be inspected and independently validated by a suitable competent person.

On completion of the development, a Validation and Closure Report must be supplied to both the Local Authority and the NHBC (if appropriate) detailing the remediation works undertaken on the site.

Any voids resulting from the removal of impacted soil must be backfilled with a suitable certified clean granular soil.

The developer/groundworker must be made aware of the need to address the risk from asbestos identified in this report; former use of the site and for the potential for additional sources of contamination not identified in the Geotechnical and Geoenvironmental Desk Study and intrusive site investigation to be found within the site both during demolition and the excavation of trenches for services and foundations.

6.7.4 Excavation of All Made Ground

Made Ground was encountered across the centre and west of the site to depths of up to 2.20m at BH04 but was otherwise generally of the order of 0.30-0.50m or comprised Topsoil. As such it may be reasonable to consider removal of Made Ground to an agreed depth as part of the site strip. A strip to a nominal depth of 300mm across the residential, commercial and industrial areas of the site would remove most of the outliers and all of the positive asbestos results noted to date.

6.7.5 Hard Landscape Entire Site

Hard landscaping the entire site could eliminate exposure pathways to contaminated soils for:

- Direct soil and dust ingestion,
- Consumption of home-grown produce,
- Dermal contact,
- Inhalation of dust (indoor and outdoor),
- Migration through permeable soils (direct precipitation, overland flow and through flow).

In this case the site will be predominantly hard covered with buildings and access roads with areas of soft landscaping between them. As such the area of covered ground may not actually significantly change from that at present.

6.7.6 Engineering Capping System

If an engineering capping system was required it should typically comprise a geotextile and/or mesh underlying a 200mm thick layer of lightly compacted gap graded crushed concrete (5-75mm) or the like, with geotextile upper cover underlying 450mm thickness of clean certified material.

Whilst not required in a human health risk sense, it may be prudent in the area of TPADD6 to cover this darker area with a suitable geotextile material to prevent contact with the underlying ground by future users and/or to consolidate the material if not considered geotechnically suitable.

6.7.7 Asbestos

Asbestos-containing materials (ACM's) and soils (ACS's) were identified at the site, though this was mainly in the above ground spoil samples. The asbestos matrix identified was described as bundles, microscopic fragments and solid cementous materials. The asbestos type was Chrysotile in all cases suggesting a possible single source, especially as several of the local buildings are known to be clad in it and/or contain it.

In collaboration with a competent and qualified asbestos advisor consultation would normally be required with the local authority to determine a suitable remediation strategy. Asbestos-containing soils (ACSs) do not necessarily require removal or treatment but would require a suitable capping layer to remain in-situ. All future works should have suitable and appropriate health and safety procedures in place to protect workers and adjacent receptors from airborne asbestos fibres. If ACSs remain in-situ measures should be put in place to ensure the risk of exposure is not increased, such as exposing buried asbestos at the surface.

Where ACSs have to be removed from site, quantification of the asbestos would be required. Waste containing asbestos will be hazardous waste if it contains more the 0.1% by weight of asbestos, (CIRIA C733, Asbestos in soil and made ground: a

guide to understanding and managing risks), though the Environment Agency expend this to include wastes with visible ACM where the ACM itself contains more than 0.1% asbestos by volume. This indicates that wastes can be returned to inert status and/or remediated by having all visible ACM's removed as experience shows that fibre alone in a soil or spoil will rarely reach this threshold. A competent advisor should be able to consider the feasibility of these options and thereby reduce the amount of hazardous waste being generated, increase sustainability and reduce costs.

Asbestos quantification would be recommended on soil and spoil samples where asbestos was identified, so a suitable assessment can be carried out. Such actions will probably be recommended by the competent person as a greater level of certainty is normally required for the acute human health risk assessment process.

As the majority of this material is present in the above ground waste spoil to the north, this can probably be undertaken purely as a waste activity and not as part of the development per se. However, depending on the wording and interpretation of the planning conditions this may not be the case in practice and so contact with the appropriate regulators (Local Planning Council and Environment Agency) prior to undertaking any such works is strongly advised. It may also be the case that the excavation and removal of this material may be a licencable and/or notifiable process, so the provision of competent advice is strongly recommended from the outset.

6.8 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust is generated as a result of construction activities. The site should be securely fenced at all times to prevent unauthorised access.

Washing facilities should be provided and eating restricted to mess huts.

6.9 Waste Considerations

Excavated material as waste must be defined or classified prior to any disposal, transport, recycling or re-use at or by an appropriately licensed or exempt carrier and/or off-site disposal facility. The requirements inherent in both Duty of Care and Health and Safety must also be complied with. In order to determine what is to happen, what is suitable, appropriate and most effective in the disposal of wastes, especially those subject to CDM waste management plan requirements, several factors must be considered and competent advice should always be sought.

The amount, type and nature of the material to be removed will in part determine the amount and type of analysis that may be required to comply with current waste guidance, and thereby allow a competent person to suitably classify and characterise the material. Often this data is uncertain or unavailable, especially in the early stages of a project, and therefore further investigation, testing and analysis may be required as additional information regarding the development becomes available.

Wastes must be classified, characterised and defined by their solid characteristics to comply with current waste guidance. Existing information and analysis derived for environmental purposes may therefore be suitable for use in this context. Waste Acceptance Criteria (WAC) report the leachability of materials and therefore cannot be used to classify, characterise or define wastes. The only purpose of a WAC analysis is to determine the suitability of a given material for acceptance at one of the three different types of available licenced landfills (inert, stable non-reactive hazardous or hazardous).

Other options are available that may lead to significant savings against disposal to landfill and expert advice should always be sought from a competent person to advise on their relative costs or benefits and advise on any additional analysis, sampling or investigation that may be required to reduce remaining uncertainties and comply with current guidance. The information available within this investigation should be suitable to allow an appropriate classification and characterisation for disposal purposes by a competent licensed contractor. As no significant results have yet been noted in terms of human health risk assessment, it is usually the case that such material is generally also inert and non-hazardous for disposal purposes, however please note that in this particular case this specifically excludes the potential presence of physical contaminants such as knotweed and/or asbestos which may require additional testing and analysis prior to disposal.

The waste acceptance criteria results and consideration of the general soils results in a waste context both strongly indicate that the majority of the materials analysed and encountered are probably suitable for disposal to an inert landfill. However, the spoil may require further analysis depending on the disposal or recycling route chosen and may require further health and safety consideration form a suitable qualified competent person due to the noted presence of asbestos as ACM and ACS in the spoil. To comply with current guidance, the waste materials may also require some form of segregation and separation prior to final disposal and a competent waste advisor should be appointed to assist with this.

6.10 Re-use of Excavated Material On-site

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008 and is accepted as an alternative regime to the EPR.

Under the EPR, material that is contaminated but otherwise suitable for re-use is also classified as waste and its re-use should be in accordance with the Environmental Permitting Regulations 2007 (EPR). Environmental Permit Exemptions (EPE) are for the re-use of non-hazardous or inert waste only; hazardous waste cannot be re-used under a permit exemption. EPE apply only to imported inert waste materials; inert material arising on site and recovered on site is not classified as waste and does not require an exemption. It is possible that materials arising on-site will be classified as inert and would not need an exemption.

Environmental Permit Exemptions are only allowed for certain activities, placing controls on the quantities that can be stored and re-used. The re-use of waste shall be within areas and levels defined in planning applications and permissions for the development. An EPE requires a site-specific risk assessment for the receptor site to demonstrate that the materials are suitable for use, i.e. that they will not give rise to harm to human health or pollution of the environment.

Under the CL:AIRE voluntary code of practice (CoP) materials excavated on-site are not deemed contaminated if suitable for re-use at specified locations or generally within the site.

Material that may have been classified as hazardous waste under the EPR may be re-used. The CoP regime requires that a 'Qualified Person' as defined under the CoP reviews the development of the Materials Management Plan, including review of Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning and Regulatory issues, and signs a Declaration which is forwarded to the Environment Agency and which confirms compliance with the CoP.

Should it be necessary to import materials from another site where materials are excavated and which is not material from a quarry or produced under a WRAP protocol, then an EPE would be necessary for the imported material whether the work was managed under the CoP or the EPR.

6.11 Imported Material

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

6.12 Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition, site strip and construction phases for the redevelopment of the site as noted previously in this report.

Care should be taken during excavation works especially to investigate any soils, which

appear by eye (e.g. such as fibrous materials, large amounts of ash and unusual discolouration), odour (e.g. fuel, oil and chemical type odours or unusual odours such as sweet odours or fishy odours) or wellbeing (e.g. light headedness and/or nausea, burning of nasal passages and blistering or reddening of skin due to contact with soil) to be contaminated or of unusual and/or different character to standard soils or those analysed.

In the event of any discovery of potentially contaminated soils or materials, this discovery should be quarantined and reported to the most senior member of site staff or the designated responsible person at the site for action. The location, type and quantity must be recorded and the Local Authority, and a suitable, competent, qualified and appropriate third party notified immediately. An approval from the Local authority must be sought prior to implementing any proposed mitigation or remediation activities.

The discovery strategy must remain on site at all times and must demonstrate a clear allocation of responsibility for reporting and dealing with contamination. A copy of the strategy must be placed on the health and safety notice board and /or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the discovery strategy.

Given the potential for discovery in the wastes, spoil and underlying the remaining buildings, it would be strongly advised to emplace the discovery strategy into the demolition and site strip phases of the works and engage suitable competent persons to advise on these activities prior to them being planned and undertaken to ensure compliance with the relevant guidance and legislation.

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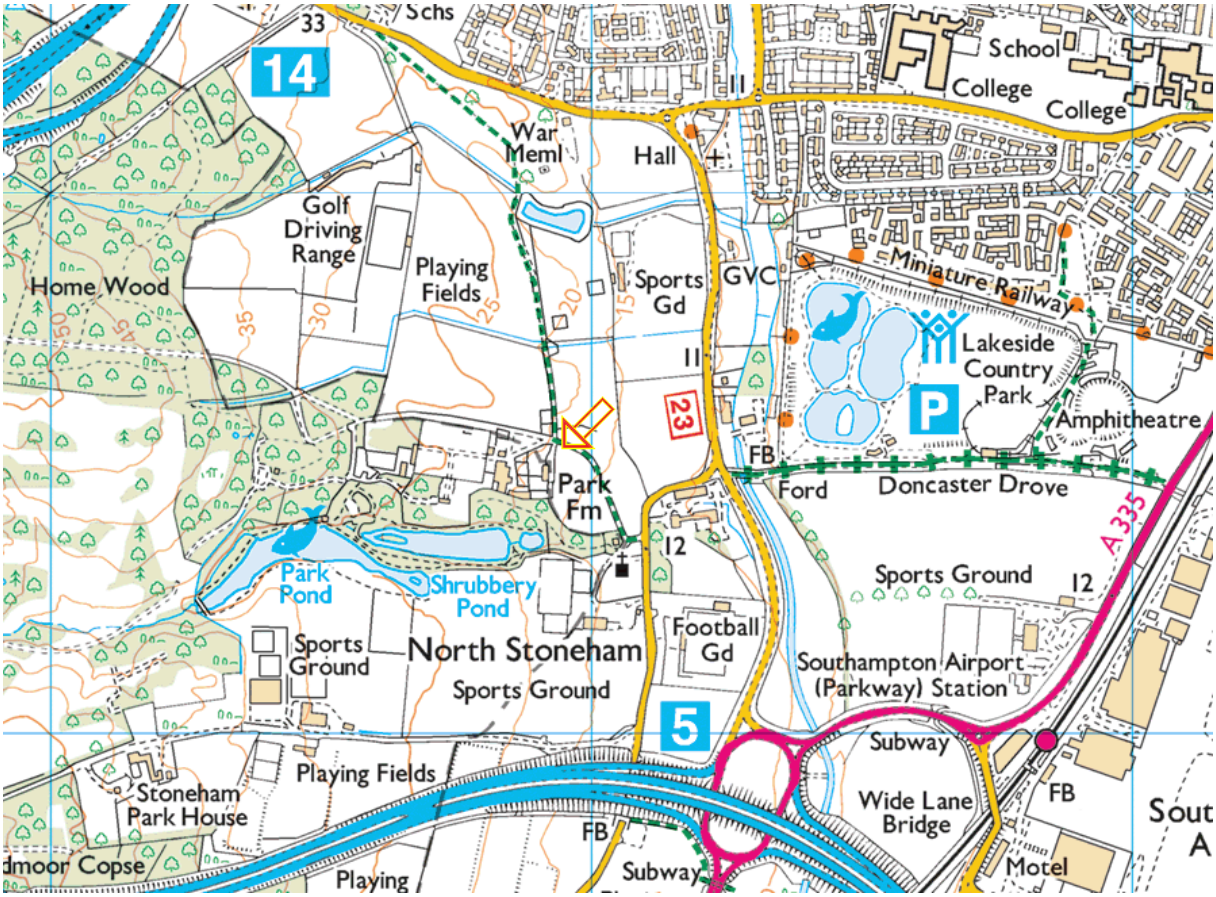


Figure 1 – Site Location Map

N

Job Number 17624	**Project** Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS
Client Cinnamon Retirement Living Limited and Highwood Homes	**Date** June 2019

Figure 2 – Aerial Photograph

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

Figure 3 – BH Location Plan

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

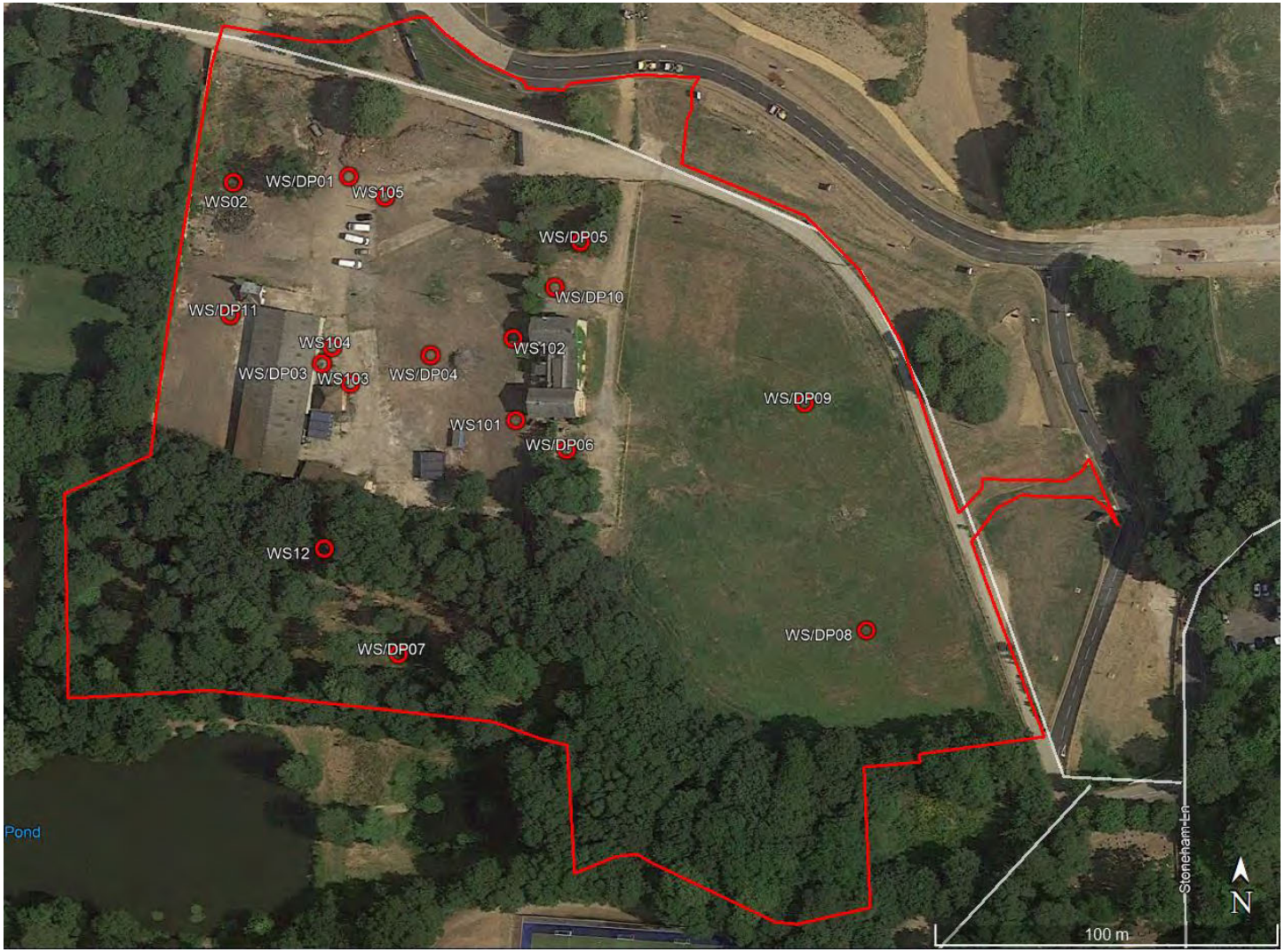


Figure 4 – WS/DP Location Plan

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

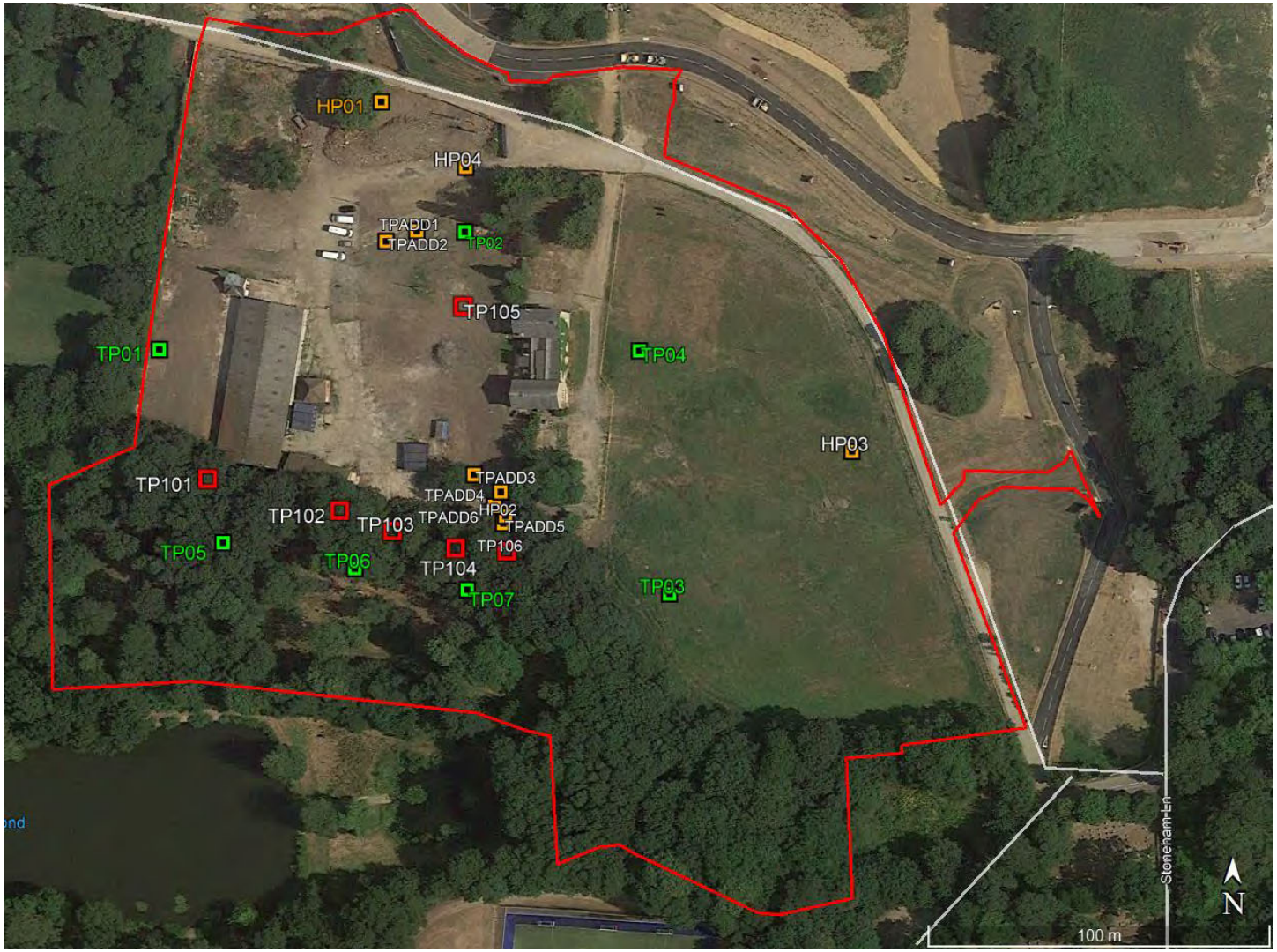


Figure 5 – TP Location Plan

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

Figure 6 – DCP Location Plan

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

Figure 7 – Stockpile samples Location Plan

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

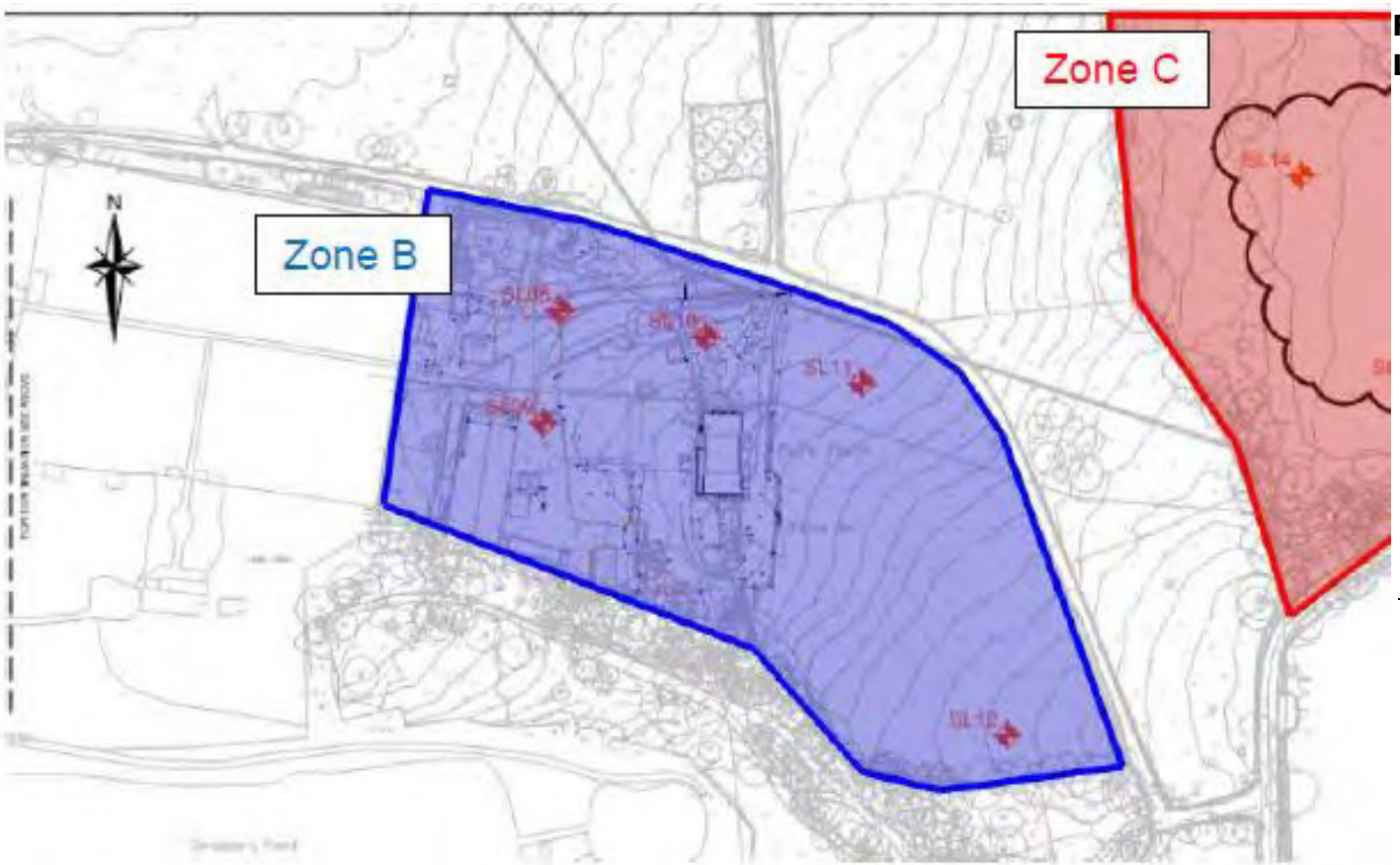


Figure 8 – Historical TP Locations – Infiltration Pits

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

Figure 9 – Indicative Foundation Zones

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

Figure 10 – Area of Knotweed Contamination (not investigated by Soils Limited)

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

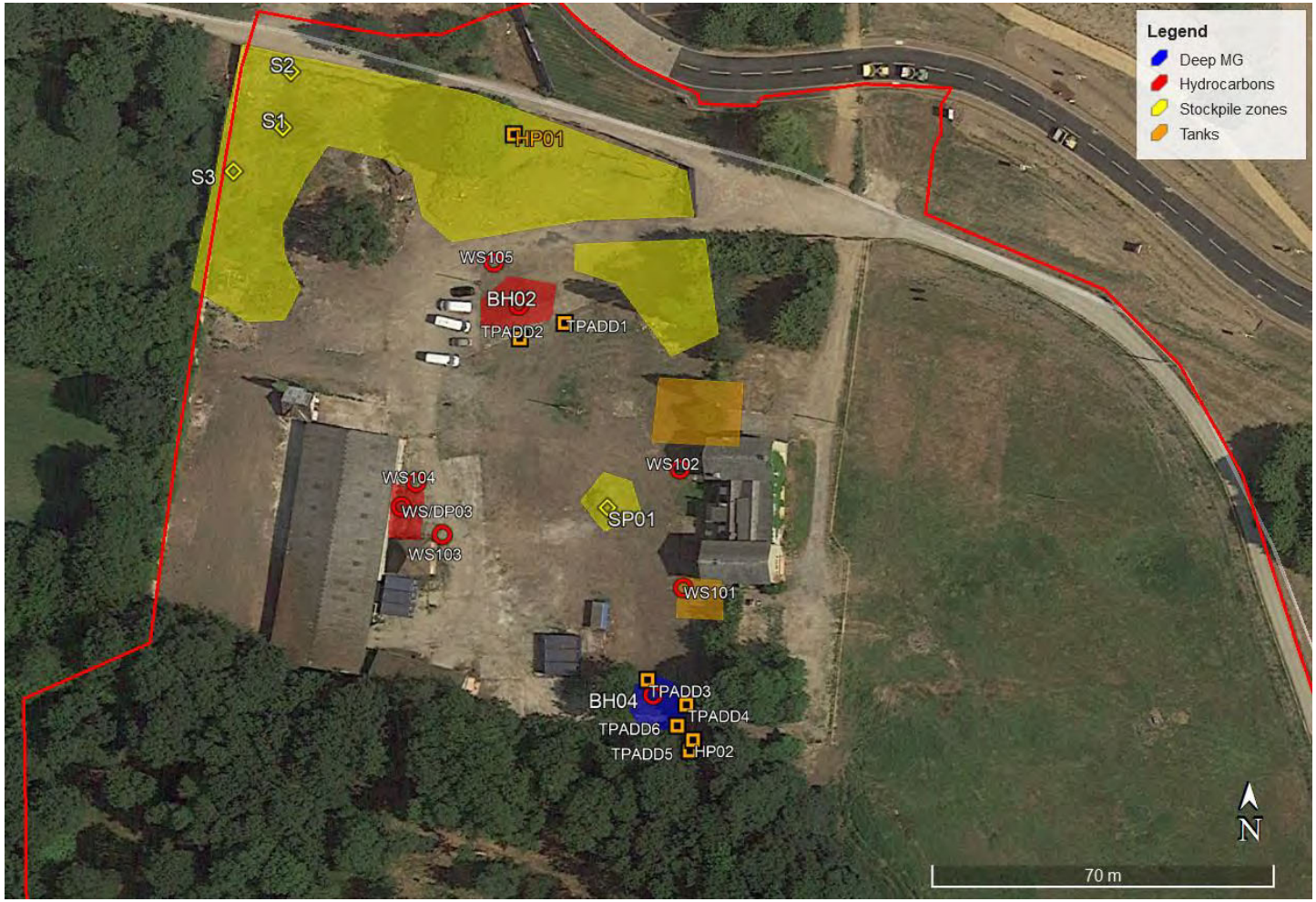


Figure 11 – Areas of Environmental Concern

Project
Stoneham Continuing Care Retirement Community, Stoneham, Eastleigh, Hampshire SO50 9HS

Client
Cinnamon Retirement Living Limited and Highwood Homes

Date
June 2019

Job Number
17624

Appendix A Field Work

Appendix A.1 Engineers Logs

soils LIMITED	Contract Name: Stoneham CCRC		Client: Highwood Group			Hole ID: BH01
	Contract Number: 17624	Start and End Date: 29-04-19 - 30-04-19	Logged By: GB	Checked By: TR	Status: FINAL	Hole Type: CP
	Easting: 443946.9	Northing: 117470.1	Ground Level: 17.51mAOD	Plant Used: Dando 1500	Print Date: 10-06-2019	Scale: 1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 1 of 3

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.10 - 0.50	B		17.41	0.10		Turf over dark grey and brown slightly gravelly slightly sandy SILT with occasional roots/rootlets. Gravel is fine angular to subangular clasts of flint. MADE GROUND		
0.50 - 1.00	B			(1.00)		Dark reddish orange mottled brown slightly clayey gravelly SAND with rare rootlets. Gravel is fine angular to subangular clasts of flint. MADE GROUND		
1.10	D		16.41	1.10		Dark grey and brown slightly gravelly slightly sandy CLAY. Gravel is fine angular to subangular clasts of flint and fine brick fragments. MADE GROUND		
1.20	SPT	N=8 (1,2/3,1,1,3)						
1.20 - 1.70	D B			(0.50)				
			15.91	1.60		Light grey and brown slightly silty sandy GRAVEL. Gravel is medium to coarse angular to rounded clasts of flint. SAnd is medium to coarse. RIVER TERRACE DEPOSITS		
2.00	SPT	N=11 (2,2/2,3,4,2)						
2.00 - 2.50	B			(1.00)				
2.60	D		14.91	2.60		Light orangish grey mottled brown slightly gravelly CLAY. Gravel is angular to subangular clasts of flint. RIVER TERRACE DEPOSITS		
			14.81	2.70		Light greyish orange mottled brown slightly sandy CLAY with patches of dark reddish brown staining. RIVER TERRACE DEPOSITS		
3.00	SPT	N=15 (1,2/2,3,4,6)						
3.00 - 3.50	D B			(1.80)				
4.00	SPT	N=19 (2,3/3,4,6,6)						
4.00 - 4.50	D B							
			13.01	4.50		Orange and yellowish brown silty fine to medium SAND. LONDON CLAY FORMATION		
5.00	SPT	50 (4,9/50 for 225mm)						
5.00 - 5.50	D B							
6.50	SPT	N=49 (6,7/49 for 295mm)						
6.50 - 7.00	D B							
				(6.40)				
8.00	SPT	N=50 (8,8/50 for 255mm)						
8.00 - 8.50	D B							
9.50	SPT	N=46 (3,4/4,8,9,25)						
9.50 - 10.00	D B							

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter Depth (m)	Dia (mm)	Casing Diameter Depth (m)	Dia (mm)
13.00	200	13.00	200
25.00	150	24.00	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	10.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.80	1.60		20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: Stoneham CCRC		Client: Highwood Group			Hole ID: **BH01**
	Contract Number: 17624	Start and End Date: 29-04-19 - 30-04-19	Logged By: GB	Checked By: TR	Status: FINAL	Hole Type: **CP**
	Easting: 443946.9	Northing: 117470.1	Ground Level: 17.51mAOD	Plant Used: Dando 1500	Print Date: 10-06-2019	Scale: 1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 2 of 3

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						Orange and yellowish brown silty fine to medium SAND. LONDON CLAY FORMATION		
11.00	SPT	N=21 (3,4/4,5,6,6)	6.61	10.90 (0.30)		Orangish brown and grey slightly gravelly clayey fine to medium SAND. Gravel is fine to medium subangular to rounded clasts of flint. LONDON CLAY FORMATION		
11.00 - 11.50	B		6.31	11.20		Dark grey slightly fine sandy CLAY. LONDON CLAY FORMATION. Occasional gravel sized shell fragments and decomposed roots at top of stratum. LONDON CLAY FORMATION		
11.70	D							
12.50 - 12.80	U	Ublow = 120						
12.80	D							
13.00 - 14.00	B							
14.00	SPT	N=41 (4,4/7,8,11,15)						
14.00 - 14.50	D B							
15.00	D					*Rare fine gravel sized selenite.*		
15.50 - 15.80	U	Ublow = 120		(13.80)				
15.80	D							
17.00	SPT	N=50 (4,7/50 for 280mm)						
17.00 - 17.50	D B							
18.50	SPT	N=50 (3,5/50 for 285mm)						
18.50 - 19.00	D B							
20.00	SPT	N=52 (5,5/52 for 275mm)						

Depth scale: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
13.00	200
25.00	150

Casing Diameter

Depth (m)	Dia (mm)
13.00	200
24.00	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	10.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.80	1.60		20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**BH01**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	29-04-19 - 30-04-19	GB	TR	FINAL	**CP**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443946.9	117470.1	17.51mAOD	Dando 1500	10-06-2019	1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 3 of 3

Samples & In Situ Testing			Strata Details					Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill/ Installation
	D					Dark grey slightly fine sandy CLAY. LONDON CLAY FORMATION. Occasional gravel sized shell fragments and decomposed roots at top of stratum. LONDON CLAY FORMATION			
20.00 - 20.50	B								
21.00	D						21		
21.50	SPT	50 (5,9/50 for 225mm)							
21.50 - 22.00	B						22		
23.00	SPT	50 (4,10/50 for 225mm)					23		
	D								
23.00 - 23.50	B						24		
24.50	SPT	50 (6,7/50 for 210mm)							
	D								
			-7.49	25.00		End of Borehole at 25.00m	25		
							26		
							27		
							28		
							29		
							30		

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
13.00	200
25.00	150

Casing Diameter

Depth (m)	Dia (mm)
13.00	200
24.00	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	10.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.80	1.60		20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: Stoneham CCRC		Client: Highwood Group			Hole ID: BH02
	Contract Number: 17624	Start and End Date: 25-04-19 - 26-04-19	Logged By: GB	Checked By: TR	Status: FINAL	Hole Type: CP
	Easting: 443868.6	Northing: 117525.1	Ground Level: 20.84mAOD	Plant Used: Dando 1500	Print Date: 10-06-2019	Scale: 1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 1 of 2

Samples & In Situ Testing

Depth	Type	Results
0.10 - 0.60	B	
0.60 - 0.90	B	
0.90	D	
1.00	D	
1.20	SPT	N=41 (8,11/41 for 255mm)
1.20 - 1.70	B	
2.00	SPT	N=32 (7,7/8,7,8,9)
	J	
2.00 - 2.50	B	
2.70 - 3.00	B	
3.00	D	
3.00 - 3.45	U	Ublow = 70
4.00	SPT	N=15 (2,3/4,4,3,4)
	D	
4.00 - 4.50	B	
5.00 - 5.45	U	Ublow = 75
5.45	D	
6.00	SPT	N=39 (6,6/8,10,10,11)
	D	
6.50 - 7.00	B	
7.00	SPT	50 (5,8/50 for 210mm)
	D	
7.00 - 7.50	B	
7.90	D	
8.50	SPT	50 (5,7/50 for 225mm)
	D	
8.50 - 9.00	B	
10.00	SPT	N=42 (1,4/5,8,13,16)
	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Strata Description
20.74	0.10 (0.50)	CONCRETE Dark red grey and brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to rounded clasts of flint. RIVER TERRACE DEPOSITS
20.24	0.60 (0.40)	Dark greyish orange mottled brown slightly gravelly slightly sandy CLAY. Gravel is fine angular to subangular clasts of flint.. RIVER TERRACE DEPOSITS
19.84	1.00 (1.70)	Light grey and brown sandy GRAVEL. Gravel is medium to coarse angular to rounded clasts of flint. Sand is medium to coarse. RIVER TERRACE DEPOSITS *Hydrocarbon type odours*
18.14	2.70 (1.30)	Light grey and brown slightly clayey sandy GRAVEL. Gravel is angular to rounded clasts of flint. RIVER TERRACE DEPOSITS
16.84	4.00 (1.45)	Light grey orange mottled brown slightly gravelly sandy CLAY. Gravel is angular clasts of flint. RIVER TERRACE DEPOSITS *Sand content increases with depth*
15.39	5.45 (1.55)	Orangish and yellow fine to medium sandy clayey SILT. LONDON CLAY FORMATION
13.84	7.00 (0.90)	Orange and yellowish brown gravelly SAND. Gravel is fine angular clasts of flint.
12.94	7.90 (0.40)	Light grey reddish orange mottled brown slightly sandy CLAY. LONDON CLAY FORMATION
12.54	8.30 (1.70)	Dark orange and yellowish brown slightly gravelly very silty fine to medium SAND. Gravel is fine subangular clasts of flint. LONDON CLAY FORMATION
10.84	10.00	

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
15.50	150

Casing Diameter

Depth (m)	Dia (mm)
14.50	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	3.00	SLOTTED	50
0.00	5.00	PLAIN	50
5.00	11.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.50			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: Stoneham CCRC		Client: Highwood Group			Hole ID: BH02
	Contract Number: 17624	Start and End Date: 25-04-19 - 26-04-19	Logged By: GB	Checked By: TR	Status: FINAL	Hole Type: CP
	Easting: 443868.6	Northing: 117525.1	Ground Level: 20.84mAOD	Plant Used: Dando 1500	Print Date: 10-06-2019	Scale: 1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 2 of 2

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
10.00 - 10.50	B			(1.50)		Dark yellow and brown slightly gravelly SAND. Gravel is subangular clasts of flint and sandstone. LONDON CLAY FORMATION		
11.50	SPT	N=37 (3,3/7,7,11,12)	9.34	11.50		Dark yellow and brown gravelly SAND. Gravel is angular to subangular clasts of flint. LONDON CLAY FORMATION		
	D							
11.50 - 12.00	B			(1.30)				
12.50 - 13.00	B							
12.80	D		8.04	12.80		Black cobbley coarse rounded flint GRAVEL. LONDON CLAY FORMATION		
13.00	SPT	N=51 (3,6/9,9,15,18)	7.94	12.90		Dark grey slightly fine sandy CLAY. LONDON CLAY FORMATION		
	D			(2.60)				
14.50 - 14.85	U	Ublow = 100						
14.85	D							
15.00	SPT	N=47 (4,5/9,10,13,15)						
	D							
15.00 - 15.50	B		5.34	15.50		End of Borehole at 15.50m		

Depth scale: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
15.50	150

Casing Diameter

Depth (m)	Dia (mm)
14.50	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	3.00	SLOTTED	50
0.00	5.00	PLAIN	50
5.00	11.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.50			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	BH03

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	01-05-19	GB	TR	FINAL	CP
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
444009.2	117411.4	13.96mAOD	Dando 1500	10-06-2019	1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 1 of 2

Samples & In Situ Testing

Depth	Type	Results
0.10 - 0.60	B	
0.60 - 1.00	B	
1.20	SPT	N=34 (6,7/6,8,10,10)
	D	
1.20 - 1.70	B	
2.00	SPT	N=36 (2,6/8,8,8,12)
	D	
2.00 - 2.50	B	
3.00	SPT	50 (3,5/50 for 225mm)
	D	
3.00 - 3.50	B	
4.00	SPT	N=50 (5,9/50 for 265mm)
	D	
4.00 - 4.50	B	
5.00	SPT	N=50 (4,6/50 for 285mm)
	D	
5.00 - 5.50	B	
6.50	SPT	N=50 (2,3/50 for 235mm)
	D	
6.50 - 7.00	B	
8.00	SPT	N=50 (1,5/50 for 240mm)
	D	
8.00 - 8.50	B	
9.50	SPT	N=27 (4,5/5,6,7,9)
9.50 - 10.00	B	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Strata Description
13.86	0.10	Turf over dark orange grey brown slightly sandy gravelly CLAY. Gravel is fragments of brick, flint and fine ash. MADE GROUND
	(0.50)	Yellow clayey gravelly SAND. Gravel is fragments of brick and fine angular to subangular clasts of flint. MADE GROUND
13.36	0.60	Yellow orange and brown very silty SAND & GRAVEL. Gravel is medium to coarse subangular to rounded clasts of flint. Sand is fine to medium. RIVER TERRACE DEPOSITS
	(1.80)	
11.56	2.40	Orangish brown and yellow silty fine to medium SAND. LONDON CLAY FORMATION Silty clay bands
	(7.00)	
4.56	9.40	Dark grey slightly gravelly clayey SAND. Gravel is fine rounded clasts of flint. LONDON CLAY FORMATION
4.36	9.60	Dark grey slightly fine sandy CLAY. LONDON CLAY FORMATION

Groundwater: Water Strike; Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
15.00	150

Casing Diameter

Depth (m)	Dia (mm)
14.00	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	10.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.00	1.60		20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**BH03**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	01-05-19	GB	TR	FINAL	**CP**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
444009.2	117411.4	13.96mAOD	Dando 1500	10-06-2019	1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 2 of 2

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
						Dark grey slightly fine sandy CLAY. LONDON CLAY FORMATION		
10.90 - 11.30	U	Ublow = 120						
11.30	D							
12.50	SPT	N=47 (5,5/7,9,14,17)		(5.40)		*Rare fine gravel sized selenite.*		
12.50 - 13.00	D B							
14.00	SPT	50 (5,6/50 for 225mm)				*Rare fine gravel sized shell fragments.*		
14.00 - 14.50	D B							
15.00	SPT	50 (3,6/50 for 225mm)	-1.04	15.00		End of Borehole at 15.00m		
	D							

Depth scale: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)
					15.00	150	14.00	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling			
From (m)	To (m)	Duration	Remarks

Installation			
Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	10.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.00	1.60		20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: Stoneham CCRC		Client: Highwood Group			Hole ID: **BH04**
	Contract Number: 17624	Start and End Date: 02-05-19	Logged By: GB	Checked By: TR	Status: FINAL	Hole Type: **CP**
	Easting: 443896.6	Northing: 117450.1	Ground Level: 19.08mAOD	Plant Used: Dando 1500	Print Date: 10-06-2019	Scale: 1:50

Weather: | Termination: | SPT Hammer: AR1575 Energy Ratio: 73% | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.10 - 0.60	B	
0.60 - 1.10	B	
1.10	SPT	N=3 (1,1/1,0,1,1)
1.10 - 1.60	B	
1.80 - 2.20	B	
2.20	SPT	N=37 (12,14/10,7,8,12)
2.20 - 2.70	B	
3.00	SPT	55 (3,4/55 for 225mm)
	D	
3.00 - 3.50	B	
4.00	SPT	N=50 (6,9/50 for 235mm)
	D	
4.00 - 4.50	B	
4.80	D	
5.00	SPT	50 (9,5/50 for 225mm)
	D	
5.00 - 5.50	B	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
	(1.10)		Dark brown and black gravelly SILT with occasional roots/rootlet.. Gravel is fragments plastic, wire, brick, ash, glass, metal and flint. MADE GROUND
17.98	1.10		Dark brown and black slightly sandy slightly gravelly CLAY. Gravel is fragments of brick and flint. Occasional black organic material. MADE GROUND
	(0.70)		
17.28	1.80		Light grey and brown sandy GRAVEL. Gravel is fine to medium angular to rounded clasts of flint and fragments of brick. MADE GROUN
	(0.40)		
16.88	2.20		Yellow and orange very sandy very clayey GRAVEL. Gravel is medium to coarse angular to subangular clasts of flint. Sand is fine to medium. RIVER TERRACE DEPOSITS.
	(2.60)		
14.28	4.80		Light orange and brown slightly sandy CLAY. RIVER TERRACE DEPOSITS
14.08	5.00		Light yellow orange and brown silty fine to medium SAND. LONDON CLAY FORMATION
	(1.00)		
13.08	6.00		End of Borehole at 6.00m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
6.00	150

Casing Diameter

Depth (m)	Dia (mm)
6.00	150

Remarks:
Hand dug pit to 1.20m bgl

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	6.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.70	1.60		20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS01**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	23-04-19	GB	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443854.3	117538.9	21.38mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: Hole collapse | Sheet 1 of 1

Samples & In Situ Testing

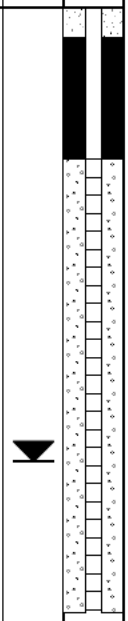
Depth	Type	Results
0.10	D+J	
0.30	D+J	
0.60	D+J	
1.20	D+J	
1.70	D	
2.00 - 2.40	B	
2.20	D	
2.40 - 2.50	B	
2.70	D	
3.20	D	
3.70	D	
4.00	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
21.18	0.20		Fine light grey brown angular to sub angular silty slightly sandy GRAVEL. Sand is fine to coarse. MADE GROUND
20.98	0.40		Dark grey black slightly clayey slightly sandy SILT. Sand is fine to coarse. Occasional rare fine angular to sub angular gravel. Occasional fine ash, brick fragments. Rare plastic. MADE GROUND
	(0.70)		Dark grey orange mottled brown Slightly sandy CLAY. Sand is fine to coarse. Rare fine brick, ash fragments. Rare occasional fine angular to sub angular gravel. MADE GROUND
20.28	1.10		Dark grey orange mottled brown slightly sandy CLAY. Sand is fine to coarse. Rare fine angular to sub angular flint gravel. RIVER TERRACE DEPOSITS
	(0.50)		
19.78	1.60		Light orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel medium to coarse subangular to rounded clasts of flint. RIVER TERRACE DEPOSITS
	(0.80)		
18.98	2.40		Light orange grey mottled brown clayey SAND. Sand is fine to coarse. Rare blavck staining. RIVER TERRACE DEPOSITS
	(1.00)		
17.98	3.40		Light yellow and orange brown silty fine to medium SAND. LONDON CLAY FORMATION
	(0.60)		
17.38	4.00		End of Borehole at 4.00m

Groundwater

Water Strike | Backfill/ Installation



Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	4.00	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
3.00			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS02**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	30-04-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443824.0	117531.3	21.90mAOD	PREM 2	10-06-2019	1:50

Weather: | Termination: Hole collapse | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.10	D+J			(0.30)		Dark brown, slightly sandy, slightly gravelly desiccated CLAY. Gravel is angular to rounded, fine to coarse, flint. Rare, angular, medium ceramic fragments. One rusted metal fragment. Occasional rootlets. MADE GROUND.		
0.40	D+J		21.60	0.30		Dark brown, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse flint, with rarer fine brick and clinker. Occasional rootlets. MADE GROUND.		
0.70	D+J		21.35	0.55		Brown, slightly sandy, slightly silty, gravelly CLAY. Gravel is angular to rounded, fine to coarse, flint. Rare rootlets and woody roots. RIVER TERRACE DEPOSITS		
				(0.45)		*Woody roots ~ 3 mm diameter at 0.8 m bgl.*		
1.20	D		20.90	1.00		Multicoloured mottled, yellowish brown, slightly silty, sandy GRAVEL. Gravel is angular to sub-angular, fine to coarse, flint. RIVER TERRACE DEPOSITS		
				(0.60)				
1.70	D+J		20.30	1.60		Light greyish brown, slightly silty, sandy GRAVEL. Gravel is angular to rounded, fine to coarse, flint. Becoming siltier towards base of stratum. Faint hydrocarbon odour. RIVER TERRACE DEPOSITS		
1.90	D+J		20.05	1.85		Yellowish brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse, flint. Becomes less gravelly towards 2.0 m bgl. Faint hydrocarbon odour. RIVER TERRACE DEPOSITS		
2.40	D		19.90	2.00		Orangish brown mottled, yellowish brown, very sandy SILT/CLAY. Sand is fine. Distinct hydrocarbon odour. RIVER TERRACE DEPOSITS		
2.50	J			(1.00)		*Backfill in WS from 2 - 2.4 m bgl.*		
2.80	D+J							
			18.90	3.00		End of Borehole at 3.00m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 1.0 m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.80			20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS03**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	01-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443846.9	117485.7	20.60mAOD	PREM 2	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.20	D+J	
0.50	D+J	
0.80	D+J	
1.20	D+J	
1.40	D+J	
1.70	D+J	
1.90	D+J	
2.40	D+J	
2.60	D+J	
2.90	D+J	
3.40	D+J	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
	(0.35)		Dark brown, slightly sandy, slightly gravelly desiccated CLAY. Gravel is angular to rounded, fine to coarse, flint, with rare fine brick. Occasional rootlets and fibrous roots. MADE GROUND.
20.25	0.35		Dark brown, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse flint, with rarer fine brick and clinker. Occasional rootlets. Occasional desiccated cement and sand pockets below 0.4 m bgl. One brick cobble at 0.4 m bgl. MADE GROUND.
20.05	0.55		Multicoloured mottled, light greyish brown, slightly clayey, sandy GRAVEL. Gravel is angular to sub-angular, fine to coarse flint. Strong hydrocarbon odour around 0.8 m. Rare rootlets. Very rare, angular, medium brick. MADE GROUND.
	(0.45)		
19.60	1.00		Firm to stiff, Greyish brown and brown mottled, slightly sandy, very gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse flint. RIVER TERRACE DEPOSITS
	(0.35)		
19.25	1.35		Firm, dark blackish grey, greyish brown, and brown mottled, slightly sandy CLAY. Sand is fine, and featured in lenses. Fine sandy band with clay laminations from 1.65 - 1.72 m bgl. Very strong hydrocarbon odour throughout.
	(0.45)		
18.80	1.80		Firm, yellowish brown, to brown with depth, interbedded CLAY with SAND. Sand is fine. Very strong hydrocarbon odour throughout, particularly in sand lenses. Occasional black speckles in clay. Hydrocarbon odour throughout. RIVER TERRACE DEPOSITS
	(0.65)		
18.15	2.45		Orangish brown mottled, light yellow and brown mottled, medium SAND. Faint Hydrocarbon odour. RIVER TERRACE DEPOSITS
18.00	2.60		Firm, yellowish brown, to brown with depth, interbedded CLAY with SAND. Sand is fine. Very strong hydrocarbon odour throughout, particularly in sand lenses. Occasional black speckles in clay. Becomes sandier at base of stratum. Faint Hydrocarbon odour. RIVER TERRACE DEPOSITS
17.80	2.80		Orangish brown bedded light yellow silty fine to medium SAND. Faint Hydrocarbon odour. LONDON CLAY FORMATION
	(0.70)		
17.10	3.50		End of Borehole at 3.50m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:

Hydrocarbon odour to base of hole. Rootlets obserbved to 1.0 m bgl.

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	3.50	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.80			20	1.70	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS04**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	23-04-19	GB	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443879.6	117495.3	19.37mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: Hole collapse | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.20	D+J	
0.50	D+J	
0.80	D+J	
1.20	D+J	
1.35	D+J	
1.80	D	
2.30	D	
2.80	D	
3.00	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
	(0.40)		Dark orange brown slightly sandy SILT. Sand is fine to coarse. Occasional rootlets. Rare fine angular to sub angular gravel. Rare occasional fine brick, ash, clinker fragments. MADE GROUND
18.97	0.40		
	(0.30)		Orange brown clayey SAND. Sand is fine to coarse. Occasional fine angular to sub angular gravel. Rare fine ash, brick fragments. RIVER TERRACE DEPOSITS
18.67	0.70		Soft light orange brown CLAY. Rare fine angular to sub angular gravel. MADE GROUND
18.47	0.90		Dark grey brown slightly sandy CLAY. Sand is fine to coarse. Rare rootlets. Rare fine ash fragments. MADE GROUND
	(0.40)		
18.07	1.30		Grey gravelly CLAY. Frequent fine angular to sub angular brick concrete gravel. MADE GROUND
17.97	1.40		Light yellow grey gravelly SAND. Sand is fine to coarse. Gravel is medium to coarse angular to sub angular clasts of flint. RIVER TERRACE DEPOSITS
	(1.60)		
16.37	3.00		End of Borehole at 3.00m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)

Remarks:

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.70			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS05**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	01-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443918.6	117525.8	19.89mAOD	PREM 2	10-06-2019	1:50

Weather: | Termination: Refusal on dense gravels | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.10	D+J			(0.40)		Light greyish brown to brown with depth, slightly gravelly, sandy, desiccated, SILT. Sand is fine. Gravel is angular to rounded, fine to coarse flint and brick. Occasional rootlets. MADE GROUND.		
0.40	D+J		19.49	0.40		Brown, slightly sandy, gravelly, desiccated, SILT. Sand is fine. Gravel is angular to rounded, fine to coarse flint. Occasional rootlets. RIVER TERRACE DEPOSITS		
			19.34	0.55		End of Borehole at 0.55m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS06**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	01-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443914.2	117462.5	18.55mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D+J			(0.40)		Dark brown, slightly sandy, slightly gravelly, desiccated SILTY CLAY. Gravel is angular to sub-rounded, fine to coarse flint and rare brick. Occasional rootlets. MADE GROUND. *Becoming gravelly at 0.3 m bgl.*		
0.50	D+J		18.14	0.40		Brown, slightly sandy, slightly gravelly SILTY CLAY. Gravel is angular to rounded, fine to coarse, flint, concrete and brick. Rare rootlets. MADE GROUND.		
0.80	D+J		17.90	0.65		Brown, slightly clayey, sandy GRAVEL. Gravel is angular to rounded, fine to coarse, flint. Rare rootlets above 1.0 m. Occasional clayey pockets. RIVER TERRACE DEPOSITS *Low recovery from 1 - 2 m, boundary ambiguous.*		
1.10	D			(1.05)				
1.70	D		16.84	1.70		Grey mottled, orangish brown, gravelly clayey SAND. Gravel is angular to rounded clasts of flint. RIVER TERRACE DEPOSITS *Low recovery from 1 - 2 m, boundary ambiguous.*		
				(0.30)				
			16.55	2.00		End of Borehole at 2.00m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 1.0 m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS07**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	03-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443878.8	117401.0	18.49mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
			18.39	0.10		Dark brown, slightly silty, very gravelly SAND. Gravel is angular to rounded, fine to medium FLINT. Frequent rootlets. TOPSOIL		
0.20	D+J			(0.40)		Brown, slightly silty, sandy GRAVEL. Gravel is angular to rounded, fine to medium FLINT. Sand is fine. Becoming siltier with depth. Rare rootlets. RIVER TERRACE DEPOSITS		
			17.99	0.50		Brown to orangish brown gravelly fine to medium SAND. Gravel is fine to medium subrounded clasts of flint. RIVER TERRACE DEPOSITS		
0.60	D+J							
0.80	D+J			(0.50)				
1.00	D		17.49	1.00		Orangish brown and brown mottled, slightly sandy CLAY. Sand is fine. Occasional black speckles. Occasional rootlets. RIVER TERRACE DEPOSITS		
			17.39	1.10		Yellowish brown to orangish brown silty fine to medium SAND. Clay band from 1.6 - 1.65 m bgl. Very rare decomposing rootlets. LONDON CLAY FORMATION		
1.30	D			(0.55)				
1.50	D							
1.70	D		16.84	1.65		Yellowish brown to brownish yellow, silty fine to medium SAND. Clay band from 1.73 - 1.8 m bgl. LONDON CLAY FORMATION		
				(0.35)				
2.00	D		16.49	2.00		Orangish brown silty fine to medium SAND. LONDON CLAY FORMATION		
2.10	D		16.39	2.10		Firm, orangish brown and brown mottled, slightly sandy CLAY. Sand is fine. Occasional black speckles. LONDON CLAY FORMATION		
2.30	D		16.29	2.20		Light brownish yellow, silty fine to medium SAND. Clay bands from 2.42 - 2.48, 2.58 - 2.62, and 2.9 - 2.92 m bgl. RIVER TERRACE DEPOSITS		
				(0.80)				
2.80	D							
			15.49	3.00		End of Borehole at 3.00m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 1.1 m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS08**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	01-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
444015.4	117411.4	13.47mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.10	D+J	
0.40	D+J	
0.80	D+J	
1.00	D	
1.40	D	
1.70	D	
2.10	D	
2.60	D	
2.70	D+J	
3.10	D	
3.70	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
	(0.30)		Firm to stiff, greyish brown, desiccated CLAY. Frequent rootlets. Very rare, angular to rounded, fine flint gravel. TOPSOIL.
13.17	0.30		Greyish brown, to brown, becoming light greyish brown with depth, slightly clayey, sandy GRAVEL. Gravel is angular to rounded, fine to coarse flint. Occasional rootlets. RIVER TERRACE DEPOSITS
	(0.45)		
12.72	0.75		Light greyish brown slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse flint. RIVER TERRACE DEPOSITS
12.57	0.90		Brown, slightly clayey, gravelly SAND. Sand is fine. Gravel is angular to rounded, fine to coarse flint. Pockets of sandy gravel from 0.9 - 1.0, and 1.1 - 1.5 m bgl. RIVER TERRACE DEPOSITS
	(0.40)		
12.17	1.30		Brown and yellowish brown banded, slightly gravelly, fine to medium SAND. Gravel is angular to rounded, fine to medium flint. RIVER TERRACE DEPOSITS
	(0.30)		
11.87	1.60		Brown and yellowish brown banded silty fine to medium SAND. Brown clay bands at 1.6 - 1.65, and 1.8 - 1.84 m bgl. LONDON CLAY FORMATION
	(0.40)		
11.47	2.00		Slightly black mottled, brown and yellowish brown banded, silty fine to medium SAND. Clay pockets from 2.7 - 2.75 m, 3.37 - 3.4 m, and 3.6 - 3.7 m bgl. RIVER TERRACE DEPOSITS *Orangish/reddish brown oxide stained clay at 2.7 m, with occasional purplish black, fine ferruginous gravel, and angular, fine to coarse mudstone gravel. Orangish brown stained at 3.0 m bgl.*
	(1.80)		
9.67	3.80		End of Borehole at 3.80m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 0.75 m bgl.

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	PLAIN	50
1.00	3.50	SLOTTED	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
3.00			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS09**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	01-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443959.4	117510.5	18.38mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D+J			(0.50)		Greyish brown, slightly sandy, slightly gravelly, desiccated SILT. Sand is fine. Gravel is angular to sub-rounded, fine to coarse flint, and rare brick. Frequent rootlets. MADE GROUND.		
0.50	D+J		17.88	0.50		Greyish brown, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse, flint. Pocket between 0.65 - 0.85 containing frequent clinker, ash, and burnt shale. MADE GROUND.		
0.70	D+J			(0.45)				
1.00	D+J		17.43	0.95		Greyish brown, brown, and dark brown mottled very sandy silty GRAVEL. Gravel is angular to rounded clasts of flint. Occasional dark blackish brown stained patches, with faint organic/ hydrocarbon odour, particularly at 1.3 - 1.4 m bgl. Very rare rootlets. RIVER TERRACE DEPOSITS		
1.40	J			(0.65)				
1.60	D		16.78	1.60		Brown, slightly sandy, clayey sandy GRAVEL. Gravel is angular to rounded, fine to coarse flint. RIVER TERRACE DEPOSITS		
1.90	D		16.58	1.80		Yellowish brown, silty fine to medium SAND. Occasional clay bands and laminations. RIVER TERRACE DEPOSITS		
2.00	D		16.38	2.00		Firm, Greyish brown and yellowish brown mottled, slightly sandy CLAY. Sand is fine, and features in lenses. Occasional very fine black speckles. RIVER TERRACE DEPOSITS		
2.20	D		16.28	2.10		Orangish brown and yellow banded, yellowish brown, silty fine to medium SAND. Clayey pockets at 2.4, and from 2.65 - 2.75 m bgl. Occasional black speckles, particularly in clay band at 2.7 m. LONDON CLAY FORMATION		
2.70	D			(0.90)				
			15.38	3.00		End of Borehole at 3.00m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 1.5 m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
3.00			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS10**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	23-04-19	GB	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443910.0	117507.2	19.11mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: Hole collapse | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.10	D+J	
0.30	D+J	
0.60	D+J	
1.00	D+J	
1.50	D	
2.00	D	
2.50	D	
3.00	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
			Dark grey brown sandy SILT with frequent roots/rootlets. TOPSOIL
18.91	0.20		Orange brown gravelly SAND. Sand is fine to coarse. Frequent occasional fine angular to sub angular flint gravel. RIVER TERRACE DEPOSITS
18.71	0.40		Dark orange brown gravelly CLAY. Sand is fine to coarse. Rare rootlets. Frequent fine angular to sub angular gravel. RIVER TERRACE DEPOSITS
	(0.50)		
18.21	0.90		Light orange brown sandy very gravelly CLAY. Sand is fine to coarse. Frequent fine angular to sub angular flint gravel. RIVER TERRACE DEPOSITS
18.01	1.10		Light yellow orange brown gravelly SAND. Sand is fine to coarse. Gravel is subangular clasts of flint. Rare fine black staining. RIVER TERRACE DEPOSITS
	(0.70)		
17.31	1.80		Light orange and yellow silty fine to medium SAND. Rare fine black staining. LONDON CLAY FORMATION
	(1.20)		
16.11	3.00		End of Borehole at 3.00m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)

Remarks:

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.70			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: Stoneham CCRC		Client: Highwood Group			Hole ID: **WS11**
	Contract Number: 17624	Start and End Date: 01-05-19	Logged By: DW	Checked By: TR	Status: FINAL	Hole Type: **WS**
	Easting: 443818.8	Northing: 117504.1	Ground Level: 21.51mAOD	Plant Used: PREM 2	Print Date: 10-06-2019	Scale: 1:50

Weather: | Termination: Refusal on dense gravels | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D+J		21.21	(0.30) 0.30		Greyish brown to brown with depth, slightly sandy, silty GRAVEL. Sand is fine. Gravel is angular to rounded, fine to coarse flint and brick. Occasional rootlets. MADE GROUND. *Very silty in top 10 cm of stratum*		
0.50	D+J		20.81	(0.40) 0.70		Dark brown, slightly sandy, gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse flint, with rarer fine brick and clinker. Occasional rootlets and roots. MADE GROUND. *Woody roots ~ 3 mm diameter.*		
0.80	D+J		20.41	(0.40) 1.10		Light brown mottled, brown, slightly sandy CLAY. Occasional peaty dark brown speckles. Occasional rootlets. Occasional to rare, sub-angular to sub-rounded, fine to medium flint gravel. RIVER TERRACE DEPOSITS		
1.30	D+J		19.71	(0.70) 1.80		Slightly black stained (odourless), orangish brown mottled, brown, slightly sandy, very gravelly CLAY. Gravel is angular to sub-angular, fine to coarse flint. RIVER TERRACE DEPOSITS		
1.60	D		18.61	(1.10) 2.90		Light grey, brown, and light brown mottled, slightly sandy CLAY. Sand is fine to medium, and features in frequent pockets and lenses. RIVER TERRACE DEPOSITS *~ 8 cm thick sand band at 2.3 m bgl.*		
1.90	D+J		18.01	(0.60) 3.50		Light brown to light yellow with depth, silty fine to medium SAND. Occasional clay lenses. LONDON CLAY FORMATION		
2.30	D					End of Borehole at 3.50m		
2.80	D							
3.00	D							
3.40	D							

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
3.30			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS12**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	03-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443848.7	117433.7	21.31mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.10	D+J	
0.40	D+J	
0.80	D+J	
1.10	D+J	
1.60	D	
1.80	D	
2.00	D	
2.20	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
			Greyish brown, slightly sandy, very gravelly, desiccated SILT. Sand is fine. Gravel is angular to sub-rounded, fine to coarse flint, and rare brick. Frequent rootlets. MADE GROUND.
21.06	0.25		Brown, slightly sandy, slightly gravelly, desiccated SILT. Sand is fine. Gravel is angular to sub-rounded, fine to coarse flint, and rare brick. Occasional rootlets. One fragment of angular, fine, flint gravel at 0.35 m bgl. MADE GROUND.
	(0.45)		
20.61	0.70		Greyish brown, slightly sandy, very gravelly SILT. Sand is fine. Occasional rootlets. RIVER TERRACE DEPOSITS
	(0.35)		
20.26	1.05		Orangish brown, slightly silty, very gravelly SAND. Sand is medium. Gravel is angular to sub-angular, fine to medium flint. Clayey pockets/laminations at base of stratum. RIVER TERRACE DEPOSITS
	(0.45)		
19.81	1.50		Orangish brown, slightly clayey, fine to medium SAND. RIVER TERRACE DEPOSITS
19.61	1.70		Slightly greyish brown mottled, orangish brown, slightly sandy CLAY. Sand is fine to medium, and features in occasional lenses. RIVER TERRACE DEPOSITS
	(0.30)		
19.31	2.00		Brown, slightly gravelly, sandy CLAY. Gravel is angular to rounded fine to coarse flint. Sand is fine to medium. RIVER TERRACE DEPOSITS
19.16	2.15		Brown, slightly sandy, very gravelly CLAY. Gravel is angular to sub-angular, fine to coarse flint. RIVER TERRACE DEPOSITS
18.91	2.40		End of Borehole at 2.40m

Groundwater

Water Strike	Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 1.15 m bgl.

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS101**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	03-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443902.2	117470.8	18.57mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.20	D+J	
0.40	D+J	
0.70	D+J	
0.90	D	
1.10	D	
1.60	D	
1.80	D	
2.30	D+J	
2.60	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
	(0.30)		Very soft, dark brown, slightly sandy, gravelly, desiccated CLAY. Sand is fine. Gravel is angular to rounded, fine to coarse flint, with very rare brick and clinker. Occasional rootlets. MADE GROUND.
18.27	0.30		Dark brown mottled, brown, slightly sandy, gravelly, CLAY. Sand is fine. Gravel is angular to rounded, fine to coarse flint, with rare brick and clinker. Occasional rootlets. Becomes very silty towards base of stratum, with gravel decreasing. MADE GROUND.
	(0.30)		
17.97	0.60		Brown, becoming light brown with depth, slightly sandy SILT. Sand is fine. Rare, angular to sub-rounded, fine to coarse flint gravel, with a pocket at base of stratum. RIVER TERRACE DEPOSITS
	(0.40)		
17.57	1.00		Light greyish brown, slightly silty, sandy GRAVEL. Gravel is angular to rounded, fine to coarse, flint. RIVER TERRACE DEPOSITS
	(0.70)		
16.87	1.70		Light greyish brown to brown, slightly clayey, sandy GRAVEL. Gravel is angular to rounded, fine to coarse, flint. Possesses a stagnant odour. RIVER TERRACE DEPOSITS
	(0.50)		
16.37	2.20		Brown, orangish brown, and black mottled/banded, slightly sandy CLAY. Sand is fine, and features in occasional lenses, with bands from 2.3 - 2.35, and 2.6 - 2.65 m bgl. Frequent organic black lenses and horizons with an odour of decomposition/anoxia. RIVER TERRACE DEPOSITS
	(0.50)		
15.87	2.70		End of Borehole at 2.70m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:
Rootlerts observed to 0.6 m bgl.

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	0.80	PLAIN	50

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.20			20	0.90	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS102**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	02-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443901.0	117494.0	18.85mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.20	D+J	
0.60	D+J	
0.75	D+J	
0.90	D	
1.10	D	
1.40	D	
1.90	D	
2.40	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
	(0.40)		Very soft to firm, dark brown, slightly sandy, gravelly SILT. Sand is fine. Gravel is angular to rounded, fine to coarse, flint, and rare fine brick. Frequent rootlets. MADE GROUND.
18.45	0.40		Black mottled, brown, and yellowish brown mottled, slightly sandy SILT. Sand is fine. Occasional angular to sub-rounded, fine to medium flint gravel, and very rare fine brick gravel (< 5 %). Occasional rootlets. Stagnant odour. RIVER TERRACE DEPOSITS
	(0.30)		
18.15	0.70		Very soft, orangish brown and brown mottled, yellowish brown, slightly sandy SILT. Sand is fine. Rare rootlets. Stagnant odour.
18.00	0.85		Orangish brown and brown mottled, yellowish brown, slightly sandy CLAY. Sand is fine. Rare rootlets. Stagnant odour. RIVER TERRACE DEPOSITS
17.85	1.00		Light greyish brown, and orangish brown mottled, slightly silty, fine SAND. Rare, angular, fine to coarse flint gravel, increasing to base of stratum. RIVER TERRACE DEPOSITS
	(0.50)		Light greyish brown to brown with depth, slightly silty, slightly sandy GRAVEL. Gravel is angular to rounded, fine to coarse, flint. RIVER TERRACE DEPOSITS
17.35	1.50		
	(1.15)		
16.55	2.30		Orangish brown, yellowish brown, and brown mottled and laminated, sandy CLAY. Sand is fine, and features in lenses. Occasional dark brown, fine gravel sized organic/peaty pockets. RIVER TERRACE DEPOSITS
	(0.50)		
16.05	2.80		End of Borehole at 2.80m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)
0.00	0.70	PLAIN	50
0.70	1.70	SLOTTED	50

Remarks:
Rootlets observed to 1.0 m bgl.

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.50			20	1.50	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS103**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	02-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443853.0	117482.2	20.39mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.20	D+J	
0.40	D+J	
0.70	D+J	
0.80	D+J	
1.10	D+J	
1.60	D+J	
2.10	D	
2.80	D	
2.90	D	
3.30	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
20.29	0.10		CONCRETE.
20.09	0.30 (0.30)		Multicoloured, slightly silty, GRAVEL AND SAND. Gravel is angular to rounded, fine to coarse, brick, flint, and desiccated concrete. Occasional rootlets. MADE GROUND.
19.79	0.60 (0.40)		Dark blackish brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to sub-rounded, fine to coarse flint, brick, desiccated concrete, and rare clinker. Rare rootlets. Rare black staining with faint hydrocarbon odour. MADE GROUND.
19.39	1.00 (0.50)		Grey and brown mottled, brownish grey, slightly sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse flint, and features in a prominent sandy band from 0.75 - 0.9 m bgl. Frequent dark blackish grey stained patches with hydrocarbon odour. RIVER TERRACE DEPOSITS
18.89	1.50 (1.40)		Firm, slightly black stained, greyish brown and reddish brown mottled, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse flint. Angular flint cobble at base of stratum. Possesses hydrocarbon odour. RIVER TERRACE DEPOSITS
			Grey and orangish brown mottled, slightly sandy CLAY. Sand is fine, and features in frequent pockets and lenses. Rare fine black speckling in clay. Occasional orange oxide stained patches. Occasional purplish black, fine ferruginous speckles at 3.0 - 3.10 m bgl. RIVER TERRACE DEPOSITS *Significant sand bands at 1.78 - 1.8, 2.2 - 2.2, 2.3, 2.4, 2.45 - 2.5, and 2.65 - 2.8 m.*
17.49	2.90 (0.50)		Light yellow, to yellowish brown with depth, silty fine to medium SAND. Pocket of orangish brown, sandy, laminated clay at 3.35 - 3.4 m. LONDON CLAY FORMATION
16.99	3.40		End of Borehole at 3.40m

Groundwater

Water Strike	Backfill/ Installation
▼	

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Remarks:
Rootlerts observed to 0.6 m bgl.

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.50			0	0.00	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
Stoneham CCRC	Highwood Group	**WS104**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
17624	02-05-19	DW	TR	FINAL	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
443846.0	117491.1	20.71mAOD	PREM 1	10-06-2019	1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing

Depth	Type	Results
0.10	D+J	
0.35	D+J	
0.60	D+J	
0.80	D+J	
0.90	D+J	
1.40	D+J	
1.80	D+J	
1.90	D+J	
2.10	D+J	
2.40	D	
2.90	D	
3.00 - 4.00	D	

Strata Details

Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description
20.61	0.10		CONCRETE
20.46	0.25		Dark brown, slightly silty, slightly gravelly SAND. Gravel is angular to rounded, fine to coarse flint, brick and desiccate concrete. Rare rootlets. MADE GROUND.
	(0.45)		Multicoloured, slightly clayey, slightly sandy GRAVEL. Gravel is angular to sub-angular, flint, and brick. Brick from 0.55 m to base of stratum (possibly broken cobble). Faint hydrocarbon odour, with a black stained patch at 0.35 m, with strong hydrocarbon odour. Occasional clay pockets. MADE GROUND.
20.01	0.70		
19.86	0.85		
19.71	1.00		Dark brown, black, and light brown mottled, slightly sandy, slightly gravelly, CLAY. Gravel is angular to sub-angular flint and brick. Black staining with strong hydrocarbon odour. Possibly reworked. MADE GROUND
	(0.70)		Orangish brown and black mottled, greyish brown, slightly sandy CLAY. Sand is fine. Rare angular to rounded, medium flint gravel. Strong hydrocarbon odour throughout. RIVER TERRACE DEPOSITS
19.01	1.70		Light greyish brown to brown with depth, slightly clayey, slightly sandy GRAVEL. Gravel is angular to rounded, fine to coarse, flint. Occasional black stained patches with hydrocarbon odour. RIVER TERRACE DEPOSITS
18.81	1.90		
	(0.40)		Orange, and brown mottled, grey, slightly sandy, slightly gravelly CLAY. Sand is fine. Faint hydrocarbon odour. RIVER TERRACE DEPOSITS
18.41	2.30		*Sand band from 0.9 - 0.95 m bgl.*
	(0.70)		Orange, grey, and brown mottled, interbedded SAND AND CLAY. Sand is fine, and features in frequent lenses. RIVER TERRACE DEPOSITS
			Orange, grey, and brown mottled, slightly sandy CLAY. Sand is fine, and features in frequent lenses. RIVER TERRACE DEPOSITS
17.71	3.00		Orangish brown to brown with depth silty fine to medium SAND. Clay features in occasional laminations and lenses. Occasional organic black speckles. LONDON CLAY FORMATION
			Considerably compressed into small WS.
	(1.00)		
16.71	4.00		End of Borehole at 4.00m

Groundwater

Water Strike | Backfill/ Installation

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Chiselling

From (m)	To (m)	Duration	Remarks

Installation

Top (m)	Base (m)	Type	Dia (mm)

Remarks:

Rootlets observed to 0.25 m bgl.

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.50			20	1.50	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: Stoneham CCRC		Client: Highwood Group			Hole ID: **WS105**
	Contract Number: 17624	Start and End Date: 02-05-19	Logged By: DW	Checked By: TR	Status: FINAL	Hole Type: **WS**
	Easting: 443863.1	Northing: 117532.8	Ground Level: 21.05mAOD	Plant Used: PREM 1	Print Date: 10-06-2019	Scale: 1:50

Weather: | Termination: | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.10	D+J			(0.50)		Dark brown, slightly sandy, gravelly, silty desiccated CLAY. Gravel is angular to rounded, fine to coarse, flint, clinker brick and cement. Frequent rootlets, becoming occasional with depth. Overlain by 8 cm of sandy silt. MADE GROUND. *Black staining at 0.45 m bgl possesses mild hydrocarbon odour.*		
0.40	D+J		20.55	0.50		Greyish brown and brown mottled, slightly sandy CLAY. Sand is fine, and features in occasional fine pockets. Occasional decomposed roots. Occasional orange oxide stained patches towards base of stratum. Rare angular, fine to medium flint gravel. Rare rootlets. RIVER TERRACE DEPOSITS		
0.60	D+J		20.30	0.75		Orangish brown and brown mottled, slightly sandy, slightly gravelly, CLAY. Sand is fine to medium. Gravel is angular to sub-angular, fine to medium flint. RIVER TERRACE DEPOSITS		
0.90	D		20.05	1.00		Grey and brown mottled, orangish brown, slightly sandy CLAY. Sand is fine to medium. Occasional angular to sub-angular, fine to coarse flint gravel. RIVER TERRACE DEPOSITS		
1.20	D			(0.40)		Multicoloured mottled, light brown to brown, slightly clayey, slightly sandy GRAVEL. Gravel is angular, fine to coarse flint. Dark grey band from 2.45 - 2.65 m, with mild hydrocarbon odour (possibly organic decomposition). Black stained patch at 2.1 m bgl, with faint hydrocarbon odour. Dark purplish black stained pocket at 2.9 m bgl, of ferruginous appearance. RIVER TERRACE DEPOSITS *Very clayey in top 20 cm of stratum, grading from previous stratum.*		
1.50	D		19.65	1.40				
2.10	D+J			(1.60)				
2.40	D							
2.50	D+J							
2.90	D							
			18.05	3.00		Orangish brown, slightly silty, slightly sandy GRAVEL. Gravel is angular, fine to coarse flint. RIVER TERRACE DEPOSITS		
			17.85	3.20		Soft to firm, orangish brown and brown mottled/laminated, sandy CLAY. Sand is fine, and features in frequent laminations and lenses. RIVER TERRACE DEPOSITS		
3.50	D			(0.50)				
			17.35	3.70		Firm, grey, orange and yellowish brown mottled and laminated, silty fine to medium SAND with clay interbedments. LONDON CLAY FORMATION		
3.90	D			(0.30)				
			17.05	4.00		End of Borehole at 4.00m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 0.75 m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
2.50			20	2.40	

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

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Trial Pit Log

Trial Pit No. **TP01**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 22.29m AOD	Co-ords: E443810.55 N117486.84	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
							Dark brown silty Gravel. Gravel is fine to coarse, angular to rounded of flint with rare brick and concrete rarely to cobble size. Frequent Roots. MADE GROUND.
	0.30	ES		0.30	21.99		Brown, orangish brown in parts, silty GRAVEL. Gravel is fine to coarse, occasionally cobble sized, subangular to rounded flint. Occasional roots. RIVER TERRACE DEPOSITS
	0.60	ES					
				0.90	21.39		Orangish brown, occasionally grey gleyed, slightly sandy slightly gravelly SILT. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. Occasional roots. RIVER TERRACE DEPOSITS
	1.00	ES					
	1.80	ES		1.80	20.49		End of Pit at 1.800m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP02**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 20.10m AOD	Co-ords: E443885.88 N117519.06	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Dark brown slightly sandy silty Gravel. Gravel is fine to coarse, angular to rounded of flint with rare brick and concrete rarely to cobble size, plastic and glass. Frequent Roots. MADE GROUND.
				0.30	19.80		
	0.50	ES					Brown, orangish brown in parts, slightly sandy silty GRAVEL. Gravel is fine to coarse, occasionally cobble sized, subangular to rounded flint. Occasional roots. RIVER TERRACE DEPOSITS
				1.20	18.90		End of Pit at 1.200m

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General Remarks:
TP collapsing, abandoned 1.20m.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP03**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 16.20m AOD	Co-ords: E443944.98 N117424.67	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Dark brown slightly sandy silty Gravel. Gravel is fine to coarse, angular to rounded of flint occasionally to cobble size, with rare brick fragments. Frequent Roots. MADE GROUND.
				0.30	15.90		Brown, orangish brown in parts, slightly sandy silty GRAVEL. Gravel is fine to coarse, rarely cobble sized, subangular to rounded flint. RIVER TERRACE DEPOSITS
	0.60	ES					
				1.70	14.50		End of Pit at 1.700m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP04**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 18.05m AOD	Co-ords: E443940.83 N117489.90	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES		0.30	17.75		Light greyish brown slightly sandy silty Gravel. Gravel is fine to coarse, angular to rounded of flint with rare brick fragments. Frequent Roots. MADE GROUND.
	0.50	ES		0.90	17.15		Brown, orangish brown in parts, slightly sandy silty Gravel. Gravel is fine to coarse, rarely cobble sized, subangular to rounded flint. MADE GROUND. *Coarse gravel sized brick fragments between 0.50 and 0.60m on TP south side.*
▼				1.30	16.75		Brown, orangish brown in parts, slightly sandy silty GRAVEL. Gravel is fine to coarse, rarely cobble sized, subangular to rounded flint. RIVER TERRACE DEPOSITS
							End of Pit at 1.300m

1 2 3 4 5

General Remarks:
TP collapsing, abandoned 1.30m.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP05**

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Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 20.11m AOD	Co-ords: E443859.66 N117414.01	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
							Dark brown slightly sandy silty Gravel. Gravel is fine to coarse, angular to rounded of flint with rare brick fragments. Frequent Roots. MADE GROUND.
	0.30	ES		0.30	19.81		Orangish brown, occasionally grey gleyed, slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
	0.50	ES					
				1.10	19.01		End of Pit at 1.100m

General Remarks:
TP collapsing, abandoned 1.10m.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP06**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 19.53m AOD	Co-ords: E443859.66 N117410.11	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Dark brown, becoming lighter with depth, slightly sandy gravelly SILT. Gravel is fine to coarse, angular to rounded of flint with rare brick fragments. Frequent Roots. MADE GROUND.
	0.50	ES		0.40	19.13		Orangish brown, occasionally grey gleyed, slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
				1.00	18.53		End of Pit at 1.000m

General Remarks:
TP collapsing, abandoned 1.00m.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP07**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 18.70m AOD	Co-ords: E443887.57 N117405.12	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Dark brown, becoming lighter with depth, slightly sandy gravelly SILT. Gravel is fine to coarse, angular to rounded of flint with rare brick fragments. Frequent Roots. MADE GROUND.
				0.50	18.20		
	0.70	ES					Orangish brown, occasionally grey gleyed, slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
				1.00	17.70		End of Pit at 1.000m

1 2 3 4 5

General Remarks:
TP collapsing, abandoned 1.00m.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP101**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 02-05-2019	Level:	Co-ords:	Logged By CB

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	J B		0.30			Dark brown gravelly silty SAND. Gravel is fragments of flint, brick and ceramics. MADE GROUND
	0.50	J B		0.90			Light brown silty gravelly SAND. Gravel is fine to medium subangular clasts of flint. RIVER TERRACE DEPOSITS
	1.20	J B		1.40			Light orangish brown sandy GRAVEL. Gravel is subangular clasts of flint. RIVER TERRACE DEPOSITS
							End of Pit at 1.400m

1 2 3 4 5

General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP102**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 02-05-2019	Level:	Co-ords:	Logged By CB

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.50	J B					Dark brown silty gravelly SAND. Gravel is fragments of flint and brick. MADE GROUND
				0.70			Light orangish brown sandy GRAVEL. Gravel is subanagular clasts of flint. RIVER TERRACE DEPOSITS
	0.80	J B					
				0.90			Light orangish brown clayey SAND. RIVER TERRACE DEPOSITS
	1.10	J B					
				1.20			Light orangish brown sandy GRAVEL. Gravel is subangular clasts of flint. RIVER TERRACE DEPOSITS
	1.25	J B					
				1.35			End of Pit at 1.350m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP103**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 02-05-2019	Level:	Co-ords:	Logged By CB

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.50	J B					Dark brown silty gravelly SAND. Gravel is fine to medium fragments of brick and flint. MADE GROUND
	0.90	J B		0.80 0.95			Light orangish brown sandy GRAVEL. Gravel is subanagular clasts of flint. RIVER TERRACE DEPOSITS
							End of Pit at 0.950m

1 2 3 4 5

General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP104**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type: TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale: 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 02-05-2019	Level:	Co-ords:	Logged By: CB

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.40	J B					Dark brown silty gravelly SAND. Gravel is fine to medium fragments of brick and flint. MADE GROUND
				0.65			Light orangish brown sandy GRAVEL. Gravel is subangular clasts of flint. RIVER TERRACE DEPOSITS
	1.00	J B					
				1.50			End of Pit at 1.500m

General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP105**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 02-05-2019	Level: 19.88m AOD	Co-ords: E443872.32 N117502.45	Logged By CB

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.30	J B					Dark brown gravelly silty SAND.. Gravel is fragments of brick, concrete and wood. MADE GROUND
				0.55	19.33		Light orangish brown clayey SAND. RIVER TERRACE DEPOSITS
	0.70	J B					
				1.50	18.38		Light orangish brown sandy GRAVEL. Gravel is subangular clasts of flint. RIVER TERRACE DEPOSITS
	1.60	J B					
				1.70	18.18		Dark brown sandy GRAVEL. Gravel is rounded clasts of flint. RIVER TERRACE DEPOSITS
	1.80	J B					
				1.90	17.98		End of Pit at 1.900m

General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TP106**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 02-05-2019	Level:	Co-ords:	Logged By CB

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	J B					Dark brown gravelly silty SAND. Gravel is fragments of flint, brick, ceramics, glass and potential asbestos. MADE GROUND
	0.30	J B					
				0.70			Light orangish brown sandy GRAVEL. Gravel is subangular clasts of flint. RIVER TERRACE DEPOSITS
	0.80	J B					
				0.90			End of Pit at 0.900m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TPADD1**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 20.41m AOD	Co-ords: E443876.98 N117522.10	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Dark brown slightly sandy silty GRAVEL. Gravel is fine to coarse subangular to subrounded of flint, occasionally to cobble size with rare brick. MADE GROUND.
	0.40	ES		0.30	20.11		Orangish brown, occasionally grey gleyed, slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
				2.00	18.41		End of Pit at 2.000m

General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **TPADD2**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 20.43m AOD	Co-ords: E443869.62 N117519.35	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Dark brown slightly sandy silty GRAVEL. Gravel is fine to coarse subangular to subrounded of flint, occasionally to cobble size with rare brick. MADE GROUND.
				0.30	20.13		Orangish brown, occasionally grey gleyed, slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. Very silty band between 0.60-0.70m. RIVER TERRACE DEPOSITS
	0.50	ES					
							Slight ephemeral floral odour 1.6m
	2.10	ES		2.10	18.33		End of Pit at 2.100m

General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No.
TPADD3
Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 19.21m AOD	Co-ords: E443893.87 N117462.00	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Black slightly sandy silty Gravel. Gravel is fine to coarse angular to rounded flint, brick, concrete (occasionally to cobble size) with occasional glass. MADE GROUND
	0.40	ES		0.30	18.91		Orangish brown slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
				0.60	18.61		End of Pit at 0.600m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No.
TPADD4
Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 18.96m AOD	Co-ords: E443901.24 N117452.47	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
							Black slightly sandy silty Gravel. Gravel is fine to coarse angular to rounded flint, brick, concrete with occasional glass. MADE GROUND
	0.30	ES		0.30	18.66		Orangish brown slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
				0.60	18.36		End of Pit at 0.600m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No.
TPADD5
Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 19.23m AOD	Co-ords: E443895.12 N117447.24	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Black slightly sandy silty Gravel. Gravel is fine to coarse angular to rounded flint, brick, concrete with occasional glass. MADE GROUND
				0.30	18.93		Orangish brown slightly sandy silty GRAVEL. Gravel is medium to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
				0.60	18.63		End of Pit at 0.600m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No.
TPADD6
Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 19.08m AOD	Co-ords: E443898.43 N117448.41	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	ES					Black slightly sandy silty Gravel. Gravel is fine to coarse angular to rounded flint, brick, concrete (occasionally to cobble size) with occasional glass, ceramic, metal and rare plastic. MADE GROUND.
				1.70	17.38		End of Pit at 1.700m

General Remarks:
TP collapsing due to water at 1.50m, abandoned 1.70m.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **HP01**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 21.09m AOD	Co-ords: E443874.66 N117557.98	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.30	ES					Mixed brown and dark brown silty sandy Gravel. Gravel is angular to rounded flint, brick concrete (rarely to boulder size) plastic, metal, wood, ceramics and possible ACM. MADE GROUND
				0.50	20.59		End of Pit at 0.500m

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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **HP02**

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 19.08m AOD	Co-ords: E443895.12 N117448.97	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.50	ES					Black slightly sandy silty Gravel. Gravel is fine to coarse angular to rounded flint, brick, concrete (occasionally to cobble size) with occasional glass, ceramic, metal and rare plastic. MADE GROUND.
	1.00	ES					*Base of TP covered by metal lattice - bed springs and reinforcing bars.*
				1.20	17.88		End of Pit at 1.200m

General Remarks:
Metal pieces forming latice at TP base, abandoned 1.20m.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **HP03**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 15.95m AOD	Co-ords: E443994.74 N117475.63	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
							Orangish brown slightly sandy silty GRAVEL. Gravel is fine to coarse subangular to rounded of flint, rarely to cobble size with rare brick. MADE GROUND.
	0.30	ES		0.30	15.65		Orangish brown, slightly sandy gravelly SILT. Gravel is fine to coarse subangular to subrounded of flint, rarely to cobble size. RIVER TERRACE DEPOSITS
				0.60	15.35		End of Pit at 0.600m

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4
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General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **HP04**

Sheet 1 of 1

Project Name: Stoneham CCRC	Project No.: 17624	Method:	Hole Type TP
Location: Stoneham, Hampshire		Plant: 3T Excavator	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 29-04-2019	Level: 20.72m AOD	Co-ords: E443881.76 N117533.24	Logged By CGS

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.30	ES					Mixed brown and dark brown silty sandy Gravel. Gravel is angular to rounded flint, brick concrete (rarely to boulder size) plastic, metal, wood, ceramics and possible ACM. MADE GROUND
				0.50	20.22		End of Pit at 0.500m

General Remarks:

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **SL8**

Project Name: Stoneham	Project No.: 17270	Method:	Hole Type TP
Location: Stoneham, Land at Chestnut Ave, Eastleigh, SO50 9HS		Plant:	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 13-11-2018	Level:	Co-ords:	Logged By

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	DJ					Blackish brown silty sandy GRAVEL. Gravel is medium to cobble sized angular to sub-rounded tarmac, concrete and brick fragments. MADE GROUND
				0.40			Light grey to yellowish brown slightly gravelly silty CLAY. Gravel is sub-angular to sub-rounded fine to course flint. Strong hydrocarbon odour. RIVER TERRACE DEPOSITS
	1.00	DJ		1.00			Orangish brown very silty very sandy GRAVEL. Gravel is fine to cobble sub angular to sub rounded flint. Coated in black sludge from 1.8m strong fuel smell. RIVER TERRACE DEPOSITS.
	2.10	DJ		2.10			End of Pit at 2.100m

1 2 3 4 5

General Remarks:
No roots observed. No ground water observed.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **SL9**

Project Name: Stoneham	Project No.: 17270	Method:	Hole Type TP
Location: Stoneham, Land at Chestnut Ave, Eastleigh, SO50 9HS		Plant:	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 15-11-2018	Level:	Co-ords:	Logged By

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.10	DJ		0.10			TOPSOIL
	0.50	DJ					Dark brownish grey sandy very clayey GRAVEL. Gravel is fine to cobble sized sub-angular to sub-rounded brick, roadstone and concrete. MADE GROUND
	0.90	DJ		1.00			Orangish grey mottled silty very clayey GRAVEL. Gravel is sub-angular to sub-rounded medium to coarse flint. RIVER TERRACE DEPOSITS
				1.20			End of Pit at 1.200m

General Remarks:
No roots observed. No ground water observed.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **SL10**

Project Name: Stoneham	Project No.: 17270	Method:	Hole Type TP
Location: Stoneham, Land at Chestnut Ave, Eastleigh, SO50 9HS		Plant:	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 15-11-2018	Level:	Co-ords:	Logged By

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
							TOPSOIL
	0.20	DJ		0.20			Slightly orangish brown slightly clayey very sandy GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded flint. RIVER TERRACE DEPOSITS
	0.50	DJ					
	0.90	DJ					
				1.10			End of Pit at 1.100m

General Remarks:
No roots observed. No ground water observed.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **SL11**

Project Name: Stoneham	Project No.: 17270	Method:	Hole Type TP
Location: Stoneham, Land at Chestnut Ave, Eastleigh, SO50 9HS		Plant:	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 15-11-2018	Level:	Co-ords:	Logged By

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	D		0.30			TOPSOIL
	0.80	D		1.10			Slightly orangish brown sandy clayey GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded flint. Frequent rootlets to base. RIVER TERRACE DEPOSITS
							End of Pit at 1.100m

General Remarks:
Rootlets observed to 1.10m bgl. No ground water observed.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

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Trial Pit Log

Trial Pit No. **SL12**

Project Name: Stoneham	Project No.: 17270	Method:	Hole Type TP
Location: Stoneham, Land at Chestnut Ave, Eastleigh, SO50 9HS		Plant:	
		Support:	Scale 1:25
Client: Highwood Group	Trial Pit Length: m	Trial Pit Width: m	
Dates: 15-11-2018	Level:	Co-ords:	Logged By

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
							TOPSOIL
	0.20	DJ		0.20			Dark brown sandy clayey GRAVEL. Gravel is fine to coarse sub-angular to sub-rounded flint. Frequent rootlets. Occasional brick fragments from 0.60m bgl. RIVER TERRACE DEPOSITS
	0.50	DJ					
	0.90	DJ					
				1.20			End of Pit at 1.200m

General Remarks:
Rootlets observed to 1.20m bgl. No ground water observed.

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Classification based on SPT "N" values:

The inferred undrained strength of the cohesive soils was based on the SPT "N" blow counts, derived from the relationship suggested by Stroud (1974) and classified using Table B.1.1. (Ref: Stroud, M. A. 1974, "The Standard Penetration Test – its application and interpretation", Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).

Table B.1.1 SPT "N" Blow Count Cohesive Classification

Classification	Undrained Cohesive Strength C_u (kPa)
Extremely low	<10
Very low	10 – 20
Low	20 – 40
Medium	40 – 75
High	75 – 150
Very high	150 – 300
Extremely high	> 300

Note: (Ref: BS EN ISO 14688-2:2004+A1:2013 Clause 5.3.)

The relative density of granular soils was classified based of the relationship given in Table B.1.2.

The *UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing, NA 3.7 SPT test, BS EN 1997-2:2007, Annex F* states "Relative density descriptions on borehole records should also be based on uncorrected SPT N values, unless significantly disturbed, using the density classification in BS 5930:2015, Table 7.

Table B.1.2 SPT "N" Blow Count Granular Classification

Classification	SPT "N" blow count (blows/300mm)
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	Greater than 50

Note: (Ref: The Standard Penetration Test (SPT): Methods and Use, CIRIA Report 143, 1995)

Classification of DCP results to CBR:

The DCP consists of a cone fixed to the bottom of a 575mm vertical rod. An 8kg weight is repeatedly lifted and dropped onto an anvil at the mid-height of the rod to deliver a 'blow'. A vertical scale alongside the rod is used to measure the depth of penetration of the cone. These measurements are then converted to CBR values using the following equation derived from the DTP Interim Advice Note 73/06 – Design Guidance for Road Pavement Foundations:

$$Log_{10}(CBR) = 2.48 - 1.057 \times Log_{10}(mm/blow)$$

Appendix B.2 Interpretation

Table B.2.1 Interpretation of SPT Tests

BH	Strata	SPT N60 Blow Counts	Inferred Cohesive Strength
BH01	RTD 1.60 – 2.70 Sandy GRAVEL	13	Medium dense
	RTD 2.70 – 4.50 Sandy CLAY	18 – 23	High (Cu = 90 - 115kPa)
	LCF 2.70 – 10.90 Silty SAND	50+	Very dense
	LCF 10.90 – 11.20 Clayey SAND	21	Medium dense
	LCF 11.20 – 25.00 Sandy CLAY	50+	Very high (Cu = >250kPa)
BH02	RTD 1.00 – 4.00 Sandy GRAVEL	39 – 50+	Dense to very dense
	LCF 4.00 – 5.45 Sandy CLAY & SILT	18	High (Cu = 90kPa)
	LCF 5.45 – 12.90 Silty SAND	45 – 50+	Dense to very dense
	LCF 12.90 – 15.50 Sandy CLAY	50+	Very high (Cu = >250kPa)
BH03	RTD 0.60 – 2.40 SAND & GRAVEL	41 – 44	Dense
	LCF 2.40 – 9.60 Silty SAND	50+	Very dense
	LCF 9.60 – 15.00 Sandy CLAY	50+	Very high (Cu = >250kPa)
BH04	RTD 2.20 – 5.00 Clayey sandy GRAVEL	45 – 50+	Dense to very dense
	LCF 5.00 – 6.00 Silty SAND	50+	Very dense

Note: Rig energy ratio - 73%

Table B.2.2 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density
DP01	RTD 1.10 – 1.60 Sandy CLAY	8 – 11	Medium (Cu = 40 - 55kPa)
	RTD 1.60 – 2.60 Clayey GRAVEL	23 – 45	Medium dense to dense
	LCF[1] 2.60 – 6.00 Silty SAND	11 – 19	Medium dense
DP02	RTD 0.60 – 1.00 Gravelly CLAY	4	Low (Cu = 20kPa)
	RTD 1.00 – 2.00 Sandy GRAVEL	34 – 50+	Dense to very dense
	RTD[1] 2.00 – 5.50 Sandy CLAY	8 – 15	Medium (Cu = 40 - 75kPa)
	LCF[1] 5.50 – 6.00 Silty SAND	15 - 38	Medium dense to dense
DP03	RTD 1.00 – 1.40 Gravelly CLAY	15 – 27	High (Cu = 75 - 135kPa)
	RTD 1.40 – 2.80 Sandy CLAY	8 – 11	Medium (Cu = 40 - 55kPa)
	LCF[1] 2.80 – 6.00 Silty SAND	19 – 50+	Medium dense to very dense
DP04	RTD[1] 1.40 – 3.70 Gravelly SAND	26 – 50	Medium dense to dense
	RTD[1] 3.70 – 3.90 CLAY	4	Low (Cu = 20kPa)
	RTD[1] 3.70 – 5.80 SAND & GRAVEL	19 – 34	Medium dense to dense
DP05	RTD[1] 0.40 – 0.90 GRAVEL	50+	Very dense
DP06	RTD 070 – 1.50 GRAVEL	27 – 50+	Medium dense to very dense
	LCF[1] 1.50 – 2.30 SAND & GRAVEL	11 – 27	Medium dense

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density
	RTD[1] 2.30 – 4.30 Sandy CLAY	11 – 15	Medium (Cu = 55 - 75kPa)
	LCF 4.30 – 4.80 Silty SAND	30 – 50+	Dense to very dense
DP07	RTD 0.10 – 0.50 GRAVEL	11	Medium dense
	RTD 0.50 – 1.20 SAND	8	Loose
	LCF 1.20 – 2.10 Silty SAND	11 – 15	Medium dense
	LCF[1] 2.10 – 3.50 Silty SAND	30 – 50+	Dense to very dense
DP08	RTD 0.30 – 0.90 Clayey GRAVEL	19 – 23	Medium dense
	RTD 0.90 – 1.60 Gravelly SAND	23 – 34	Medium dense to dense
	LCF 1.60 – 3.60 Silty SAND	19 – 34	Medium dense to dense
	LCF[1] 3.60 – 6.00 Sandy CLAY	34 – 50+	Dense to very dense
DP09	RTD 1.00 – 1.70 Clayey GRAVEL	46 – 50+	Dense to very dense
	RTD 1.70 – 2.10 Clayey SAND	19 – 23	Medium dense
	LCF[1] 2.10 – 3.70 Silty SAND	15 – 23	Medium dense
	LCF[1] 3.70 – 4.70 Silty SAND	38 – 50+	Dense to very dense
DP10	RTD 0.20 – 1.80 Clayey GRAVEL	49 – 50+	Dense to very dense
	LCF[1] 1.80 – 3.80 Silty SAND	11 – 19	Medium dense

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density
	RTD[1] 3.80 – 4.60 Silty SAND	8	Loose
	LCF[1] 4.60 – 5.40 Silty SAND	11 – 15	Medium dense
	LCF[1] 5.40 – 6.00 Silty SAND	41	Dense
DP11	RTD 0.70 – 1.20 CLAY	<1	Very low (Cu = <10kPa)
	RTD 1.20 – 1.70 Clayey GRAVEL	15 – 27	Medium dense
	RTD 1.70 – 2.90 Sandy CLAY	8 – 11	Medium (Cu = 40 - 55kPa)
	LCF[1] 2.90 – 6.00 Silty SAND	15 – 50+	Medium dense to very dense

Note: [1] Ground conditions inferred past the base of windowless sampler boreholes. Rig energy ratios presented within DPSH logs.

Table B.2.3 Interpretation of QUU Tests

Location	Stratum	Sample Depth (m bgl)	Moisture Content (%)	Soil Strength	Shear Strength (kPa)
BH02	LCF	14.50	23	High to very high	134 – 203
BH03	LCF	10.90	23	High to very high	144 – 155

Table B.2.4 Interpretation of CU Tests

Location	Strata	Sample Depth (m bgl)	Initial Cell Pressure (kPa)	Initial Pore Pressure (kPa)	Principal Minor Effective Stress (kPa)	Principal Major Effective Stress (kPa)
BH01	LCF	12.50	400	150	241	900
			500	150	297	1135
			600	150	344	1313
BH01	LCF	15.50	400	90	304	1153
			500	90	387	1470
			600	90	404	1562

Table B.2.5 Interpretation of Atterberg Limit Tests

Stratum	Moisture Content (%)	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Soil Classification	Volume Change Potential	
						BRE	NHBC
RTD	4 - 33	9 - 46	55 - 100	9 - 30	CL-CH	Low to medium	Low to medium
LCF	11 - 25	6 - 32	80 - 100	6 - 32	ML-CI	Low to medium	Low to medium

Note: BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)
NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2
Soils Classification based on British Soil Classification System
The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240. The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 µm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 µm and some particles, 'rock flour' for example, can be finer than 2 µm but are not clay minerals.
(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Clauses 3.2, 4.3 and 5)

Table B.2.6 Interpretation of PSD Tests

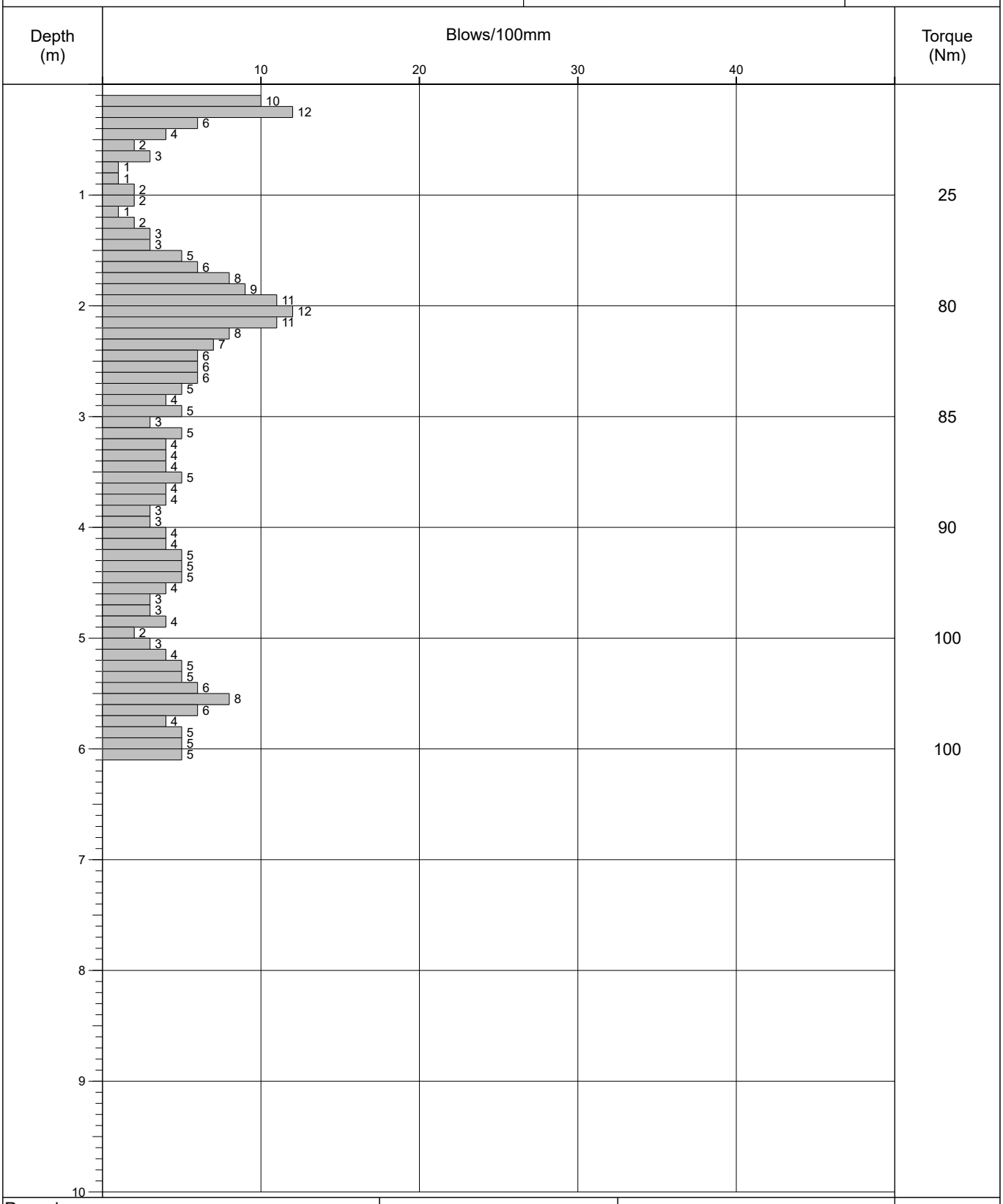
Location	Depth (m bgl)	Strata	Soil Description	Volume Change Potential		Passing 63µm Sieve (%)
				BRE	NHBC	
BH01	2.00-2.50	RTD	Slightly silty sandy GRAVEL	No	No	1
BH01	11.00-11.50	LCF	Slightly gravelly silty SAND	Yes	No	20
BH02	1.20-1.70	RTD	Sandy GRAVEL	No	No	0
BH02	6.50-7.00	LCF	Sandy clayey SILT	Yes	Yes	60
BH02	8.50-9.00	LCF	Slightly gravelly sandy clayey SILT	Yes	Yes	37
BH03	0.60-1.00	RTD	Very silty very sandy GRAVEL	Yes	No	24
BH03	6.50-7.00	LCF	Silty fine to medium SAND	No	No	6
BH04	3.00-3.50	RTD	Very sandy very silty GRAVEL	Yes	No	24
WS09	1.00	RTD	Very sandy silty GRAVEL	No	No	5
WS10	2.00	LCF	Very silty fine to medium SAND	Yes	No	26

Note: BRE 240 states that a soil has a volume change potential when the clay fraction **exceeds 15%**. Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve.
NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63µm sieve is greater than 35% and the Plasticity Index is greater than 10%.
(The Particle Size Distribution Tests were undertaken in accordance with BS 1377: Part 2: 1990 Clause 9)

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk		**Probe Log**	Probe No. **DP01** Sheet 1 of 1

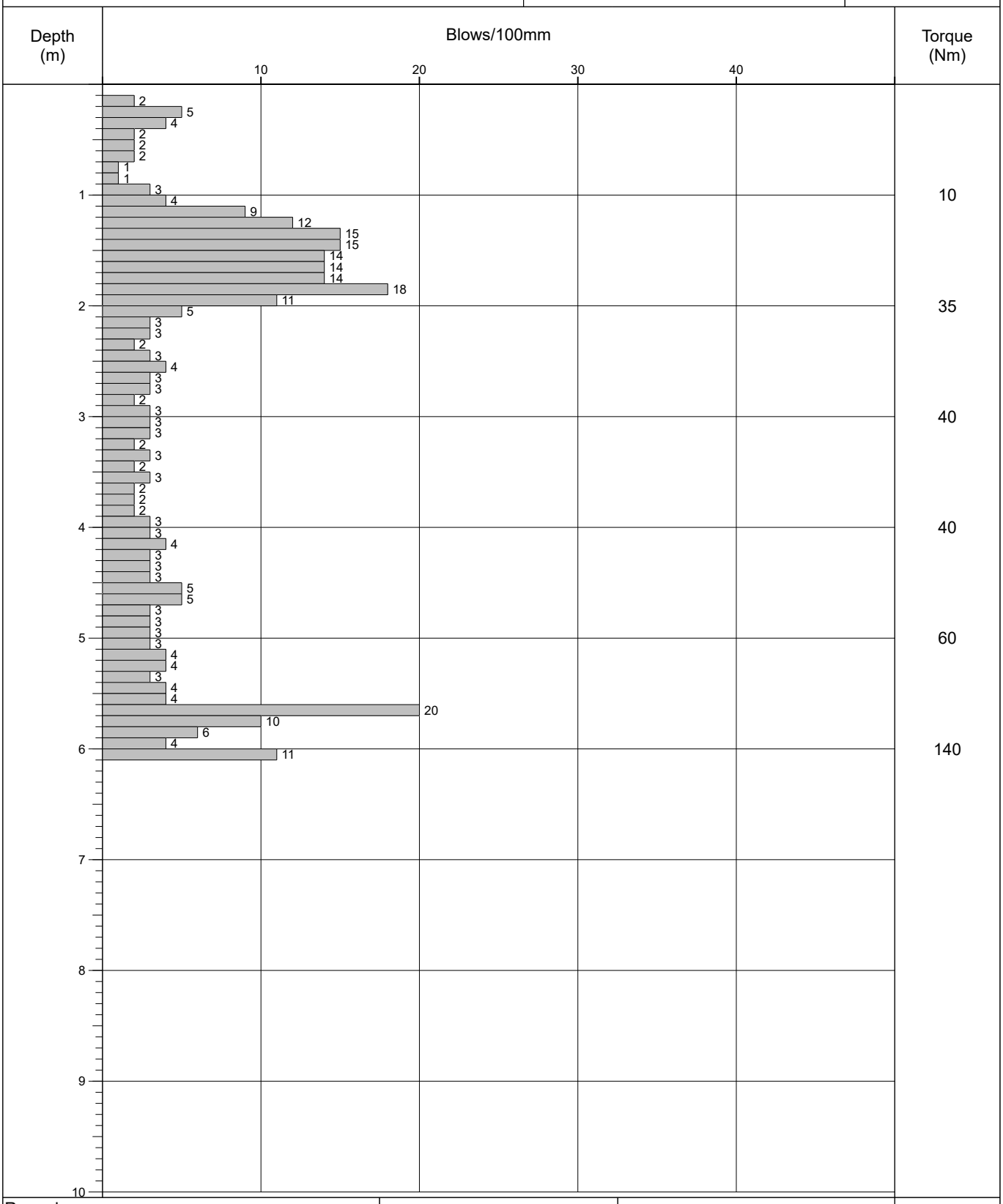
Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443854.30E - 117538.92N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	21.38m AOD	Scale 1:50
Client:	Highwood Group		Dates:	23-04-2019	Logged By



Remarks	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	6m
	Probe Type	DPSH-B	Energy Ratio (Er)	78.58%

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk	Probe Log	Probe No. **DP02** Sheet 1 of 1

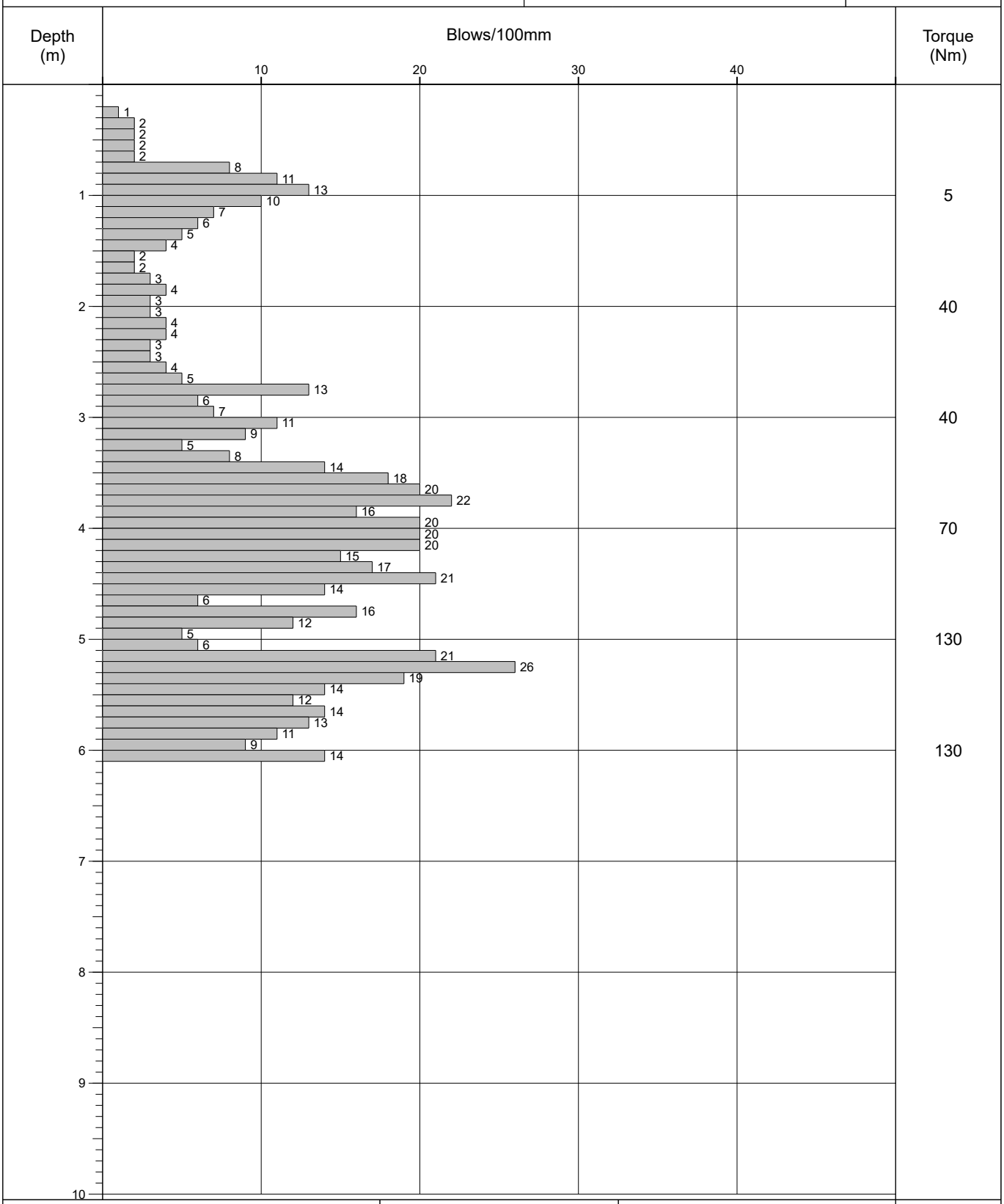
Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443824.00E - 117531.27N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	21.9m AOD	Scale 1:50
Client:	Highwood Group		Dates:	30-04-2019	Logged By



Remarks				
	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	6m
	Probe Type	DPSH-B	Energy Ratio (Er)	79.93%

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk		**Probe Log**	Probe No. **DP03** Sheet 1 of 1

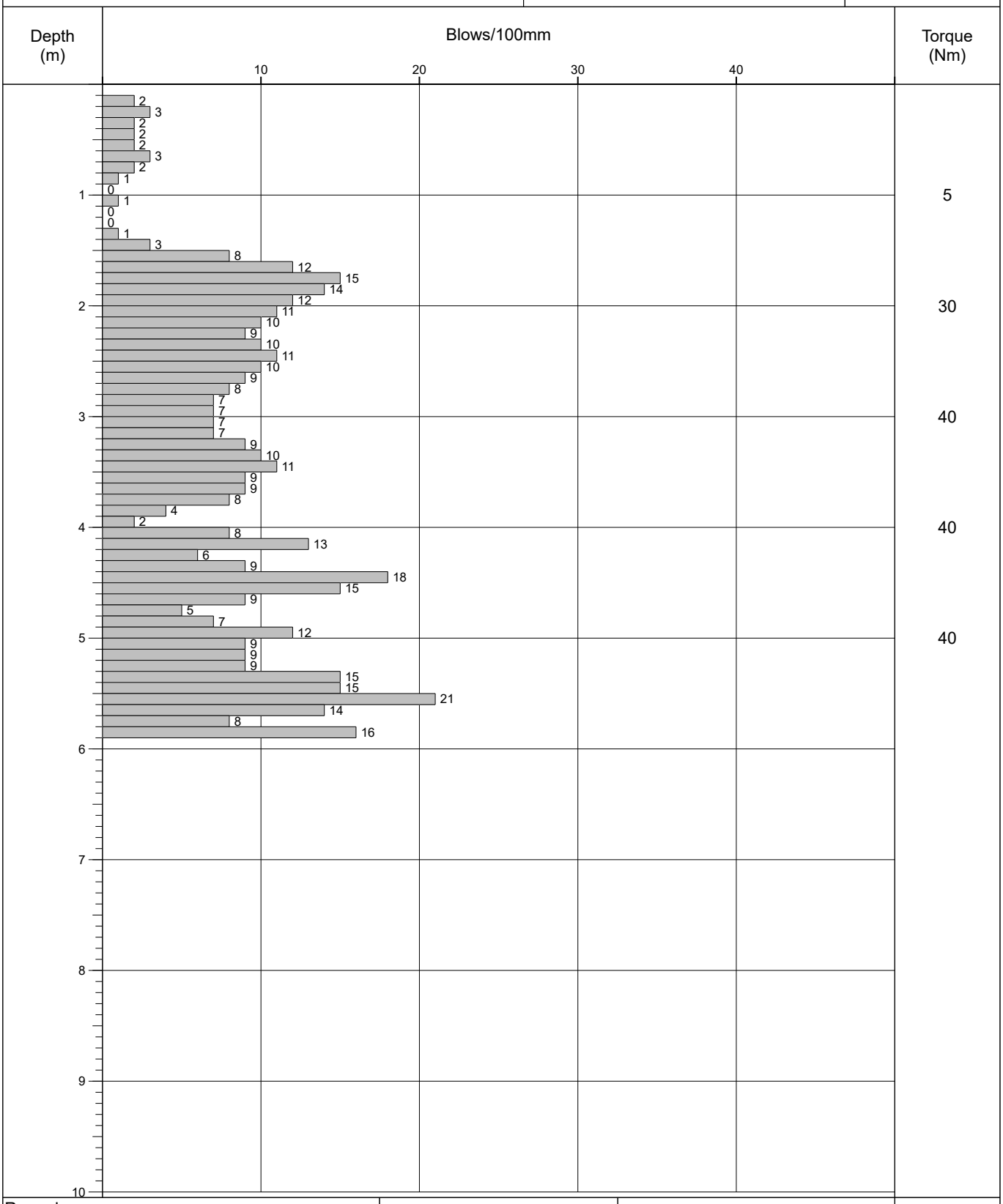
Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443846.87E - 117485.75N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	20.6m AOD	Scale 1:50
Client:	Highwood Group		Dates:	30-04-2019	Logged By



Remarks	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	6m
	Probe Type	DPSH-B	Energy Ratio (Er)	79.93%

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk	**Probe Log**	Probe No. **DP04** Sheet 1 of 1

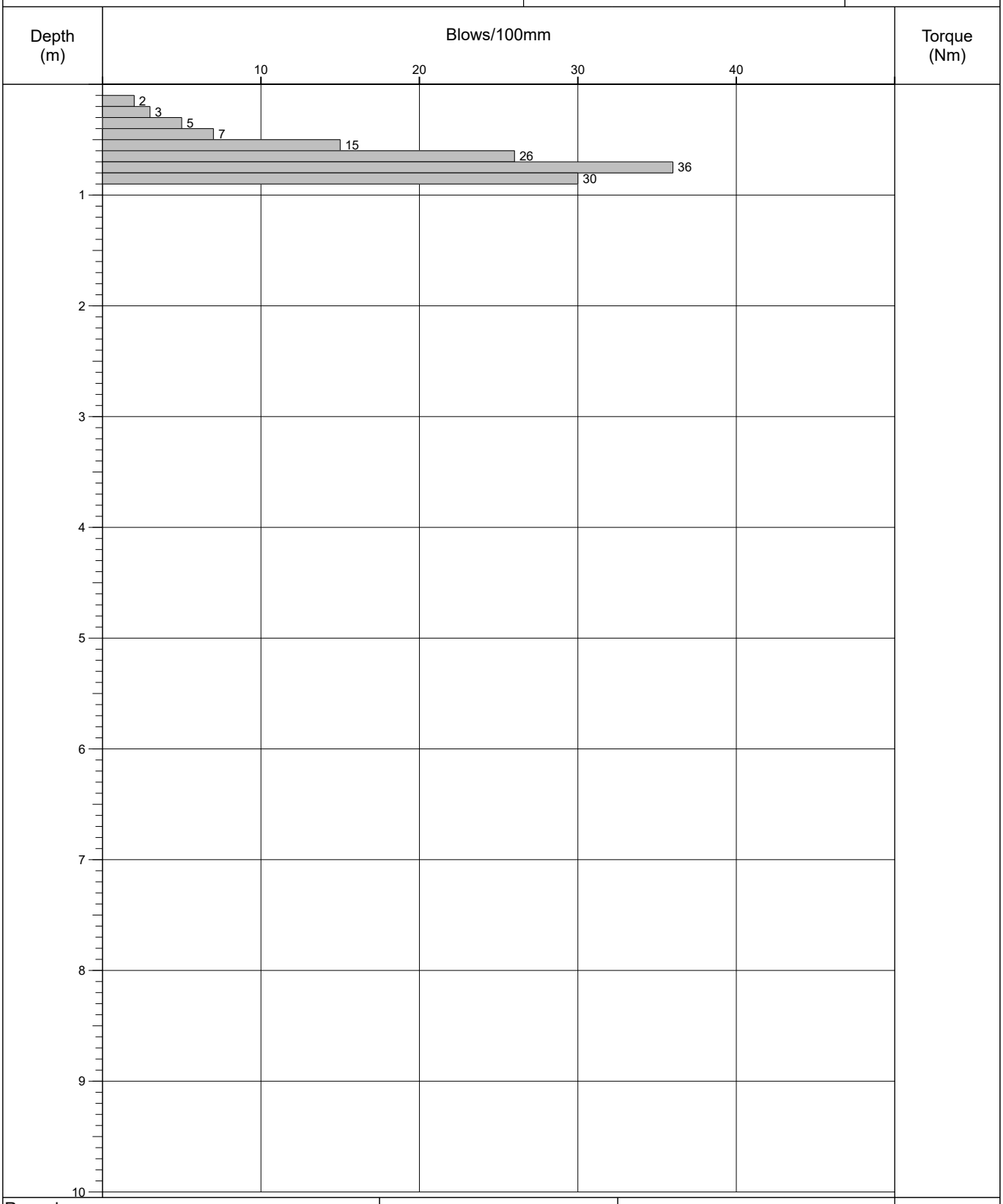
Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443879.60E - 117495.27N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	19.37m AOD	Scale 1:50
Client:	Highwood Group		Dates:	23-04-2019	Logged By



Remarks				
	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	5.8m
	Probe Type	DPSH-B	Energy Ratio (Er)	78.58%

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk		**Probe Log**	Probe No. **DP05** Sheet 1 of 1

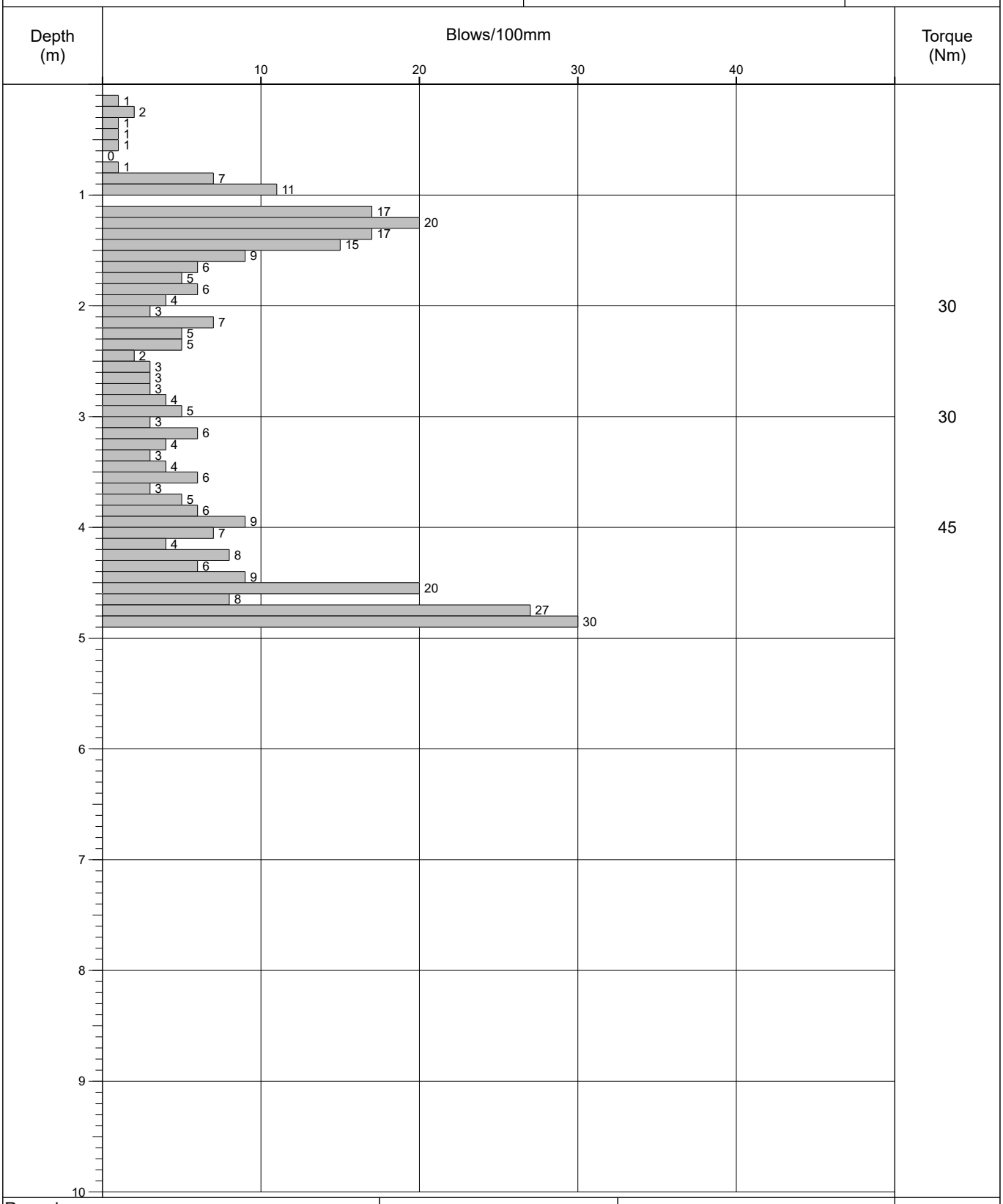
Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443918.64E - 117525.82N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	19.89m AOD	Scale 1:50
Client:	Highwood Group		Dates:	30-04-2019	Logged By



Remarks	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	0.8m
	Probe Type	DPSH-B	Energy Ratio (Er)	79.93%

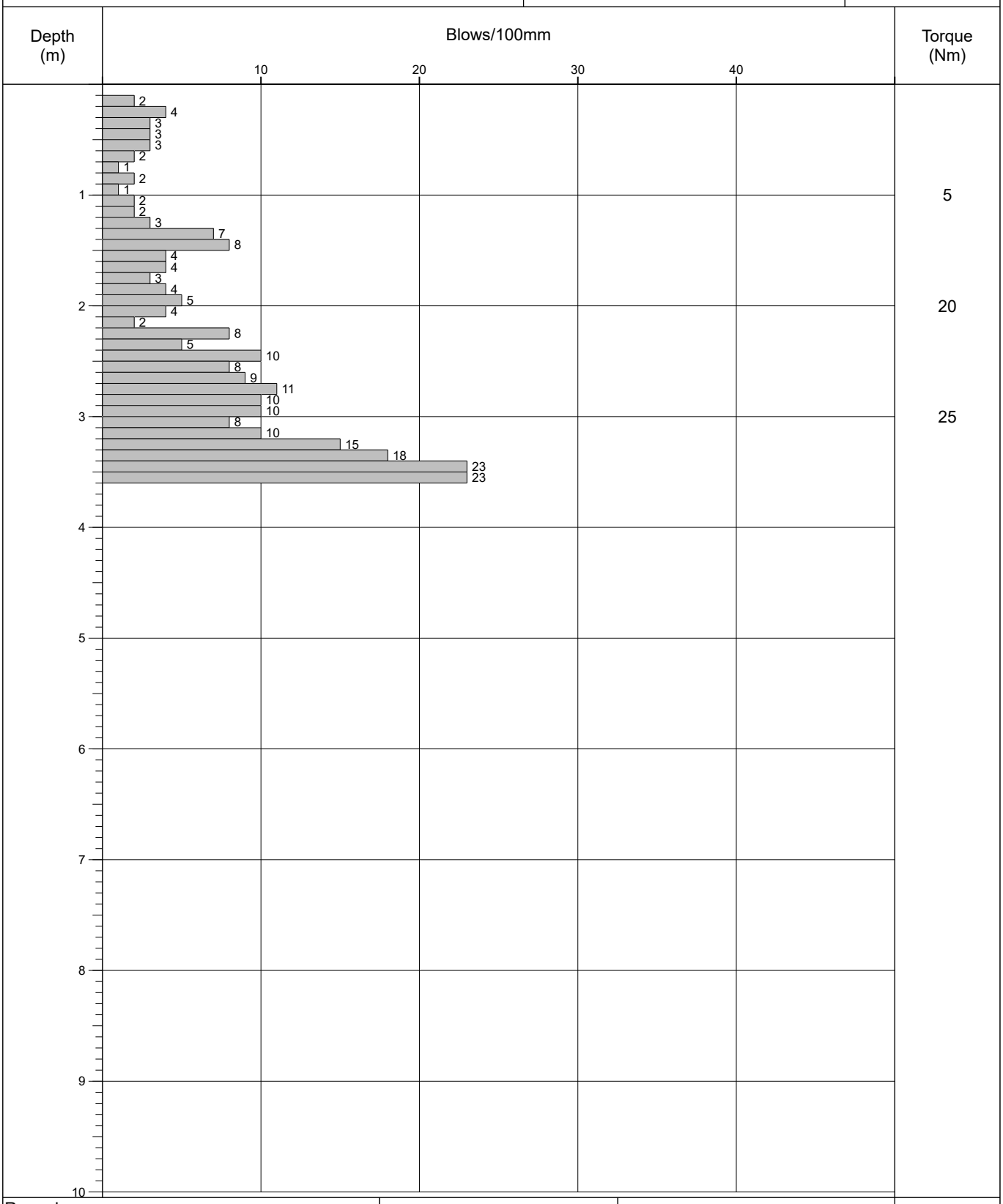
Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk	Probe Log	Probe No. **DP06** Sheet 1 of 1

Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443914.25E - 117462.52N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	18.55m AOD	Scale 1:50
Client:	Highwood Group		Dates:	01-05-2019	Logged By



Remarks				
	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	4.8m
	Probe Type	DPSH-B	Energy Ratio (Er)	79.93%

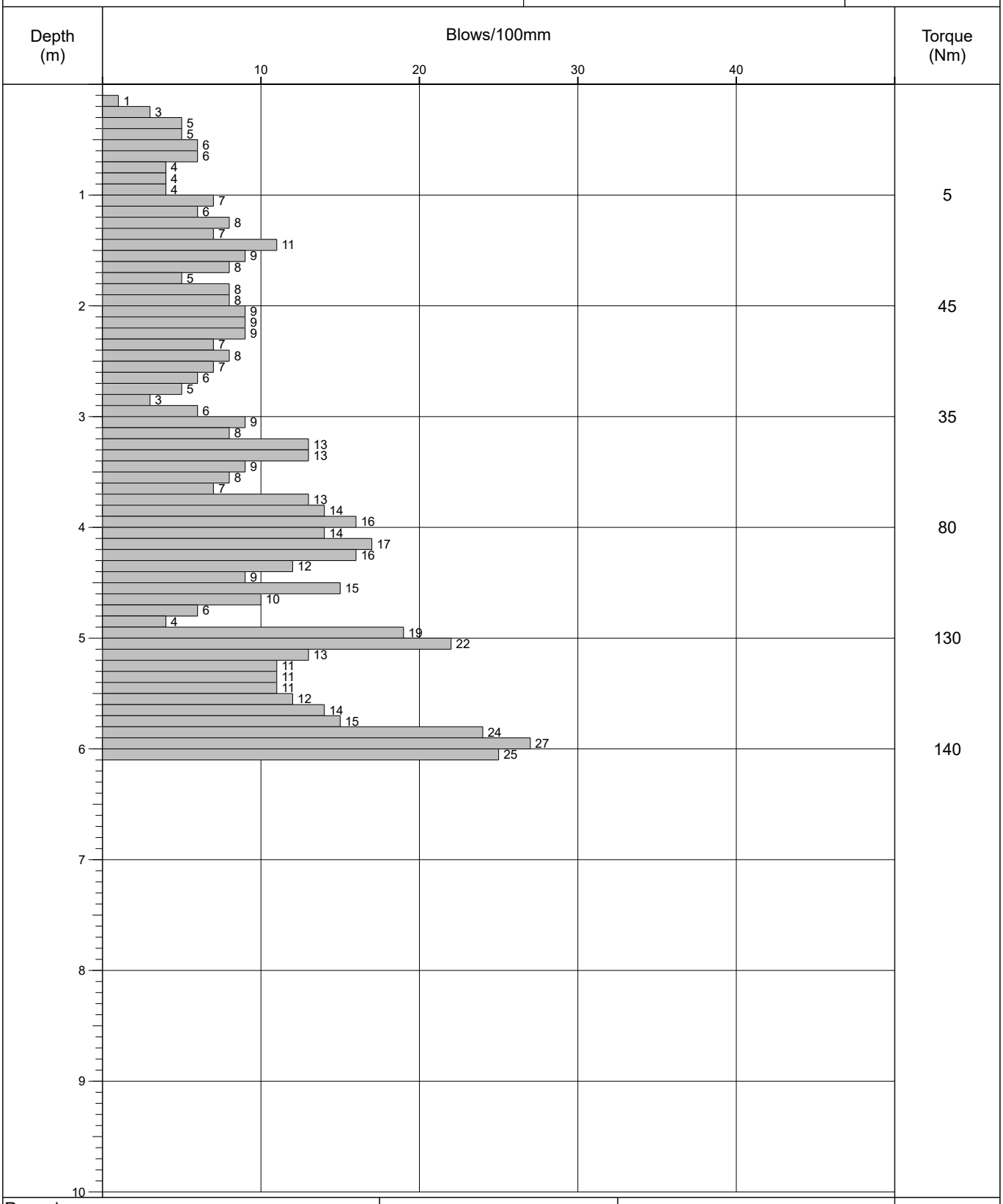
Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk		**Probe Log**	Probe No. **DP07** Sheet 1 of 1
Project Name: Stoneham CCRC	Project No. 17624	Co-ords: 443878.75E - 117401.00N	Hole Type DP
Location: Stoneham, Hampshire		Level: 18.49m AOD	Scale 1:50
Client: Highwood Group		Dates: 03-05-2019	Logged By



Remarks	Fall Height 750mm	Cone Base Diameter 50mm	AGS
	Hammer Weight 63.5kg	Final Depth 3.5m	
	Probe Type DPSH-B	Energy Ratio (Er) 78.58%	

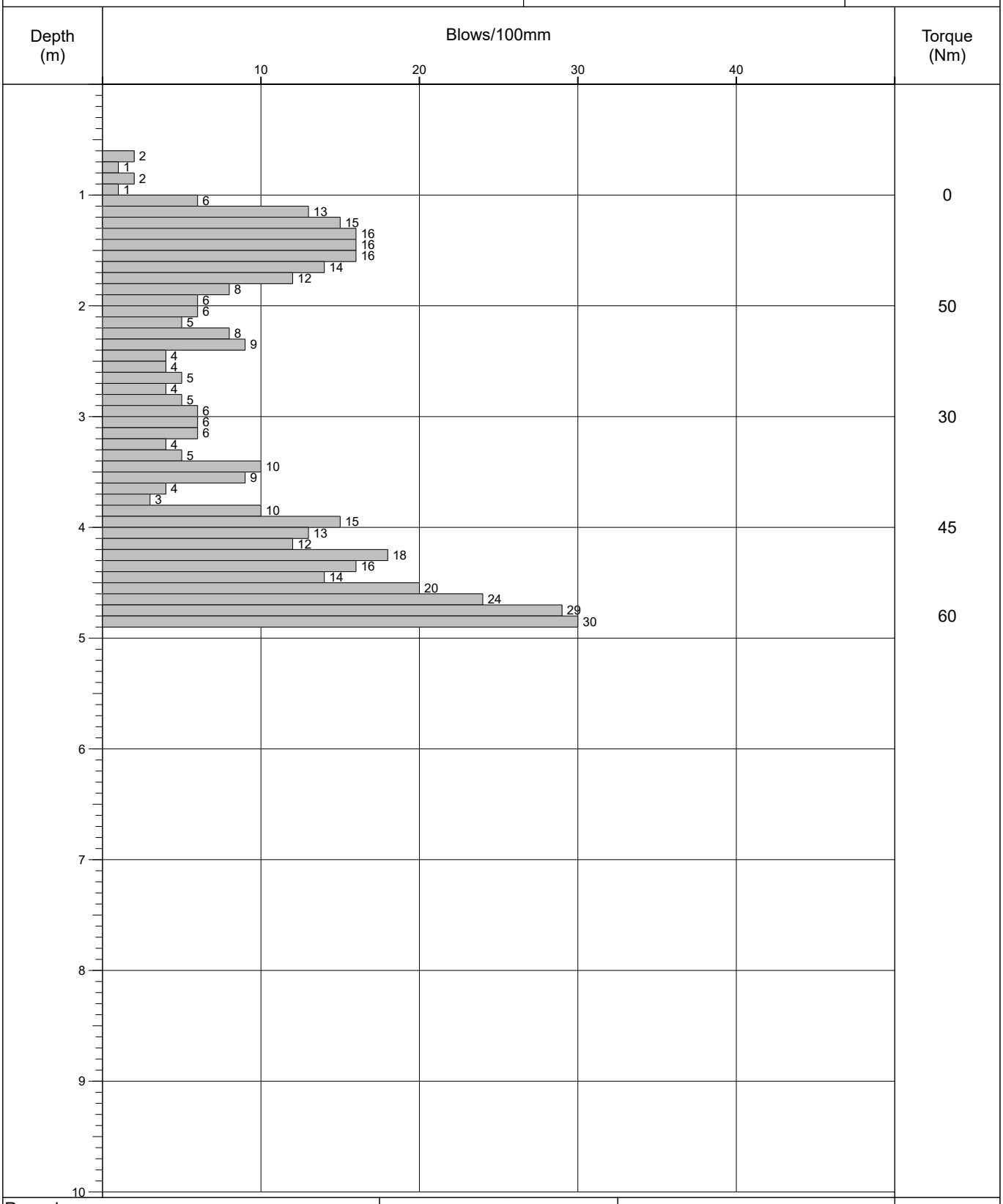
Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk	Probe Log	Probe No. **DP08** Sheet 1 of 1

Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	444015.41E - 117411.36N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	13.47m AOD	Scale 1:50
Client:	Highwood Group		Dates:	01-05-2019	Logged By



Remarks				
	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	6m
	Probe Type	DPSH-B	Energy Ratio (Er)	79.93%

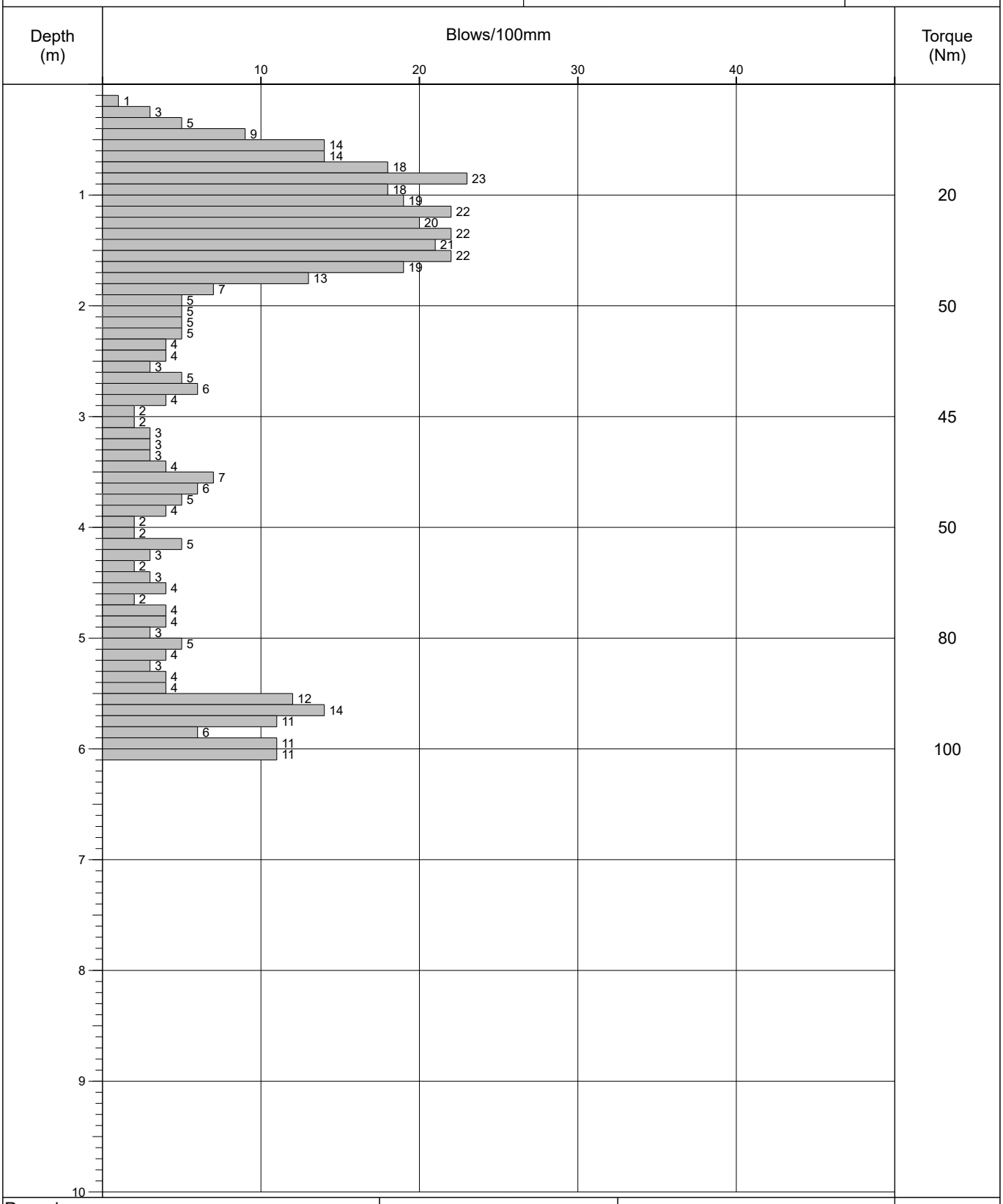
Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk				Probe Log	Probe No. **DP09** Sheet 1 of 1
Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443959.41E - 117510.49N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	18.38m AOD	Scale 1:50
Client:	Highwood Group		Dates:	01-05-2019	Logged By



Remarks				
	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	4.7m
	Probe Type	DPSH-B	Energy Ratio (Er)	79.93%

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk				Probe No. **DP10** Sheet 1 of 1
Project Name:	Stoneham CCRC	Project No. 17624	Co-ords: 443910.02E - 117507.19N	Hole Type DP
Location:	Stoneham, Hampshire		Level: 19.11m AOD	Scale 1:50
Client:	Highwood Group		Dates: 23-04-2019	Logged By

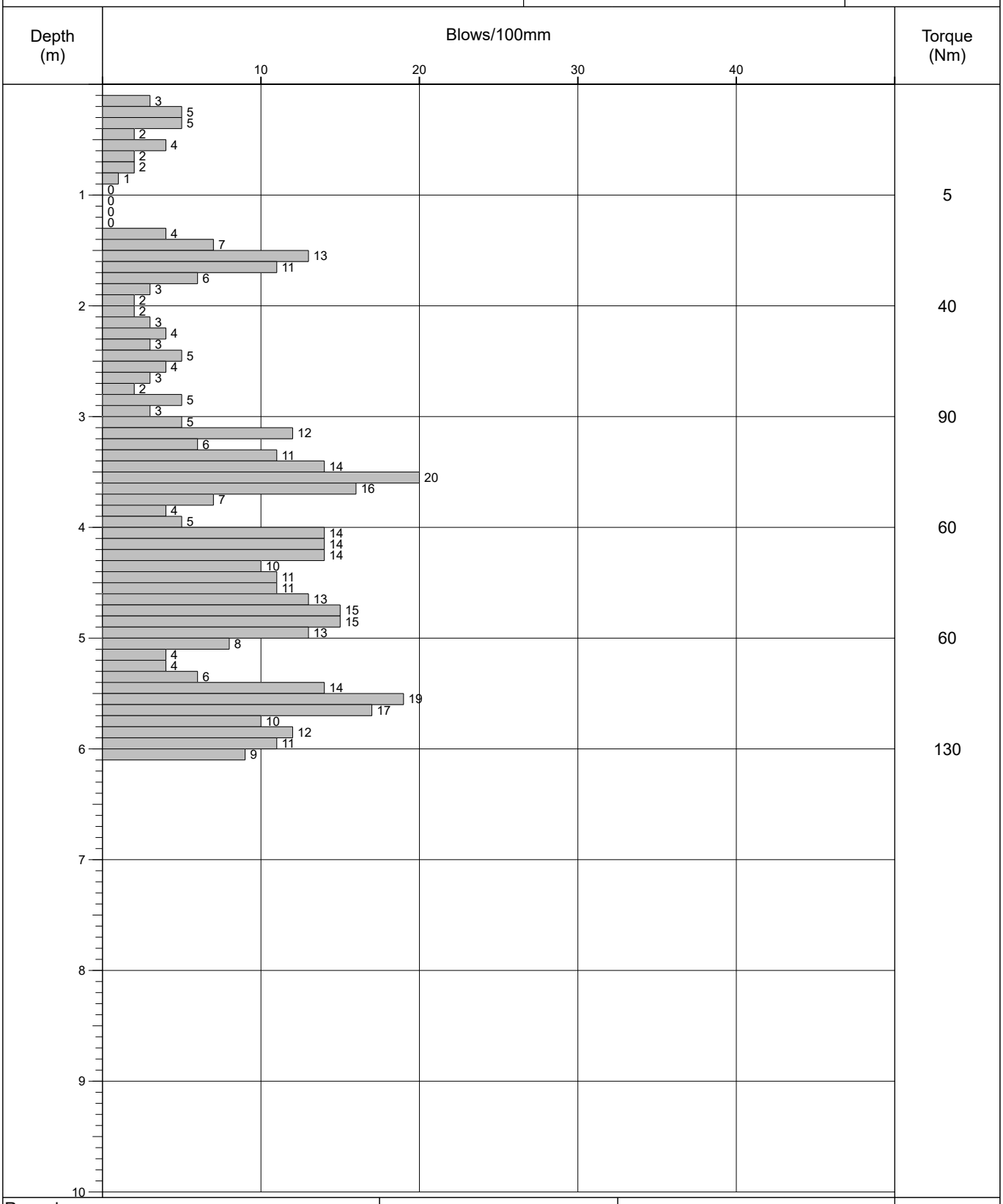
Probe Log



Remarks	Fall Height 750mm	Cone Base Diameter 50mm	AGS
	Hammer Weight 63.5kg	Final Depth 6m	
	Probe Type DPSH-B	Energy Ratio (Er) 78.58%	

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk		**Probe Log**	Probe No. **DP11** Sheet 1 of 1

Project Name:	Stoneham CCRC	Project No. 17624	Co-ords:	443818.79E - 117504.10N	Hole Type DP
Location:	Stoneham, Hampshire		Level:	21.51m AOD	Scale 1:50
Client:	Highwood Group		Dates:	30-04-2019	Logged By



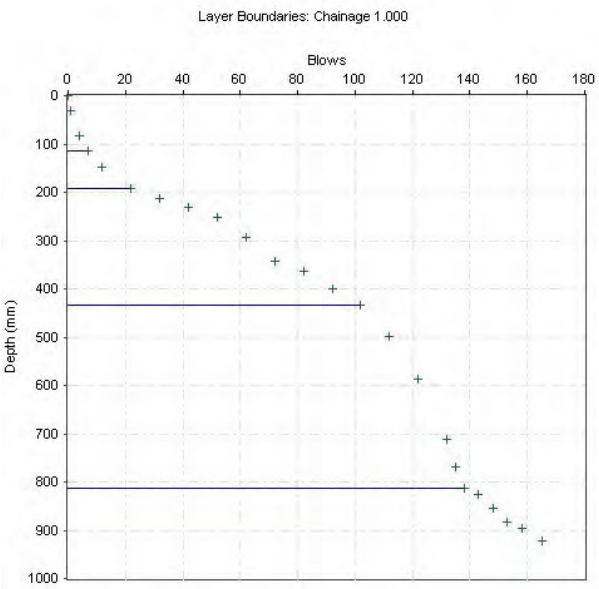
Remarks	Fall Height	750mm	Cone Base Diameter	50mm
	Hammer Weight	63.5kg	Final Depth	6m
	Probe Type	DPSH-B	Energy Ratio (Er)	79.93%

UK DCP V3.1

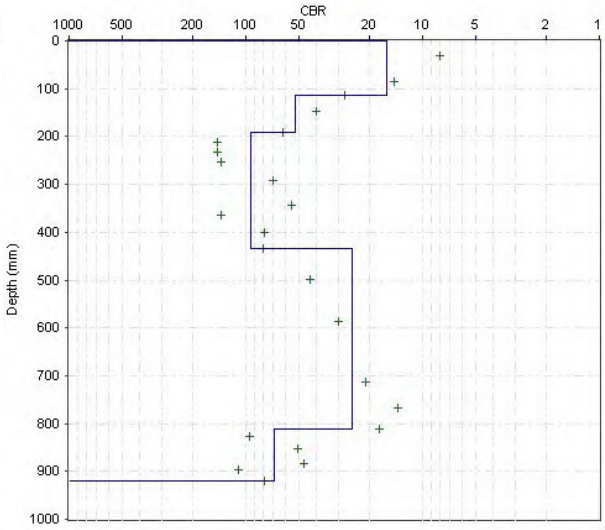
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	1.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	29	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	16.14	16	113	113	Base	0.04	0.19	0.19	0.19
2	5.27	52	79	192	Base	0.10	0.33	0.33	0.33
3	3.04	93	243	435	Base	0.14	1.30	1.30	1.30
4	10.47	25	377	812	Base	0.06	0.91	0.91	0.91
5	4.04	69	109	921	Base	0.12	0.52	0.52	0.52

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	3.25	3.25	3.25
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	3.25	3.25	3.25

CBR Relationship:

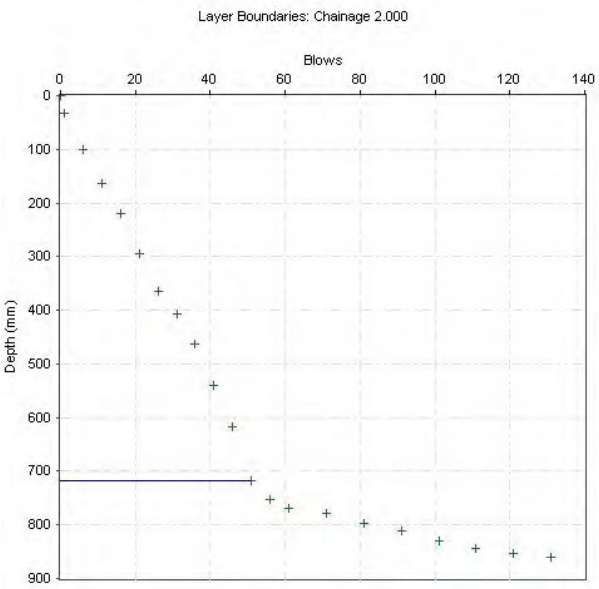
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

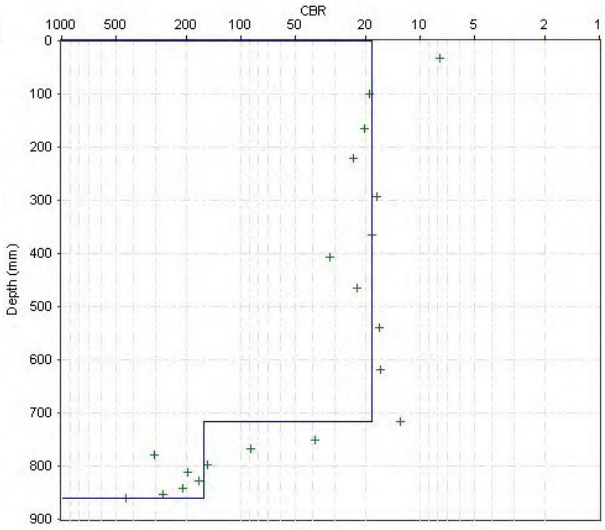
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	2.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	33	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	14.06	18	717	717	Base	0.05	1.34	1.34	1.34
2	1.80	162	144	861	Base	0.14	0.82	0.82	0.82

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	2.15	2.15	2.15
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	2.15	2.15	2.15

CBR Relationship:

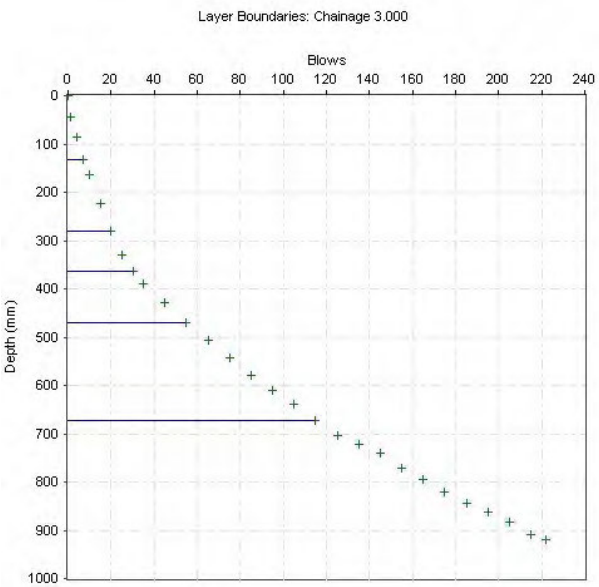
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

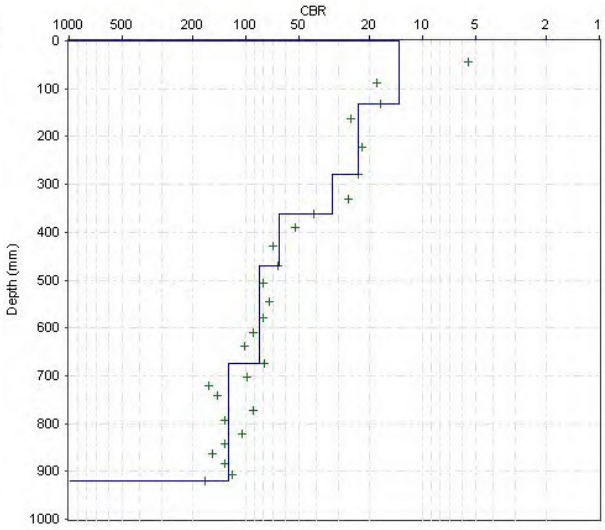
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	3.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	30	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	18.86	14	132	132	Base	0.04	0.19	0.19	0.19
2	11.38	23	148	280	Base	0.06	0.33	0.33	0.33
3	8.30	32	83	363	Base	0.07	0.24	0.24	0.24
4	4.32	64	108	471	Base	0.12	0.50	0.50	0.50
5	3.38	83	203	674	Base	0.13	1.05	1.05	1.05
6	2.30	125	246	920	Base	0.14	1.39	1.39	1.39

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	3.70	3.70	3.70
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	3.70	3.70	3.70

CBR Relationship:

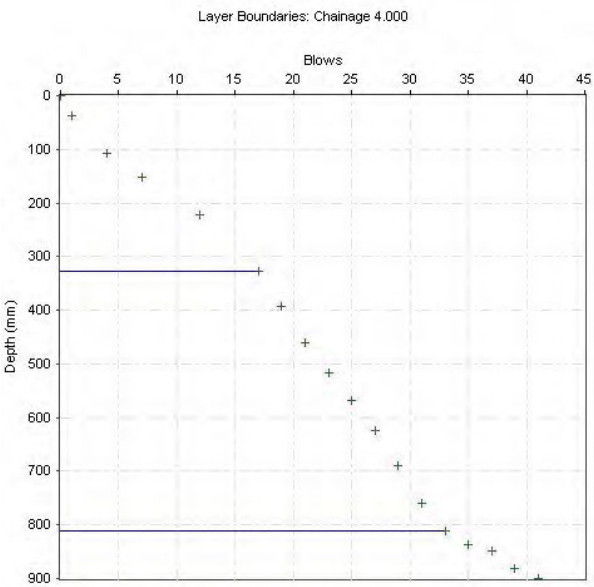
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

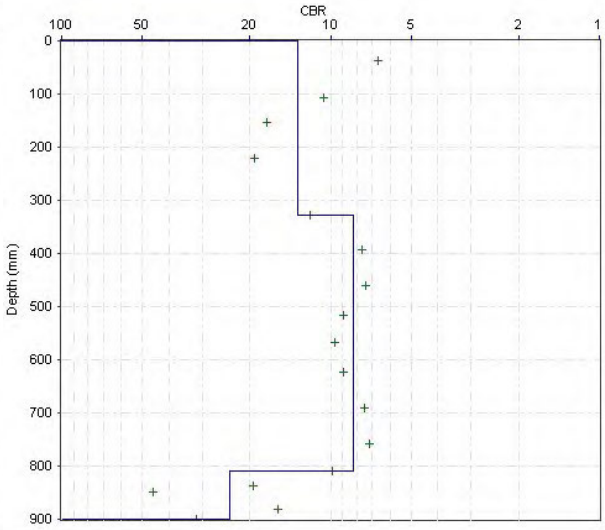
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	4.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	51	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	19.29	13	328	328	Base	0.04	0.45	0.45	0.45
2	30.13	8	482	810	Base	0.02	0.43	0.43	0.43
3	11.13	24	89	899	Base	0.06	0.20	0.20	0.20

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	1.09	1.09	1.09
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	1.09	1.09	1.09

CBR Relationship:

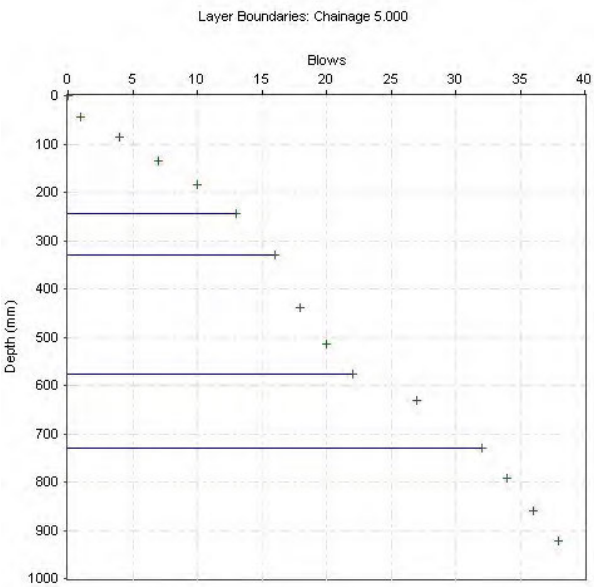
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

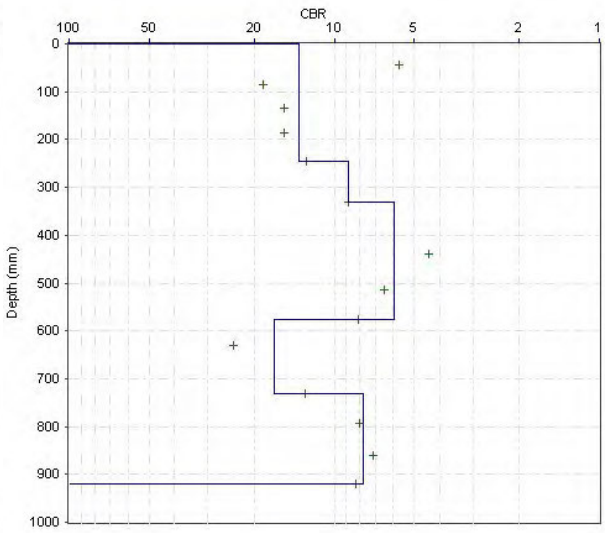
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	5.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	29	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	18.85	14	245	245	Base	0.04	0.35	0.35	0.35
2	28.33	9	85	330	Base	0.02	0.08	0.08	0.08
3	41.00	6	246	576	Base	0.02	0.16	0.16	0.16
4	15.40	17	154	730	Base	0.04	0.26	0.26	0.26
5	31.83	8	191	921	Base	0.02	0.16	0.16	0.16

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	1.02	1.02	1.02
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	1.02	1.02	1.02

CBR Relationship:

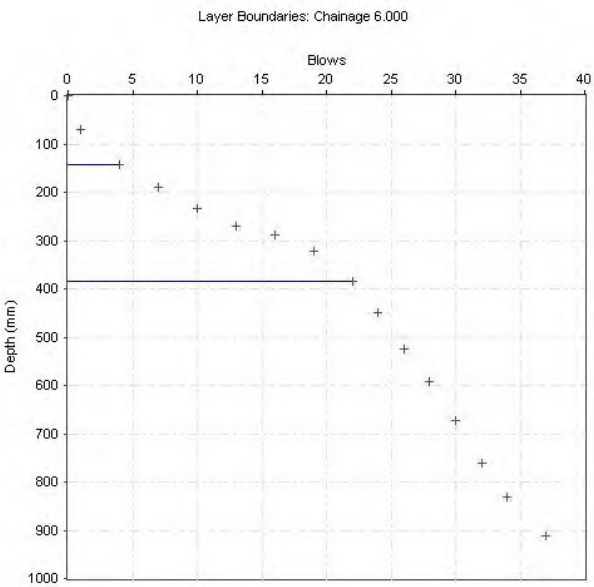
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

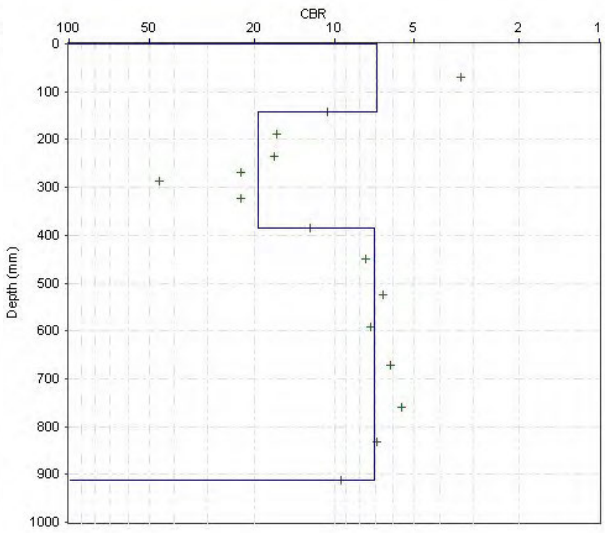
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	6.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	39	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	35.50	7	142	142	Base	0.02	0.11	0.11	0.11
2	13.50	19	243	385	Base	0.05	0.47	0.47	0.47
3	35.07	7	526	911	Base	0.02	0.40	0.40	0.40

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	0.98	0.98	0.98
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	0.98	0.98	0.98

CBR Relationship:

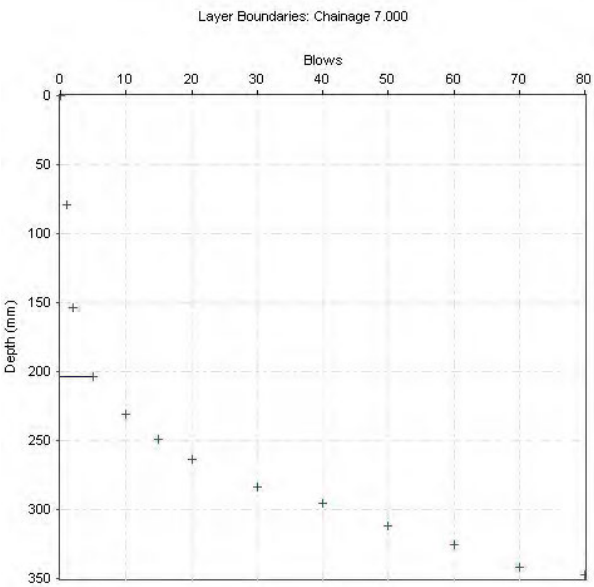
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

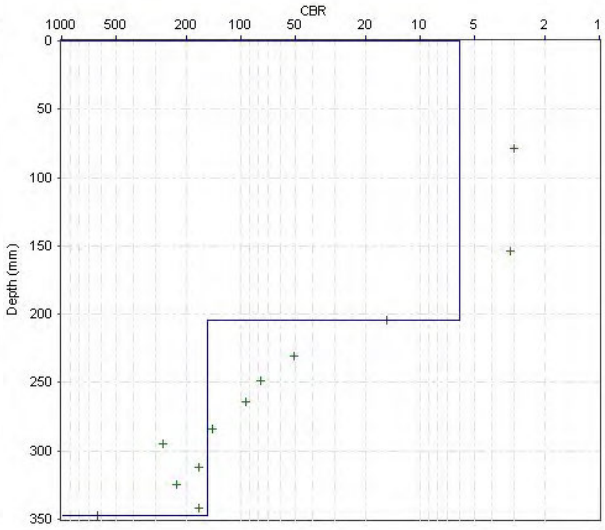
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	7.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	32	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	40.80	6	204	204	Base	0.02	0.13	0.13	0.13
2	1.91	153	143	347	Base	0.14	0.81	0.81	0.81

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	0.95	0.95	0.95
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	0.95	0.95	0.95

CBR Relationship:

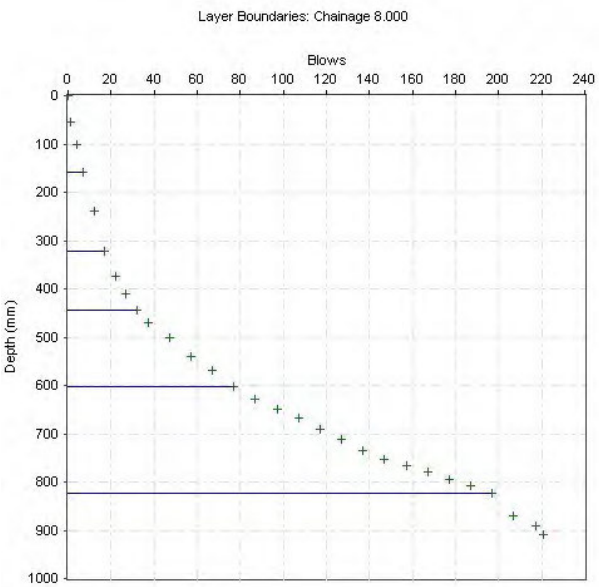
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

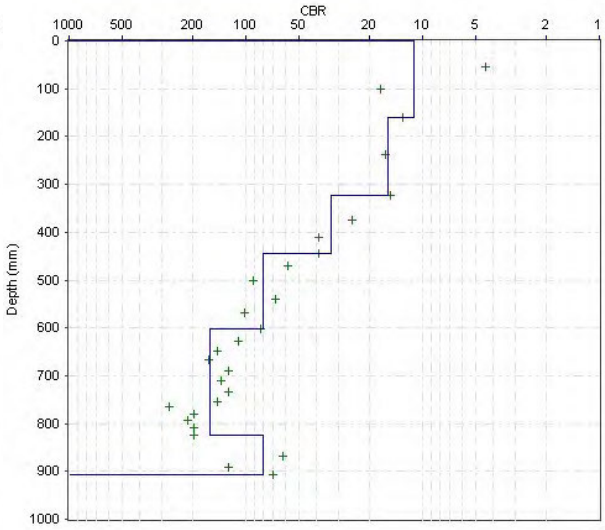
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	8.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	42	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	22.71	11	159	159	Base	0.03	0.19	0.19	0.19
2	16.30	16	163	322	Base	0.04	0.26	0.26	0.26
3	8.20	33	123	445	Base	0.08	0.37	0.37	0.37
4	3.51	80	158	603	Base	0.13	0.81	0.81	0.81
5	1.84	158	221	824	Base	0.14	1.25	1.25	1.25
6	3.50	80	84	908	Base	0.13	0.43	0.43	0.43

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	3.31	3.31	3.31
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	3.31	3.31	3.31

CBR Relationship:

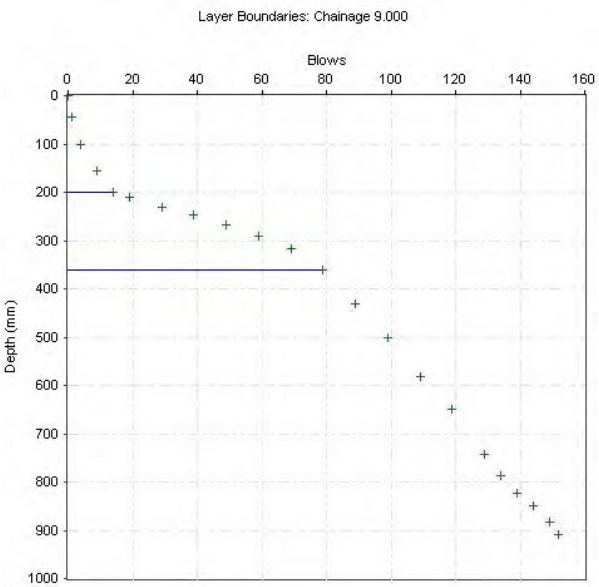
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

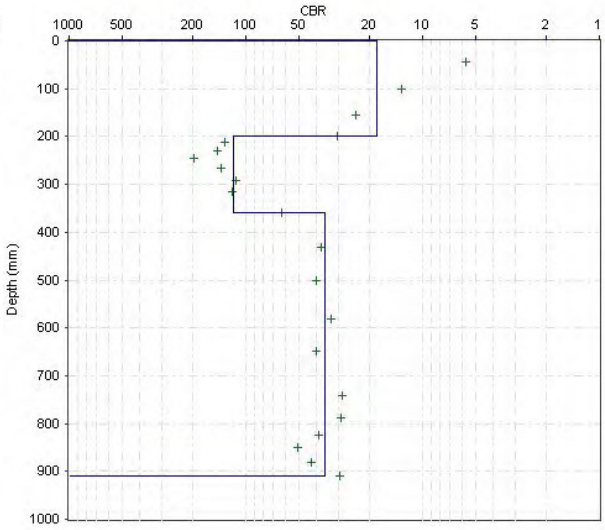
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	9.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	41	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	14.29	18	200	200	Base	0.05	0.37	0.37	0.37
2	2.46	117	160	360	Base	0.14	0.90	0.90	0.90
3	7.52	36	549	909	Base	0.08	1.75	1.75	1.75

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	3.02	3.02	3.02
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	3.02	3.02	3.02

CBR Relationship:

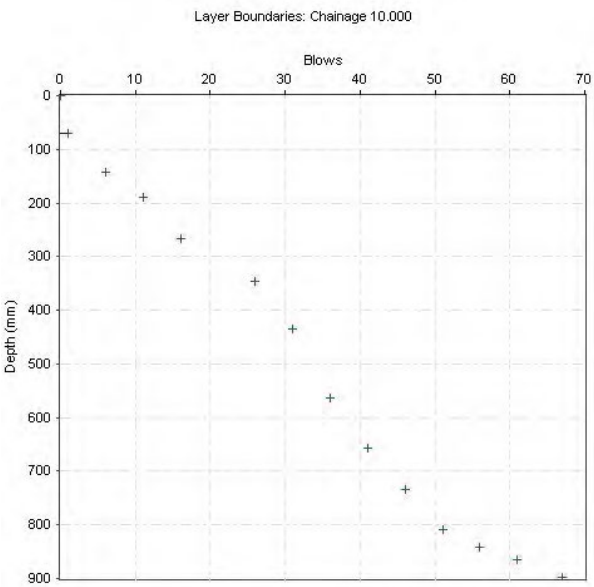
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

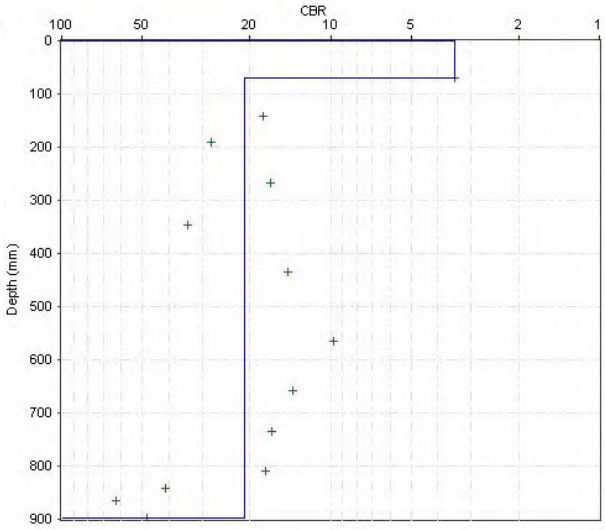
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	10.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	52	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	69.00	3	69	69	Base	0.01	0.03	0.03	0.03
2	12.56	21	829	898	Base	0.05	1.71	1.71	1.71

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	1.74	1.74	1.74
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	1.74	1.74	1.74

CBR Relationship:

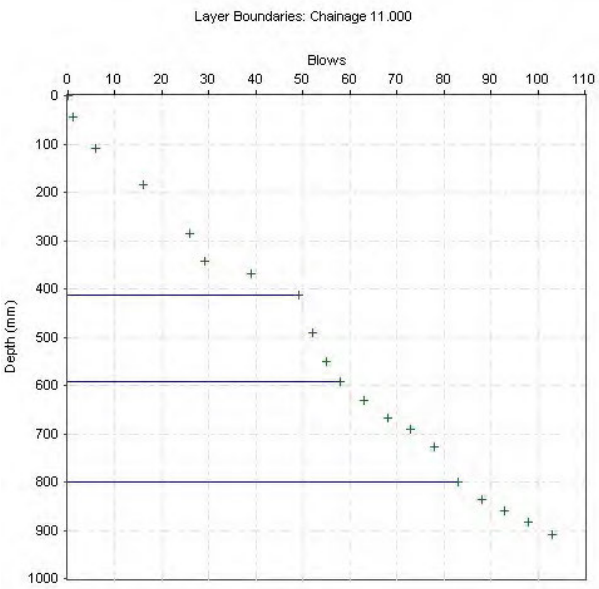
TRL equation: $\log_{10}(CBR) = 2.48 - 1.057 \times \log_{10}(Strength)$

Report produced by .....

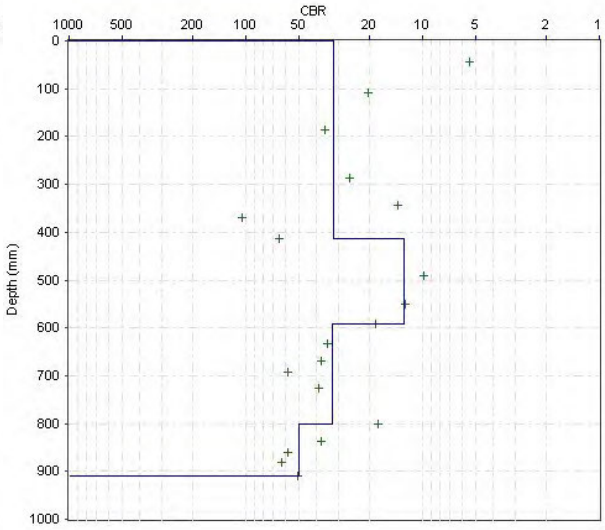
DCP Layer Strength Analysis Report

Project Name: 17624 DCPs

Chainage (km):	11.000	Surface Type:	Unpaved
Direction:		Thickness (mm):	0
Location/Offset:	Carriageway	Base Type:	
Cone Angle:	60 degrees	Thickness (mm):	
Zero Error (mm):	41	Surface Moisture:	Unknown
Test Date:	09/05/2019	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)	Position	Strength Coefficient	SN	SNC	SNP
1	8.43	32	413	413	Base	0.07	1.20	1.20	1.20
2	20.00	13	180	593	Base	0.03	0.24	0.24	0.24
3	8.28	32	207	800	Base	0.08	0.61	0.61	0.61
4	5.45	50	109	909	Base	0.10	0.44	0.44	0.44

Pavement Strength

	Layer Contribution		
Layer	**SN**	**SNC**	**SNP**
Surface	--	--	--
Base	2.49	2.49	2.49
Sub-Base	--	--	--
Subgrade	--	--	--
Pavement Strength	2.49	2.49	2.49

CBR Relationship:

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

Report produced by .....

Laboratory Report

GEO Site & Testing Services Ltd

Contract Number: 44273

Client Ref: **17624**
Client PO:

Report Date: **14-06-2019**

Client **Soils Limited**
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

Contract Title: **Stoneham CCRC**
For the attention of: **Tim Rudkin**

Date Received: **17-05-2019**
Date Commenced: **17-05-2019**
Date Completed: **14-06-2019**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	20
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	20
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	10
PSD: Sedimentation by pipette carried out with Wet Sieve (Wet Sieve must also be selected) BS 1377:1990 - Part 2 : 9.4 - * UKAS	3
Measurement of Swelling (Includes Swelling Pressure) BS 1377:1990 - Part 5 : 4.4	1
Quick Undrained Triaxial Compression test - set of 3 - 38mm diameter specimens BS 1377:1990 - Part 7 : 8 - * UKAS	2

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

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 except in full, without the prior written approval of the laboratory.

Approved Signatories:
Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

Laboratory Report

GEO Site & Testing Services Ltd

Contract Number: 44273

Test Description	Qty
Immediate Shear Strength - set of 3 60 x 60 mm Shear Box Specimens by Direct Shearing (note suitable for free draining material only) BS 1377:1990 - Part 7 : 4 - * UKAS	1
CUT 38mm Consolidated undrained triaxial compression test on a set of three x 38 mm diameter specimens with the measurement of pore water pressure including saturation and consolidation, test duration four days. **PLEASE NOTE IT IS LIKELY THIS TEST WILL INCUR EXTRA OVER DAY CHARGES.** BS 1377:1990 - Part 8 : 7 - @ Non Accredited Test	2
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

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 except in full, without the prior written approval of the laboratory.

Approved Signatories:
Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5) DESCRIPTIONS	
Contract Number	44273	
Site Name	Stoneham CCRC	
Date Tested	30/05/2019	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
BH01	B4	B	2.00	-	2.50	Brown slighty clayey/silty fine to coarse sandy fine to coarse GRAVEL
BH01	D4	D	3.00	-		Brown silty sandy CLAY
BH01	D7	D	6.50	-		Brown clayey fine to coarse gravelly SAND
BH01	D8	D	8.00	-		Brown fine to medium gravelly clayey SAND
BH01	D10	D	11.70	-		Grey silty sandy CLAY
BH01	D16	D	18.50	-		Grey silty sandy CLAY
BH01	D19	D	23.00	-		Grey silty sandy CLAY
BH02	D4	D	4.00	-		Brown fine gravelly silty sandy CLAY
BH02	B6	B	4.00	-	4.50	Brown silty sandy CLAY
BH02	B7	B	6.50	-	7.00	Brown clayey silty fine to coarse SAND
BH02	B9	B	8.50	-	9.00	Brown slightly fine to medium gravelly clayey silty fine to coarse SAND
BH02	D14	D	14.85	-		Grey silty sandy CLAY
BH03	B2	B	0.60	-	1.00	Brown slightly clayey silty fine to coarse sandy fine to coarse GRAVEL
BH03	B8	B	6.50	-	7.00	Brown slightly clayey/silty fine to coarse SAND
BH03	D8	D	11.30	-		Grey silty sandy CLAY
BH03	D11	D	15.00	-		Grey silty sandy CLAY
WS02		D	0.70	-		Brown fine to coarse gravelly silty sandy CLAY
WS02		D	2.80	-		Brown silty sandy CLAY
WS10		D	2.00	-		Brown clayey/silty fine to coarse SAND
WS11		D	0.80	-		Brown fine to medium gravelly sandy silty CLAY
				-		
				-		
				-		
				-		

Operators	Checked	31/05/2019	Emma Sharp (Office Manager)
Daniel Bassett	Approved	31/05/2019	Paul Evans (Quality/Technical Manager)

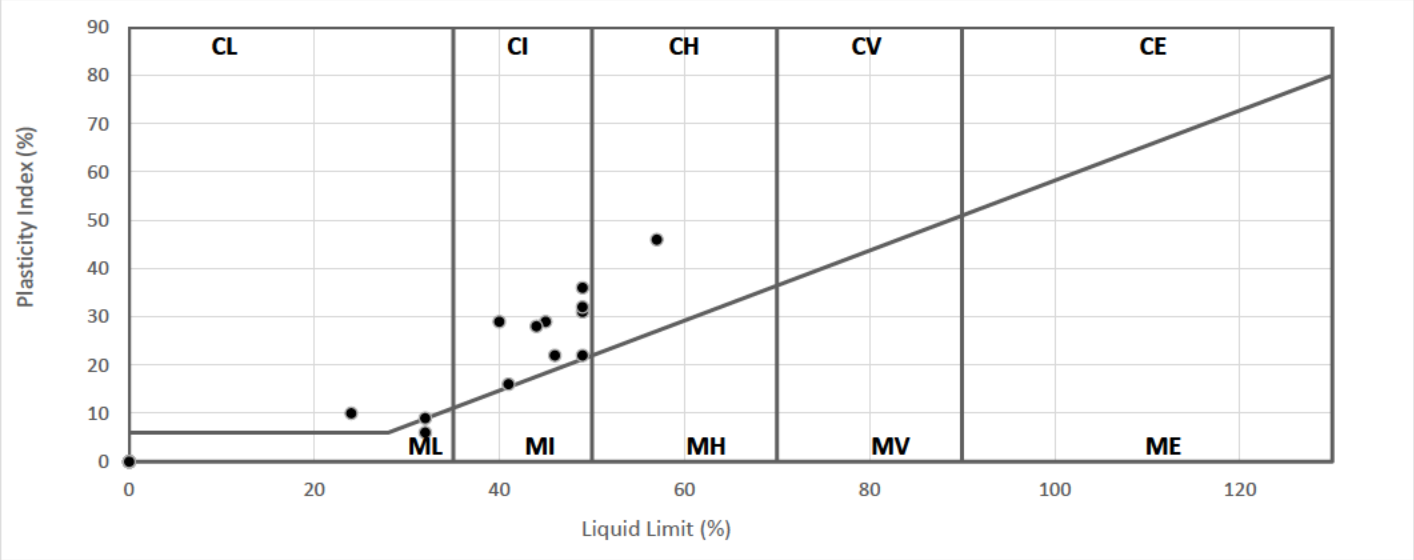
UKAS TESTING 2788

GSTL	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	44273	
Site Name	Stoneham CCRC	
Date Tested	30/05/2019	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
BH01	B4	B	2.00	-	2.50	4.0		NP		8	
BH01	D4	D	3.00	-		22	40	11	29	100	CI Intermediate Plasticity
BH01	D7	D	6.50	-		21		NP		80	
BH01	D8	D	8.00	-		24		NP		75	
BH01	D10	D	11.70	-		25	45	16	29	100	CI Intermediate Plasticity
BH01	D16	D	18.50	-		21	41	25	16	100	CI Intermediate Plasticity
BH01	D19	D	23.00	-		25	44	16	28	100	CI Intermediate Plasticity
BH02	D4	D	4.00	-		27	49	13	36	83	CI Intermediate Plasticity
BH02	B6	B	4.00	-	4.50	33	49	27	22	100	CI Intermediate Plasticity
BH02	B7	B	6.50	-	7.00	22	32	26	6	97	ML Low Plasticity
BH02	B9	B	8.50	-	9.00	11		NP		93	
BH02	D14	D	14.85	-		22	46	24	22	100	CI Intermediate Plasticity
BH03	B2	B	0.60	-	1.00	13		NP		59	
BH03	B8	B	6.50	-	7.00	19		NP		96	
BH03	D8	D	11.30	-		23	49	18	31	100	CI Intermediate Plasticity
BH03	D11	D	15.00	-		25	49	17	32	100	CI Intermediate Plasticity
WS02		D	0.70	-		13	57	11	46	55	CH High Plasticity
WS02		D	2.80	-		21	32	23	9	100	CL Low Plasticity
WS10		D	2.00	-		16		NP		99	
WS11		D	0.80	-		18	24	14	10	76	CL Low Plasticity
				-							
				-							
				-							
				-							

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

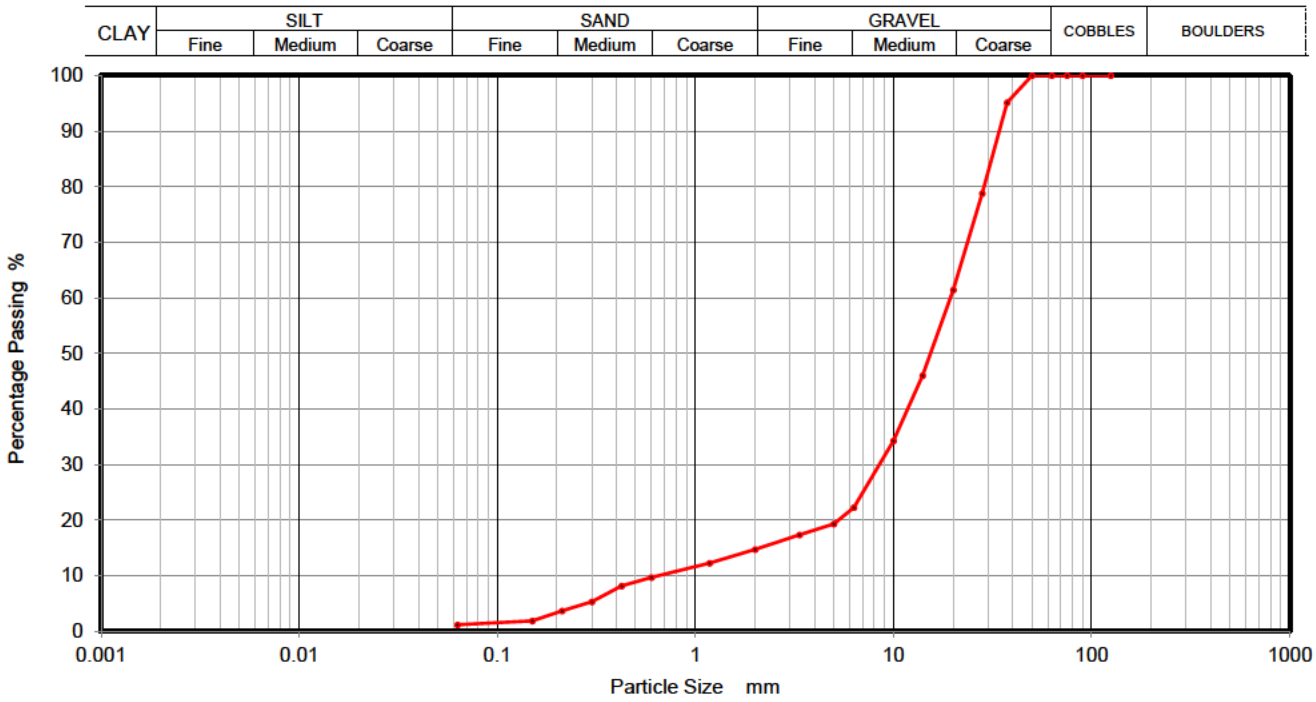
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	31/05/2019	Emma Sharp (Office Manager)
Daniel Bassett	Approved	31/05/2019	Paul Evans (Quality/Technical Manager)

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	44273
		Borehole/Pit No.	BH01
Site Name	Stoneham CCRC	Sample No.	B4
Soil Description	Brown slighty clayey/silty fine to coarse sandy fine to coarse GRAVEL	Depth Top	2.00
		Depth Base	2.50
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	95		
28	79		
20	61		
14	46		
10	34		
6.3	22		
5	19		
3.35	17		
2	15		
1.18	12		
0.6	10		
0.425	8		
0.3	5		
0.212	4		
0.15	2		
0.063	1		

Sample Proportions	% dry mass
Cobbles	0
Gravel	85
Sand	14
Silt and Clay	1

Remarks

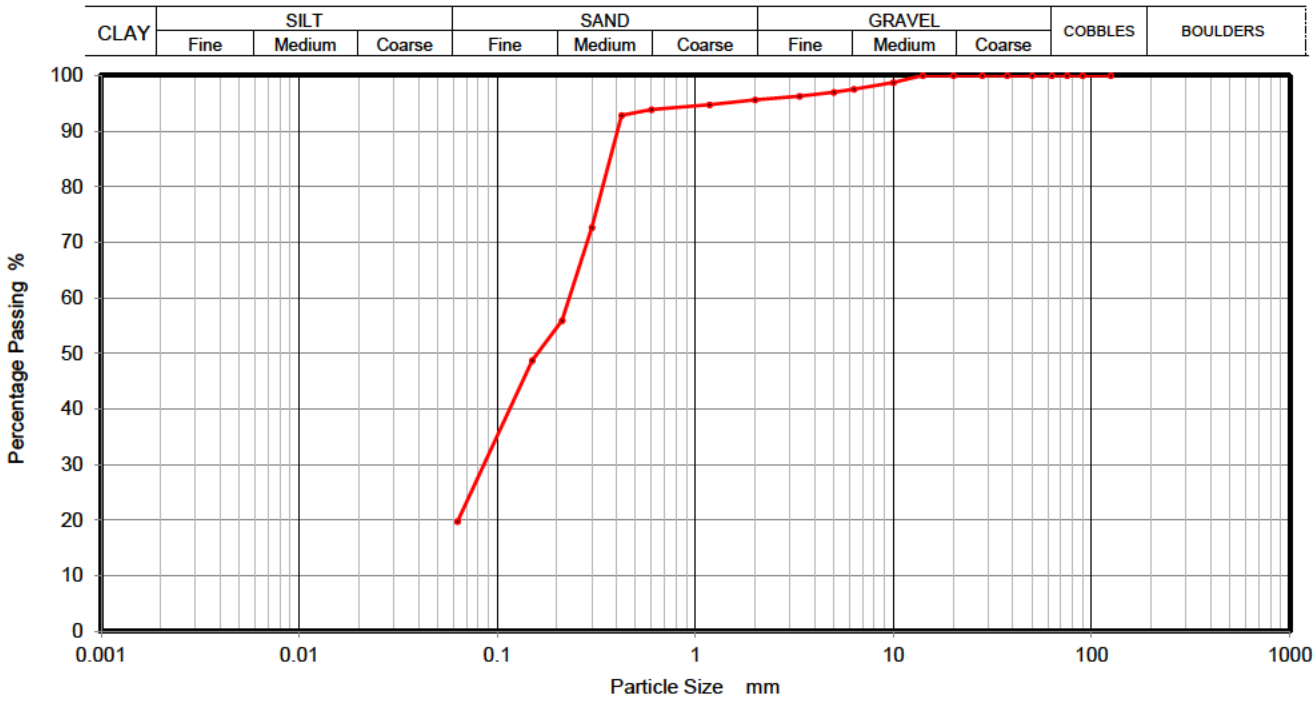
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp
RO/MH	Approved	31/05/2019	Paul Evans

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	44273
		Borehole/Pit No.	BH01
Site Name	Stoneham CCRC	Sample No.	B11
Soil Description	Brown slightly fine to medium gravelly clayey/silty fine to coarse SAND	Depth Top	11.00
		Depth Base	11.50
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	98		
5	97		
3.35	96		
2	96		
1.18	95		
0.6	94		
0.425	93		
0.3	73		
0.212	56		
0.15	49		
0.063	20		

Sample Proportions	% dry mass
Cobbles	0
Gravel	4
Sand	76
Silt and Clay	20

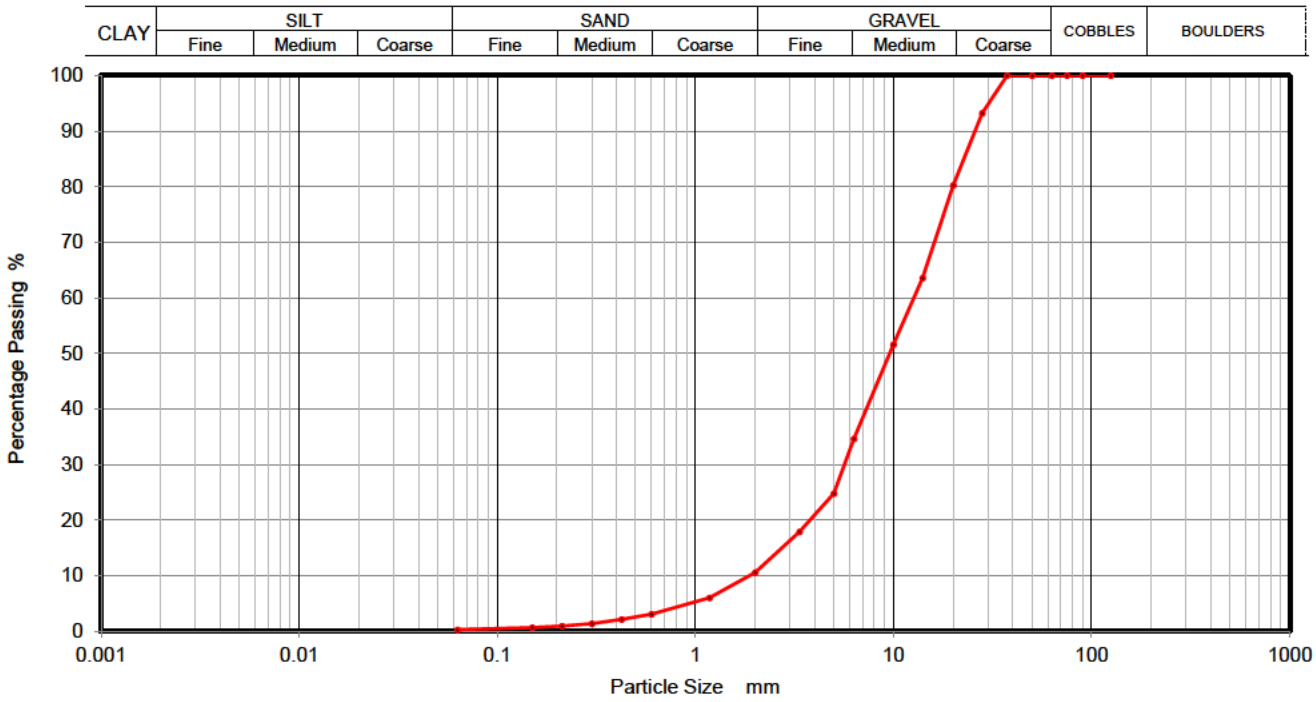
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp	[redacted]
RO/MH	Approved	31/05/2019	Paul Evans	

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	44273
		Borehole/Pit No.	BH02
Site Name	Stoneham CCRC	Sample No.	B3
Soil Description	Brown fine to coarse sandy fine to coarse GRAVEL	Depth Top	1.20
		Depth Base	1.70
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	93		
20	80		
14	64		
10	52		
6.3	35		
5	25		
3.35	18		
2	11		
1.18	6		
0.6	3		
0.425	2		
0.3	1		
0.212	1		
0.15	1		
0.063	0		

Sample Proportions	% dry mass
Cobbles	0
Gravel	89
Sand	11
Silt and Clay	0

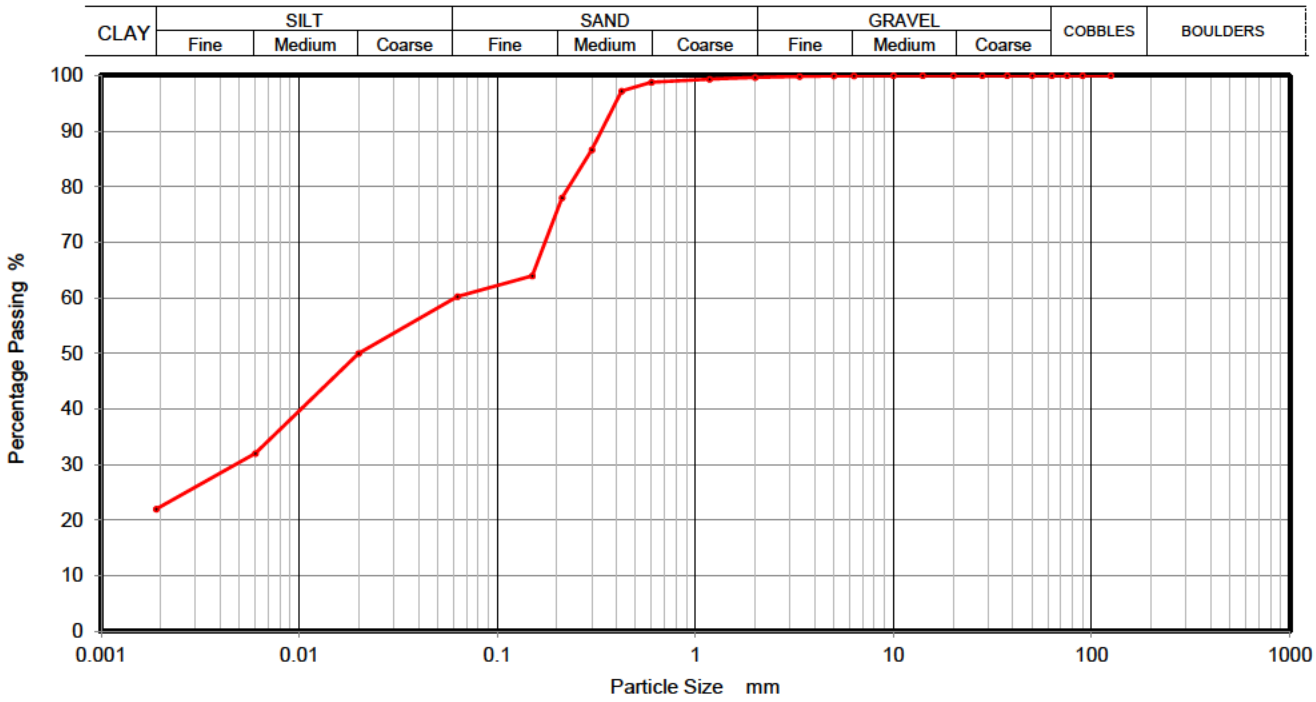
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp	[redacted]
RO/MH	Approved	31/05/2019	Paul Evans	

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4	Contract Number	44273
		Borehole/Pit No.	BH02
Site Name	Stoneham CCRC	Sample No.	B7
Soil Description	Brown clayey silty fine to coarse SAND	Depth Top	6.50
		Depth Base	7.00
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	50
90	100	0.0060	32
75	100	0.0020	22
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	97		
0.3	87		
0.212	78		
0.15	64		
0.063	60		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	40
Silt	38
Clay	22

Remarks

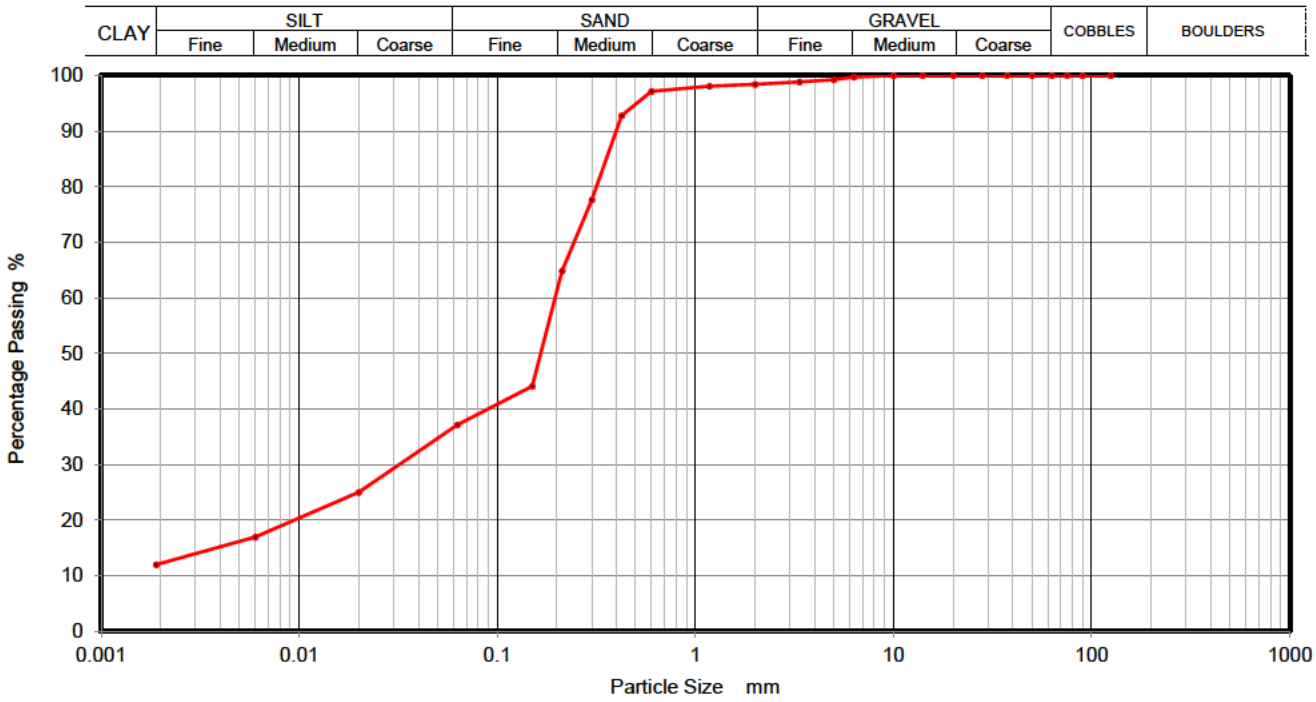
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp
RO/MH	Approved	31/05/2019	Paul Evans

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4	Contract Number	44273
		Borehole/Pit No.	BH02
Site Name	Stoneham CCRC	Sample No.	B9
Soil Description	Brown slightly fine to medium gravelly clayey silty fine to coarse SAND	Depth Top	8.50
		Depth Base	9.00
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	25
90	100	0.0060	17
75	100	0.0020	12
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97		
0.425	93		
0.3	78		
0.212	65		
0.15	44		
0.063	37		

Sample Proportions	% dry mass
Cobbles	0
Gravel	2
Sand	61
Silt	25
Clay	12

Remarks

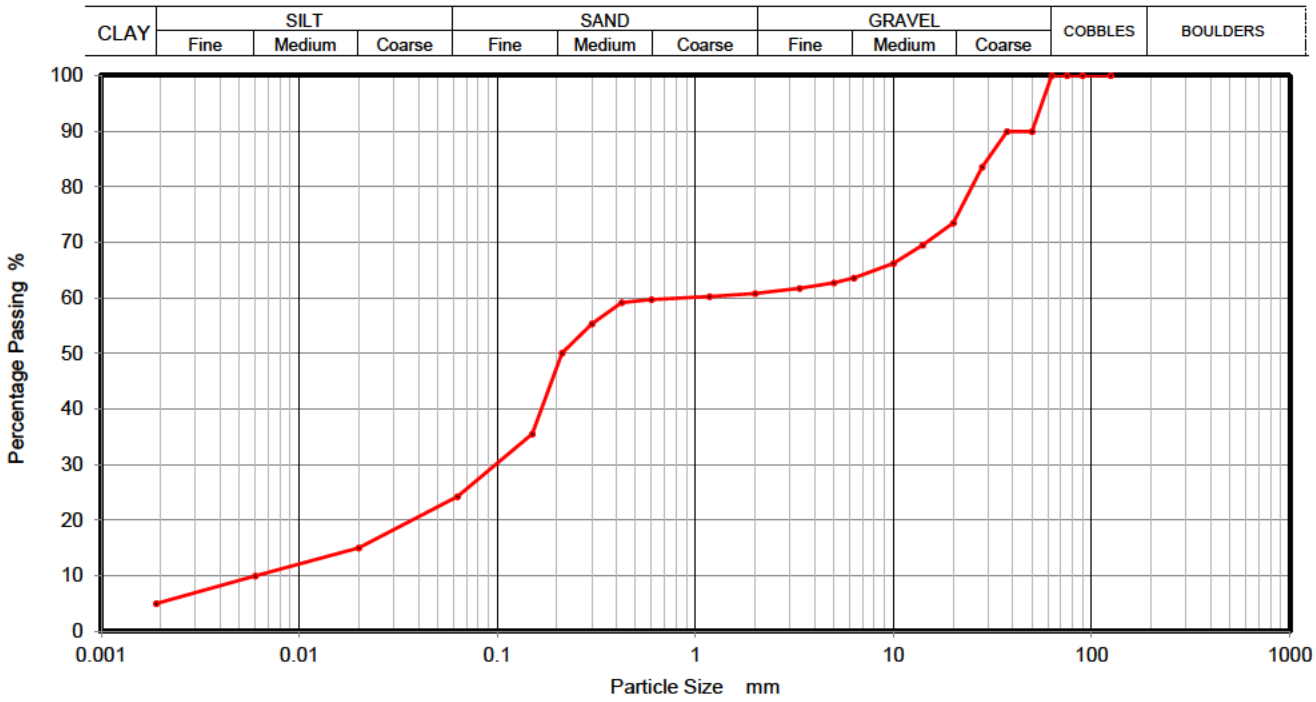
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp
RO/MH	Approved	31/05/2019	Paul Evans

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4	Contract Number	44273
		Borehole/Pit No.	BH03
Site Name	Stoneham CCRC	Sample No.	B2
Soil Description	Brown slightly clayey silty fine to coarse sandy fine to coarse GRAVEL	Depth Top	0.60
		Depth Base	1.00
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	15
90	100	0.0060	10
75	100	0.0020	5
63	100		
50	90		
37.5	90		
28	84		
20	73		
14	69		
10	66		
6.3	64		
5	63		
3.35	62		
2	61		
1.18	60		
0.6	60		
0.425	59		
0.3	55		
0.212	50		
0.15	36		
0.063	24		

Sample Proportions	% dry mass
Cobbles	0
Gravel	39
Sand	37
Silt	19
Clay	5

Remarks

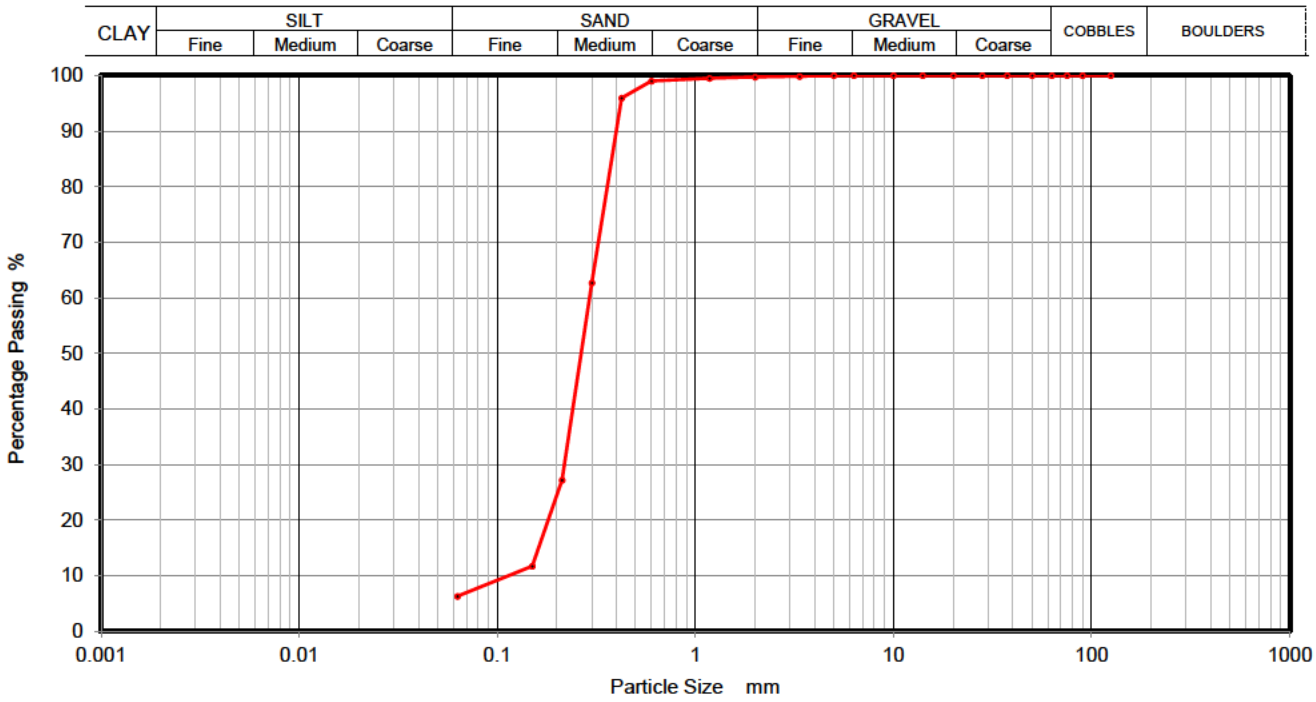
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp
RO/MH	Approved	31/05/2019	Paul Evans

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	44273
		Borehole/Pit No.	BH03
Site Name	Stoneham CCRC	Sample No.	B8
Soil Description	Brown slightly clayey/silty fine to coarse SAND	Depth Top	6.50
		Depth Base	7.00
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	96		
0.3	63		
0.212	27		
0.15	12		
0.063	6		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	94
Silt and Clay	6

Remarks

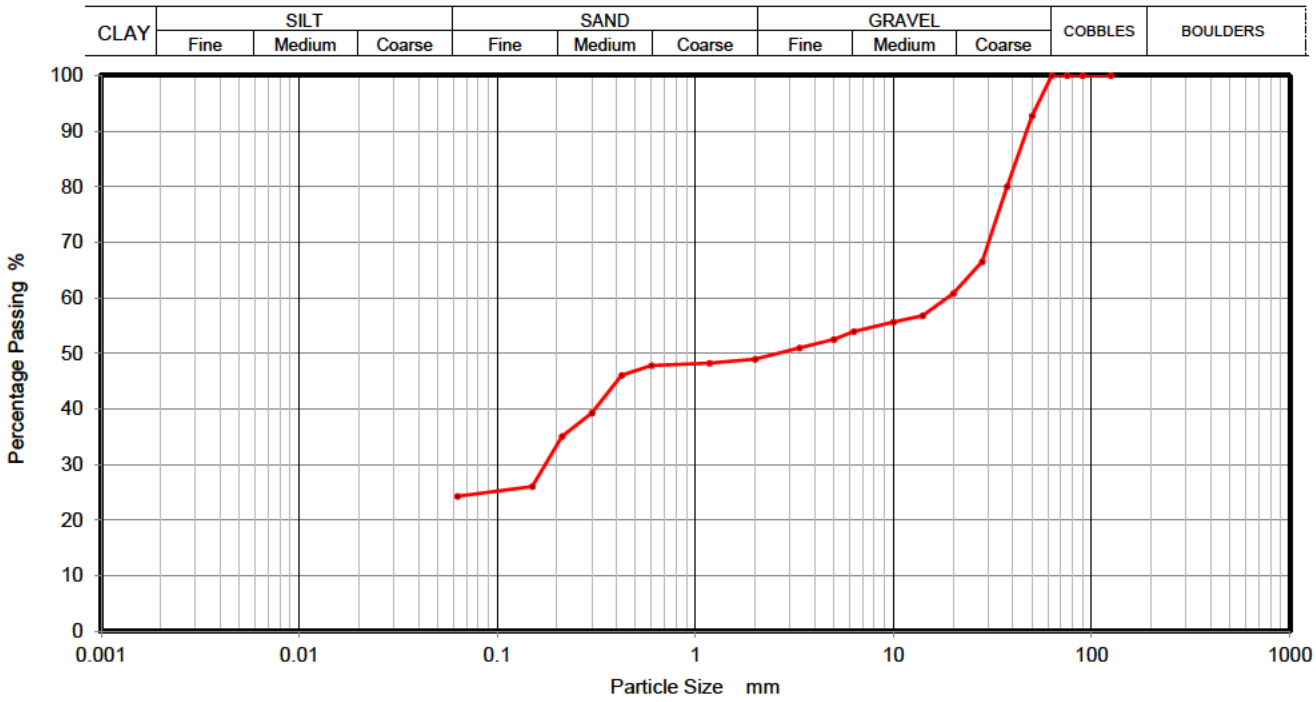
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp
RO/MH	Approved	31/05/2019	Paul Evans

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	44273
		Borehole/Pit No.	BH04
Site Name	Stoneham CCRC	Sample No.	B6
Soil Description	Brown clayey/silty fine to coarse sandy fine to coarse GRAVEL	Depth Top	3.00
		Depth Base	3.50
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	93		
37.5	80		
28	67		
20	61		
14	57		
10	56		
6.3	54		
5	53		
3.35	51		
2	49		
1.18	48		
0.6	48		
0.425	46		
0.3	39		
0.212	35		
0.15	26		
0.063	24		

Sample Proportions	% dry mass
Cobbles	0
Gravel	51
Sand	25
Silt and Clay	24

Remarks

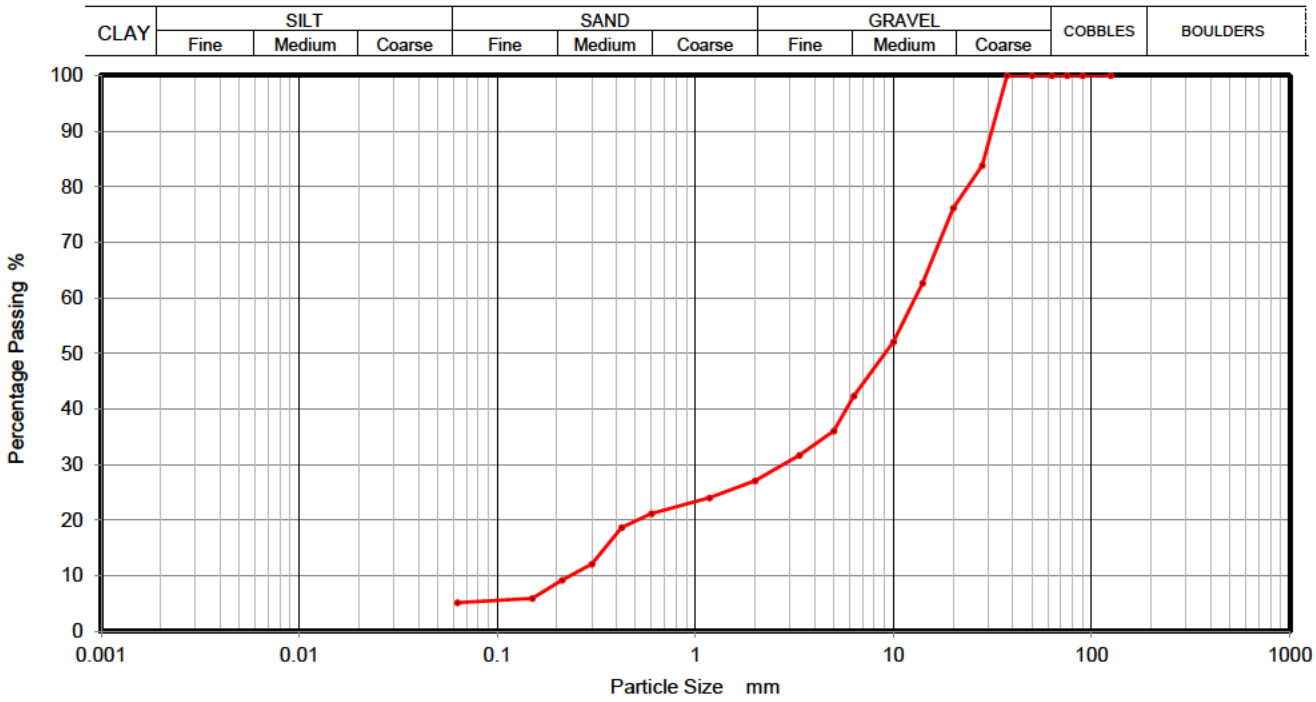
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp
RO/MH	Approved	31/05/2019	Paul Evans

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	44273
		Borehole/Pit No.	WS09
Site Name	Stoneham CCRC	Sample No.	
Soil Description	Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL	Depth Top	1.00
		Depth Base	
		Sample Type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	84		
20	76		
14	63		
10	52		
6.3	42		
5	36		
3.35	32		
2	27		
1.18	24		
0.6	21		
0.425	19		
0.3	12		
0.212	9		
0.15	6		
0.063	5		

Sample Proportions	% dry mass
Cobbles	0
Gravel	73
Sand	22
Silt and Clay	5

Remarks

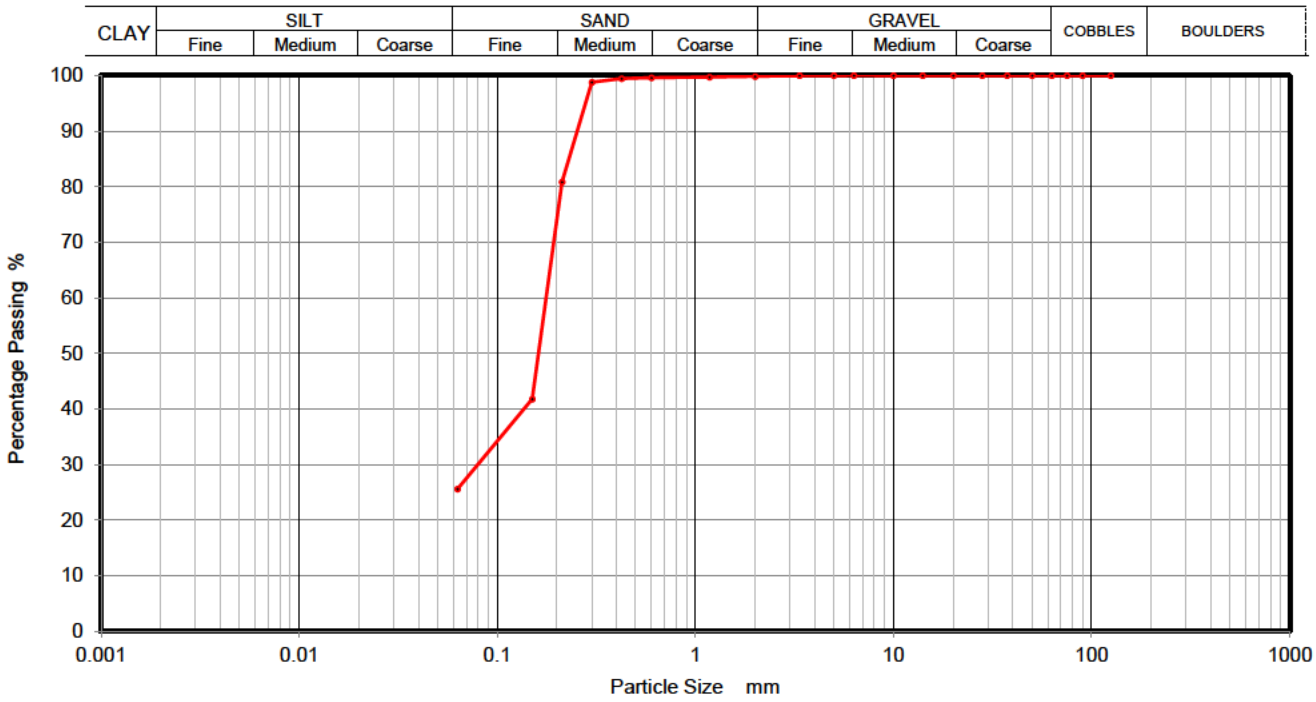
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/05/2019	Ben Sharp
RO/MH	Approved	31/05/2019	Paul Evans

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	44273
		Borehole/Pit No.	WS10
Site Name	Stoneham CCRC	Sample No.	
Soil Description	Brown clayey/silty fine to coarse SAND	Depth Top	2.00
		Depth Base	
		Sample Type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	99		
0.212	81		
0.15	42		
0.063	26		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	74
Silt and Clay	26

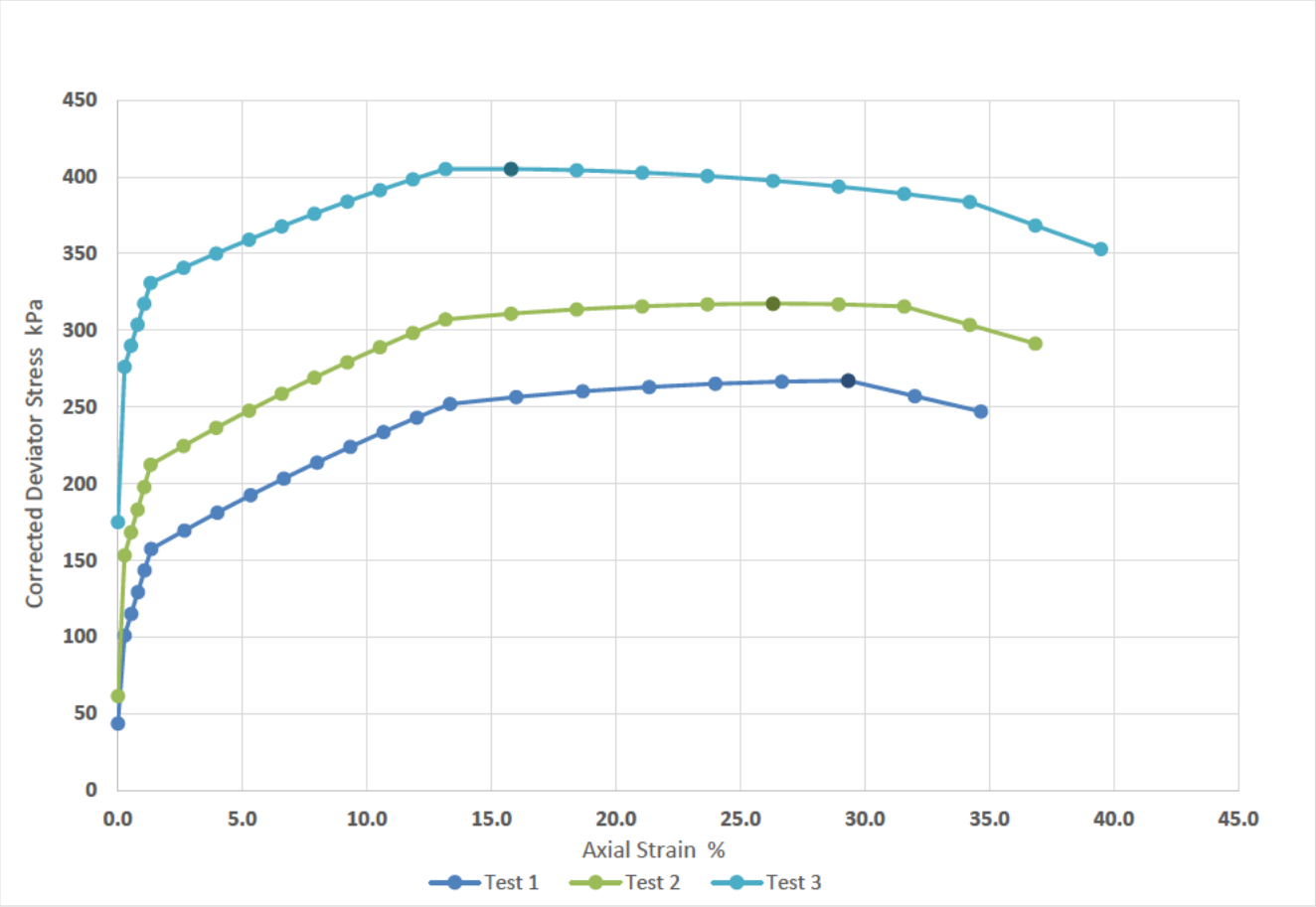
Remarks

Preparation and testing in accordance with BS1377 unless noted below

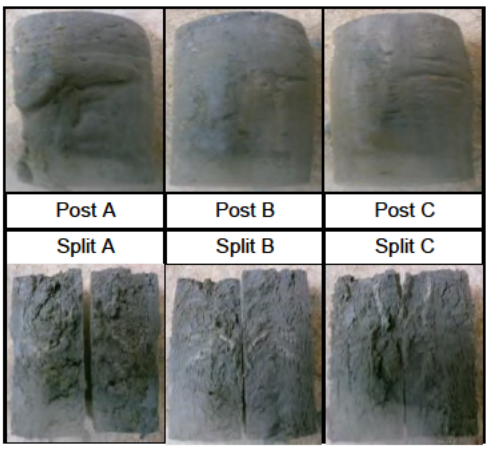
Operators	Checked	30/05/2019	Ben Sharp	[redacted]
RO/MH	Approved	31/05/2019	Paul Evans	[redacted]

UKAS TESTING 2788

GSTL	Undrained Shear Strength in Triaxial Compression BS1377 : Part7 : Clause 8 : 1991 Set of Three 38 mm without the measurement of Pore Pressure	Contract Number	44273
		Borehole/Pit No.	BH02
Site Name	Stoneham CCRC	Sample No.	U3
Soil Description	Brown sandy silty CLAY	Depth Top	14.50
		Depth Base	14.95
		Sample Type	U



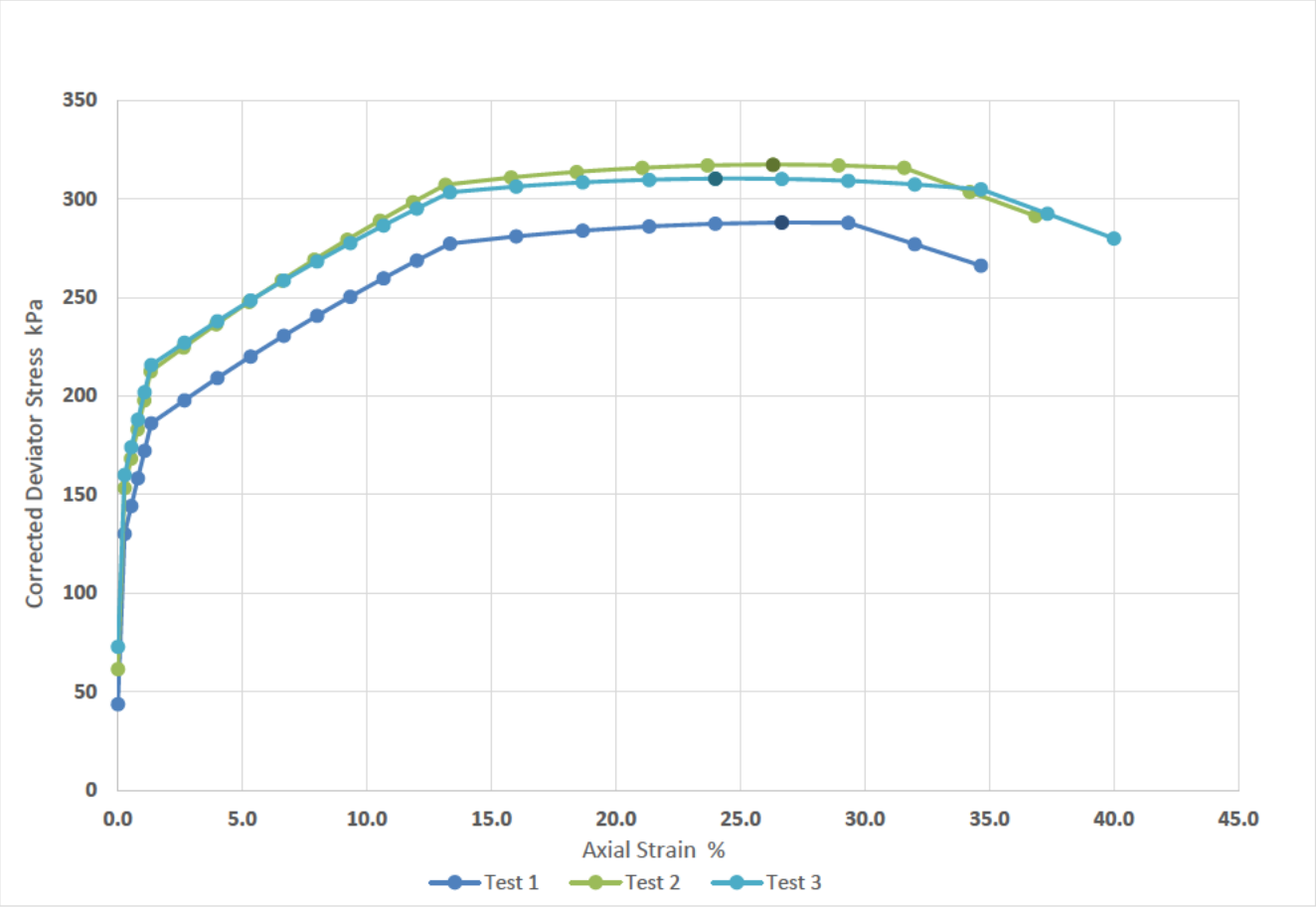
	Specimen 1	Specimen 2	Specimen 3
Moisture Content (%)	23	23	23
Bulk Density (Mg/m^3)	1.86	1.92	1.91
Dry Density (Mg/m^3)	1.51	1.55	1.55
Specimen Length (mm)	75	76	76
Specimen Diamteter (mm)	38	37	38
Cell Pressures (kPa)	290	390	490
Deviator Stress (kPa)	267	317	405
Undrained Shear Strength (kPa)	134	159	203
Failure Strain (%)	29	26	203
Mode Of Failure	Compound	Plastic	Plastic
Membrane Used/Thickness	Rubber/0.3mm	Rubber/0.3mm	Rubber/0.3mm
Rate of Strain (%/min)	2.00	1.97	1.97



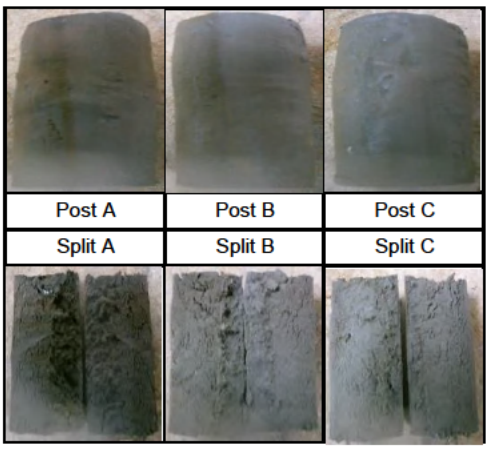
Checked	30/05/2019	Ben Sharp	[redacted]
Approved	31/05/2019	Paul Evans	

UKAS TESTING 2788

GSTL	Undrained Shear Strength in Triaxial Compression BS1377 : Part7 : Clause 8 : 1991 Set of Three 38 mm without the measurement of Pore Pressure	Contract Number	44273
		Borehole/Pit No.	BH03
Site Name	Stoneham CCRC	Sample No.	U1
Soil Description	Brown sandy silty CLAY	Depth Top	10.90
		Depth Base	11.30
		Sample Type	U



	Specimen 1	Specimen 2	Specimen 3
Moisture Content (%)	23	23	23
Bulk Density (Mg/m^3)	2.06	2.09	2.00
Dry Density (Mg/m^3)	1.68	1.70	1.63
Specimen Length (mm)	75	76	75
Specimen Diamteter (mm)	38	37	38
Cell Pressures (kPa)	220	320	420
Deviator Stress (kPa)	288	317	310
Undrained Shear Strength (kPa)	144	159	155
Failure Strain (%)	27	26	155
Mode Of Failure	Plastic	Plastic	Plastic
Membrane Used/Thickness	Rubber/0.3mm	Rubber/0.3mm	Rubber/0.3mm
Rate of Strain (%/min)	2.00	1.97	2.00



Checked	30/05/2019	Ben Sharp	[redacted]
Approved	31/05/2019	Paul Evans	

UKAS TESTING 2788

Test Report: Quick Shearbox Test

BS1377:Part 7:4.5 :1990.

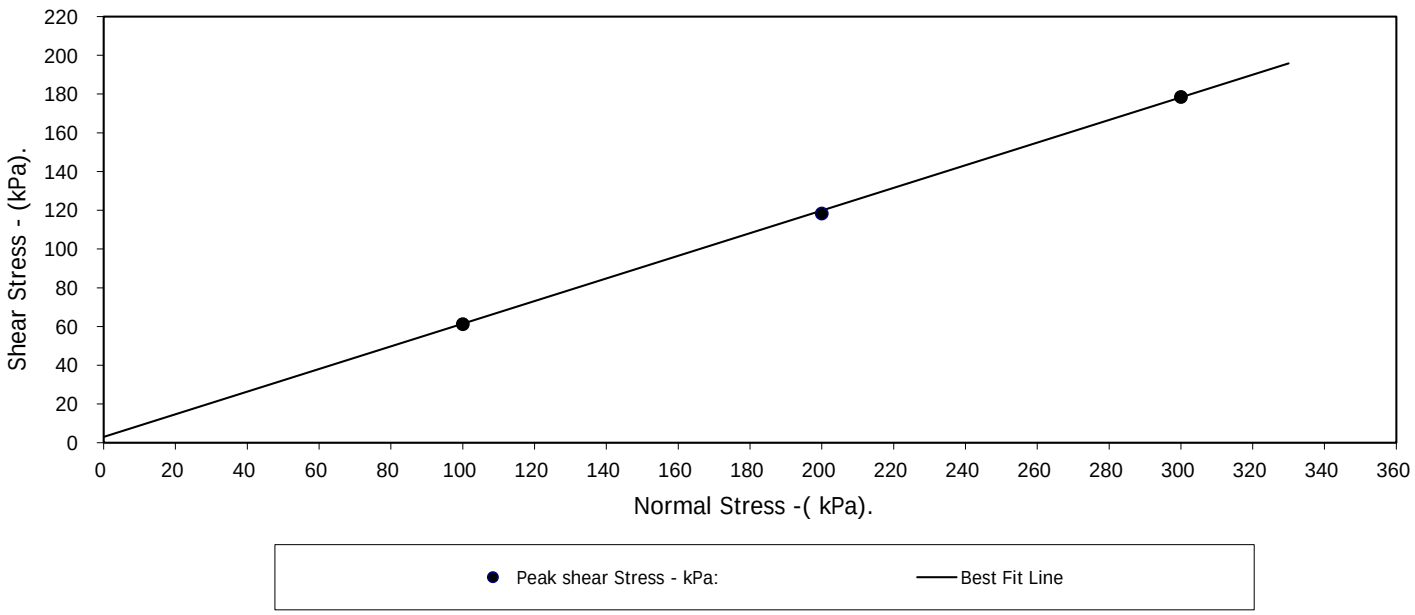
Borehole:	BH02	Depth (m) from:	5.00
Sample Number :	U2	Depth (m) to:	5.45

Sample Type:	U
Particle Density - Mg/m3:	2.65 (Assumed)
Specimen Tested:	Submerged, Remoulded material above 2.00mm removed
Sample Description: Orange brown slightly clayey SAND	

STAGE	1	2	3
Initial Conditions			
Height - mm:	23.98	23.98	23.98
Length - mm:	60.00	60.00	60.00
Moisture Content - %:	32	32	32
Bulk Density - Mg/m3:	1.86	1.86	1.86
Dry Density - Mg/m3:	1.41	1.41	1.41
Voids Ratio:	0.8803	0.8802	0.8800
Normal Pressure- kPa	100	200	300
Consolidation			
Consolidated Height - mm:	23.46	23.09	22.73
Shear			
Rate of Strain (mm/min)	0.625	0.625	0.625
Strain at peak shear stress (mm)	4.38	4.66	4.93
Peak shear Stress - kPa:	61	118	179

PEAK	
Angle of Shearing Resistance:(θ)	30.3
Effective Cohesion - kPa:	3

FAILURE CONDITIONS



[redacted] 23/05/19

Date

[redacted] 23/05/19

Approved Page 1 by: Date

Contract No.: 44273

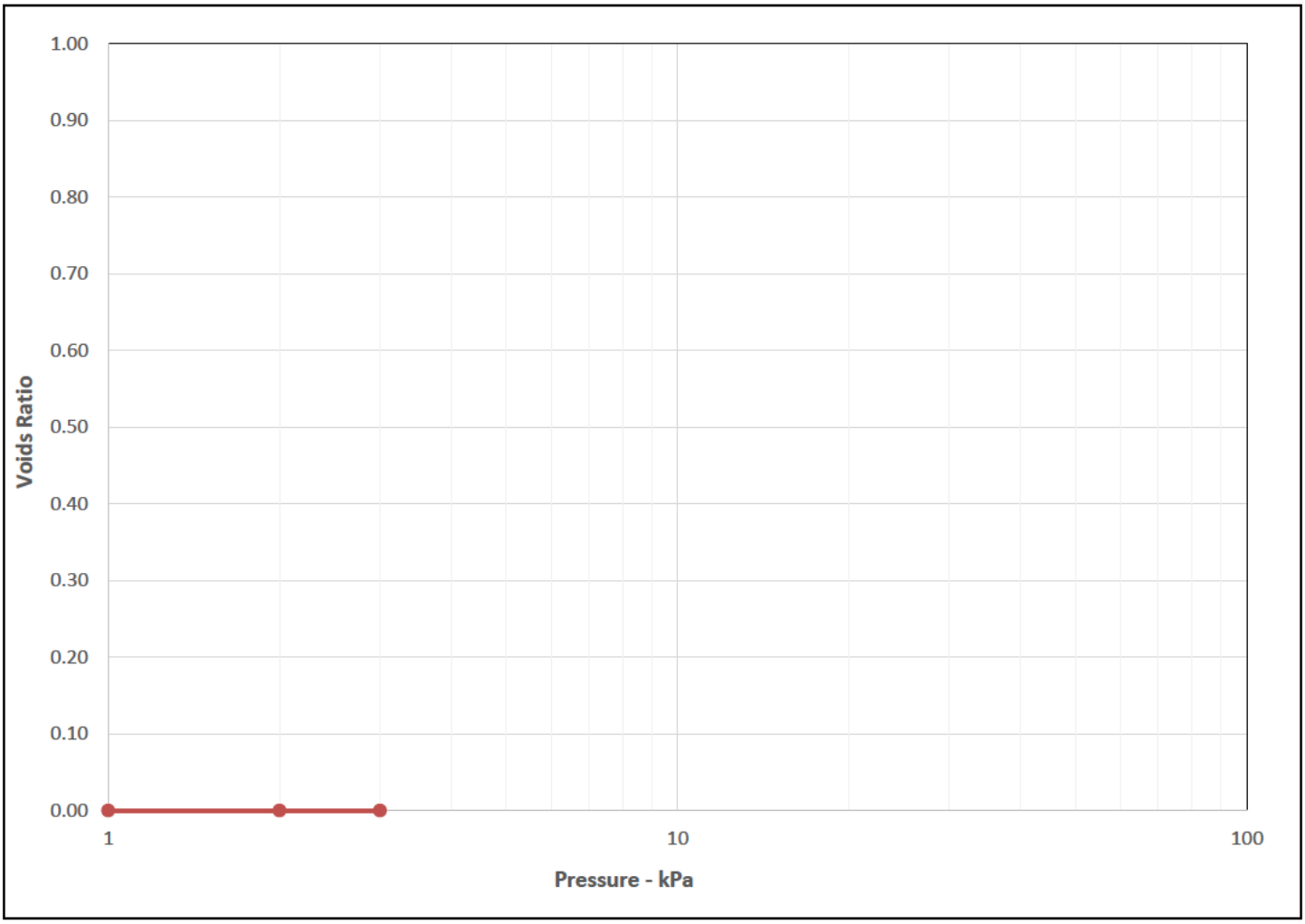
Stoneham CCRC

Client Ref Number: 17624

GSTL GEO SITE & TESTING SERVICES LTD

030704 QSHEARBOX

GSTL	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3	Contract Number	44273
		Borehole/Trialpit No.	BH02
Site Name	Stoneham CCRC	Sample No.	2
Soil Description	Grey/ brown sandy CLAY	Depth Top (m)	5.00
		Depth Base (m)	5.45
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U



Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	35	NO SWELL	-	6 KPA				-			
Bulk Density (Mg/m3)	1.75		-					-			
Dry Density (Mg/m3)	1.29		-					-			
Voids Ratio	1.0513		-					-			
Degree of saturation	88.8		-					-			
Height (mm)	15.21		-					-			
Diameter (mm)	74.91		-					-			
Particle Density (Mg/m3)	2.65		-					-			

Operators	Checked	09/06/2019	Wayne Honey	[redacted]
LG	Approved	10/06/2019	Ben Sharp	

UKAS TESTING 2788

Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	12.50
Depth	to(m)	12.80
Date		14/06/2019
Disturbed / Undisturbed		U

Description of Specimen

Brown slightly sandy silty CLAY

Initial Specimen Conditions

Height	mm	76.00	76.00	76.00
Diameter	mm	38.00	38.00	38.00
Area	mm^2	1134.11	1134.11	1134.11
Volume	cm^3	86.19	86.19	86.19
Mass	g	170.80	170.80	170.90
Dry Mass	g	137.00	137.00	137.00
Density	Mg/m^3	1.98	1.98	1.98
Dry Density	Mg/m^3	1.59	1.59	1.59
Moisture Content	%	25	25	25
Specific Gravity	kN/m^3	2.65	2.65	2.65
(assumed/measured)		assumed	assumed	assumed

Final Specimen Conditions

Moisture Content	%	25	25	25
Density	Mg/m^3	2.47	2.64	2.84
Dry Density	Mg/m^3	1.98	2.12	2.27

[redacted]

Checked and Approved By

14/06/19
Date

Client Ref

17624

Stoneham CCRC

Contract No

44273

GSTL
GEO SITE & TESTING SERVICES LTD

Consolidated Undrained Triaxial Compression Test

BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	12.50
Depth	to(m)	12.80

Test Setup

Date started	07/06/2019	07/06/2019	07/06/2019
Date Finished	13/06/2019	13/06/2019	13/06/2019
Top Drain Used	y	y	y
Base Drain Used	y	y	y
Side Drains Used	y	y	y
Pressure System Number	P10	P8	P9
Cell Number	C10	C8	C9

Saturation

Cell Pressure Incr.	kPa	100.00	100.00	100.00
Back Pressure Incr.	kPa	95.00	95.00	95.00
Differential Pressure	kPa	5.00	5.00	5.00
Final Cell Pressure	kPa	400.00	500.00	600.00
Final Pore Pressure	kPa	400.00	500.00	600.00
Final B Value		0.95	0.95	0.97

Consolidation

Effective Pressure	kPa	250.00	350.00	450.00
Cell Pressure	kPa	400.00	500.00	600.00
Back Pressure	kPa	150.00	150.00	150.00
Excess Pore Pressure	kPa	250.00	350.00	450.00
Pore Pressure at End	kPa	150.00	150.00	150.00
Consolidated Volume	cm^3	69.09	64.74	60.39
Consolidated Height	mm	70.97	69.70	68.42
Consolidated Area	mm^2	984.11	945.96	907.80
Vol. Compressibility	m^2/MN	1.32262	1.65907	1.99553
Consolidation Coef.	$m^2/yr.$	1.65475	2.94178	3.72319

[redacted]

Checked and Approved By

14/06/19
Date

Client Ref

17624

Stoneham CCRC

Contract No

44273

GSTL
GEO SITE & TESTING SERVICES LTD

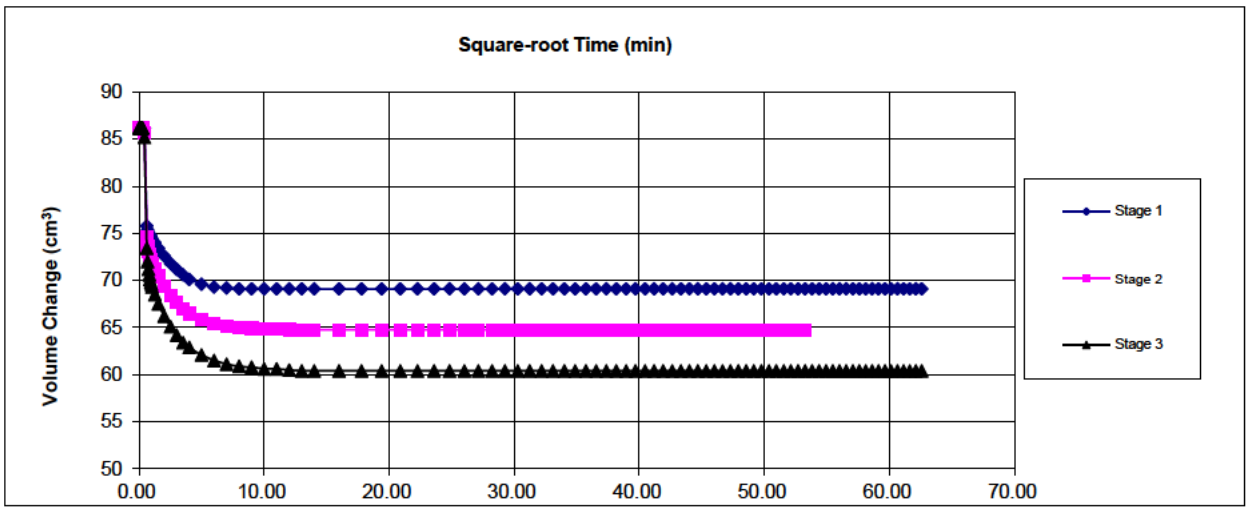
Consolidated Undrained Triaxial Compression Test

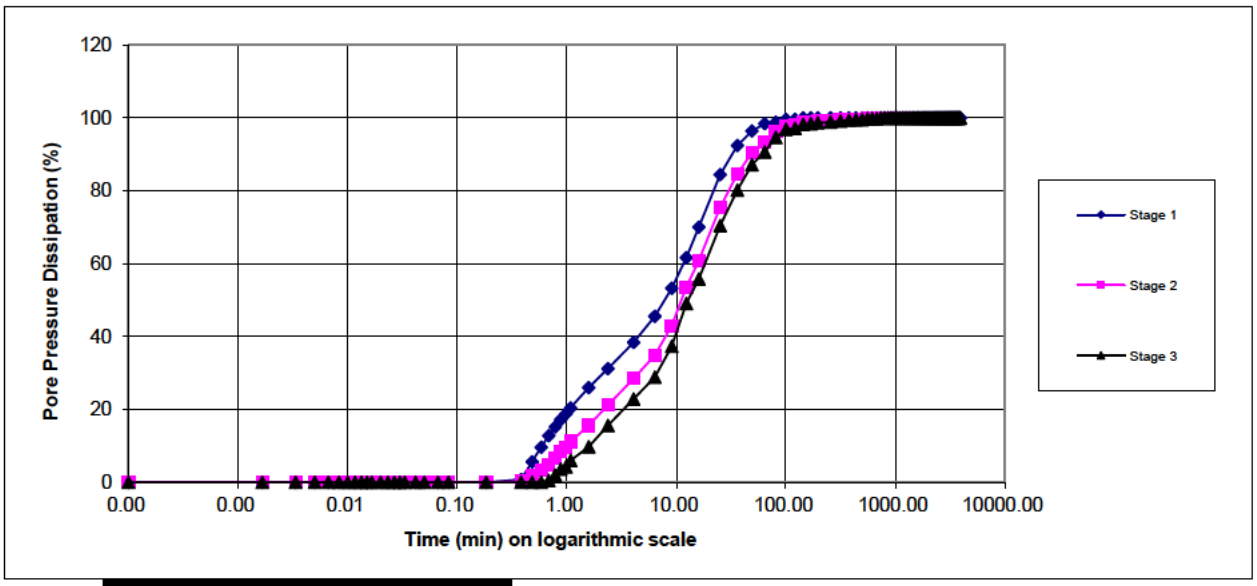
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	12.50
Depth	to(m)	12.80

Consolidation Stage





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Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	12.50
Depth	to(m)	12.80

Shearing

Initial Cell Pressure	kPa	400	500	600
Initial Pore Pressure	kPa	150	150	150
Rate of Strain	mm/min	0.0857	0.1497	0.1859
Max Deviator Stress				
Axial Strain		12.864	14.219	15.654
Axial Stress	kPa	687.091	866.01	994.16
Cor. Deviator stress	kPa	675.054	852.70	980.79
Effective Major Stress	kPa	934.054	1158.20	1338.79
Effective Minor Stress	kPa	260.000	305.50	358.00
Effective Stress Ratio		3.593	3.791	3.74
s'	kPa	597.027	731.85	848.39
t'	kPa	337.027	426.35	490.39
Max Effective Priciple Stress Ratio				
Axial Strain		7.862	12.555	14.602
Axial Stress	kPa	671.106	851.037	983.051
Cor. Deviator stress	kPa	659.093	838.063	969.841
Effective Major Stress	kPa	900.093	1135.063	1313.841
Effective Minor Stress	kPa	241.000	297.000	344.000
Effective Stress Ratio		3.735	3.822	3.819
s'	kPa	570.547	716.032	828.921
t'	kPa	329.547	419.032	484.921
Shear Resistance Angle	degs			36.0
Cohesion c'	kPa			0

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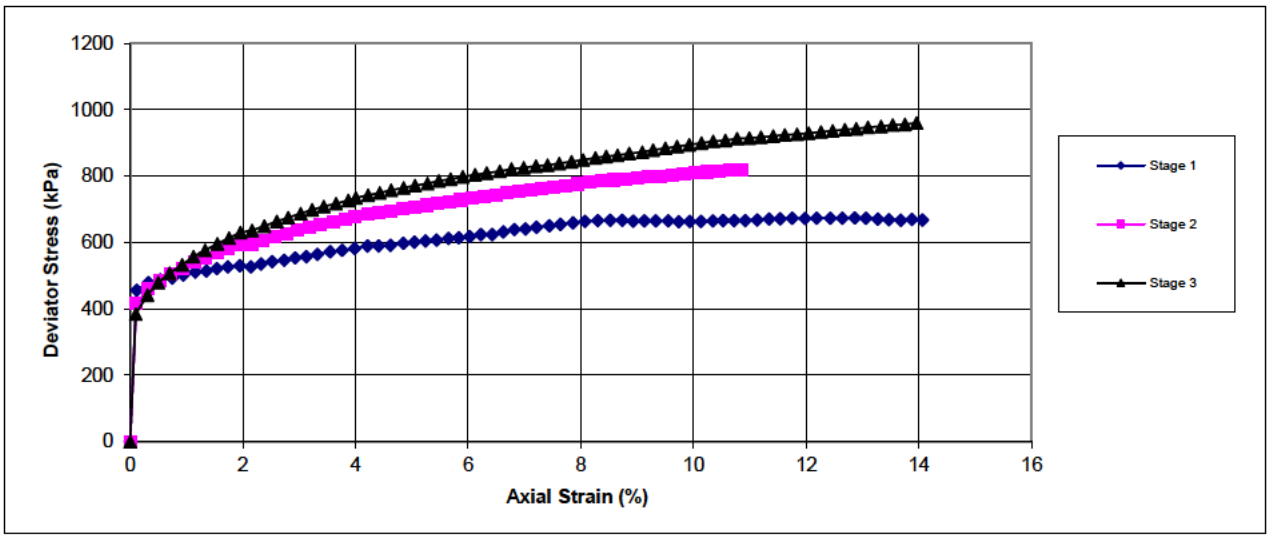
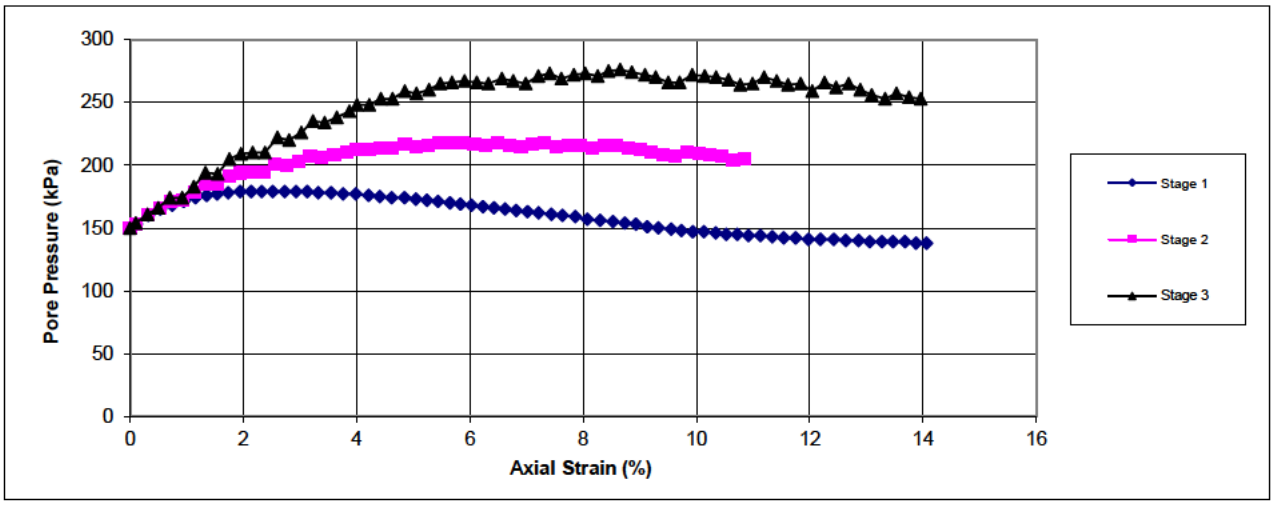
Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	12.50
Depth	to(m)	12.80

Shearing Stage





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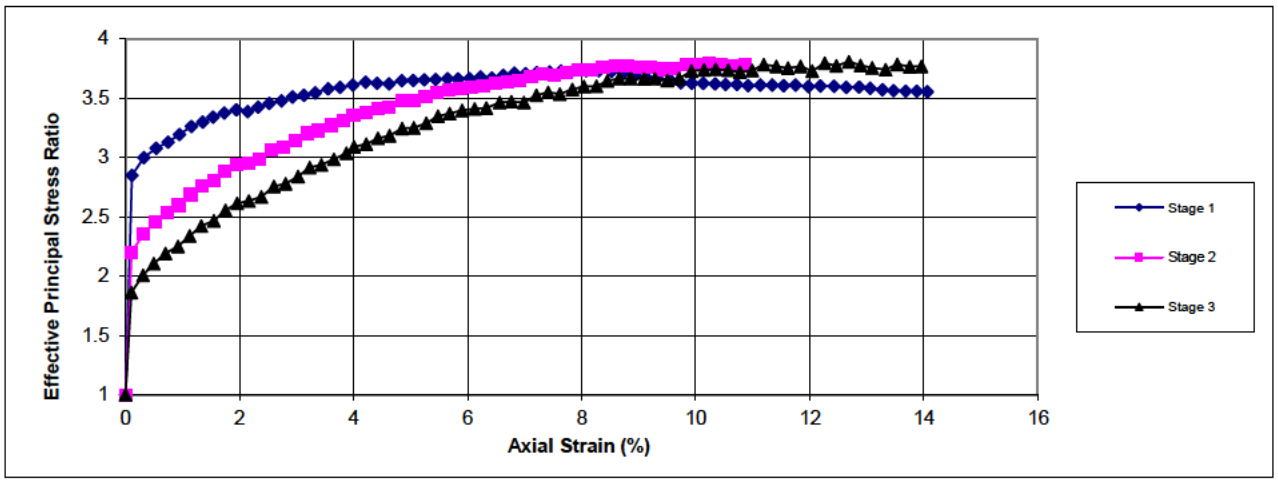
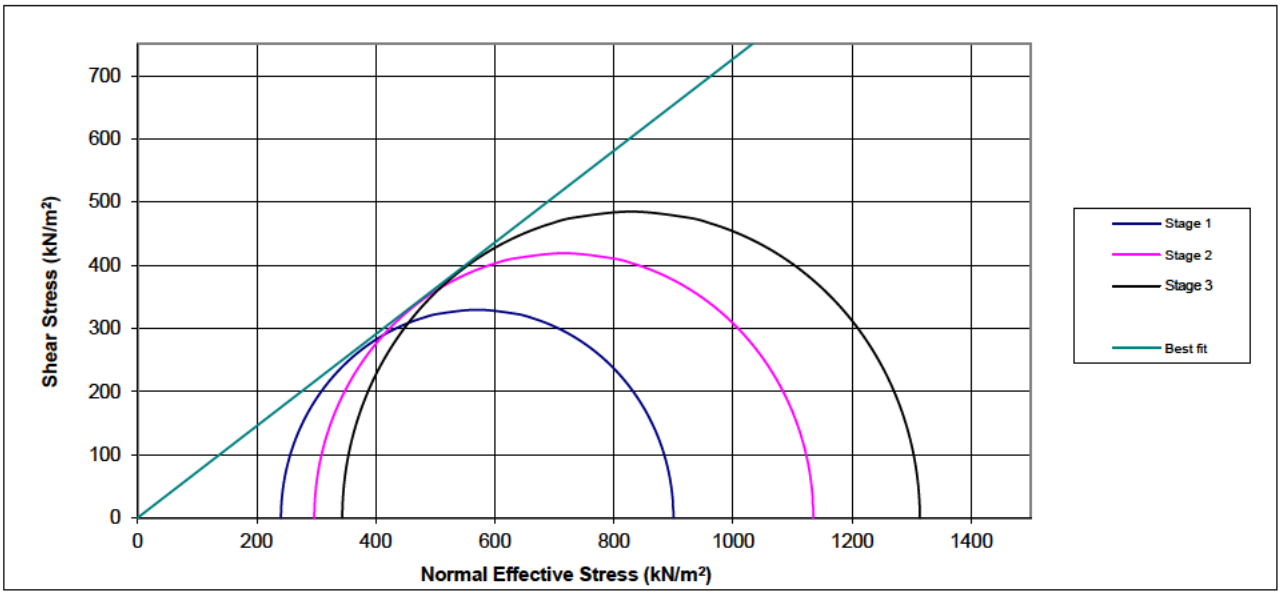
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	12.50
Depth	to(m)	12.80

Shearing Stage





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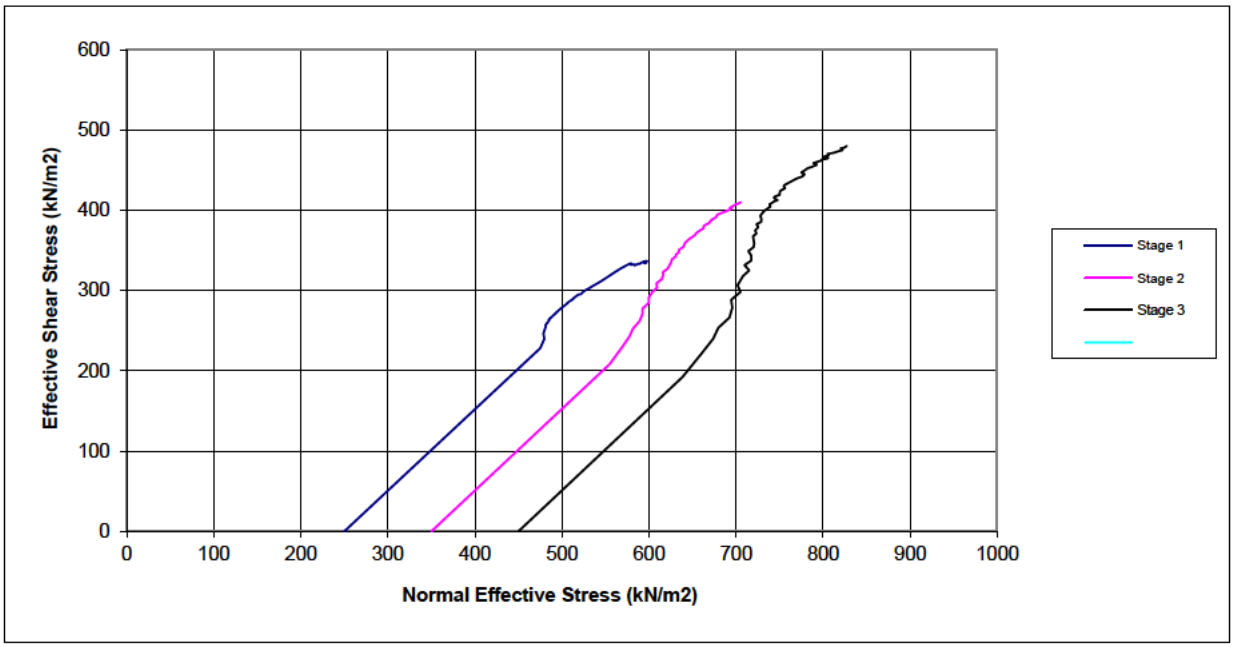
BS 1377 : Part 8 : 1990 : 38mm Set of Three

Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	12.50
Depth	to(m)	12.80

Shearing Stage



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Borehole		BH01
Sample No.		U1
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Consolidated Undrained Triaxial Compression Test

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Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	15.50
Depth	to(m)	15.80
Date		14/06/2019
Disturbed / Undisturbed		U

Description of Specimen

Brown silty CLAY

Initial Specimen Conditions

Height	mm	76.00	76.00	76.00
Diameter	mm	38.00	38.00	38.00
Area	mm^2	1134.11	1134.11	1134.11
Volume	cm^3	86.19	86.19	86.19
Mass	g	174.30	174.80	175.10
Dry Mass	g	143.00	143.00	144.00
Density	Mg/m^3	2.02	2.03	2.03
Dry Density	Mg/m^3	1.66	1.66	1.67
Moisture Content	%	22	22	22
Specific Gravity	kN/m^3	2.65	2.65	2.65
(assumed/measured)		assumed	assumed	assumed

Final Specimen Conditions

Moisture Content	%	22	22	22
Density	Mg/m^3	2.69	2.80	2.92
Dry Density	Mg/m^3	2.21	2.29	2.40

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Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	15.50
Depth	to(m)	15.80

Test Setup

Date started	07/06/2019	07/06/2019	07/06/2019
Date Finished	13/06/2019	13/06/2019	13/06/2019
Top Drain Used	y	y	y
Base Drain Used	y	y	y
Side Drains Used	y	y	y
Pressure System Number	P11	P13	P12
Cell Number	C11	C13	C12

Saturation

Cell Pressure Incr.	kPa	100.00	100.00	100.00
Back Pressure Incr.	kPa	95.00	95.00	95.00
Differential Pressure	kPa	5.00	5.00	5.00
Final Cell Pressure	kPa	400.00	500.00	600.00
Final Pore Pressure	kPa	400.00	499.00	598.00
Final B Value		0.95	0.95	0.97

Consolidation

Effective Pressure	kPa	310.00	410.00	510.00
Cell Pressure	kPa	400.00	500.00	600.00
Back Pressure	kPa	90.00	90.00	90.00
Excess Pore Pressure	kPa	310.00	410.00	508.00
Pore Pressure at End	kPa	90.00	90.00	90.00
Consolidated Volume	cm^3	64.79	62.44	60.09
Consolidated Height	mm	69.71	69.02	68.33
Consolidated Area	mm^2	946.40	925.78	905.17
Vol. Compressibility	m^2/MN	2.75868	3.06161	3.36455
Consolidation Coef.	$m^2/yr.$	9.53137	2.94178	1.05904

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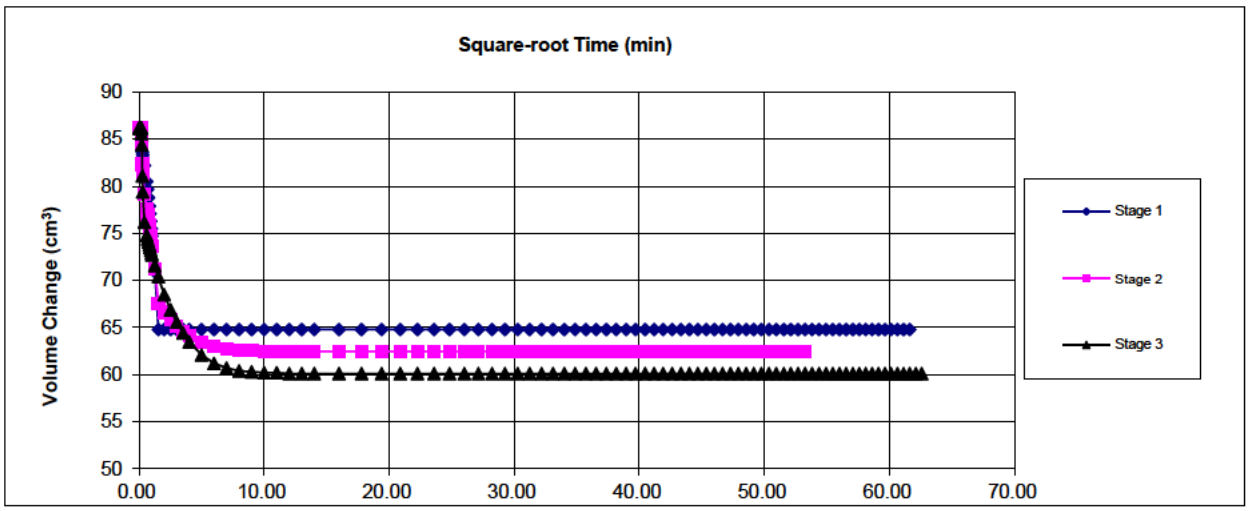
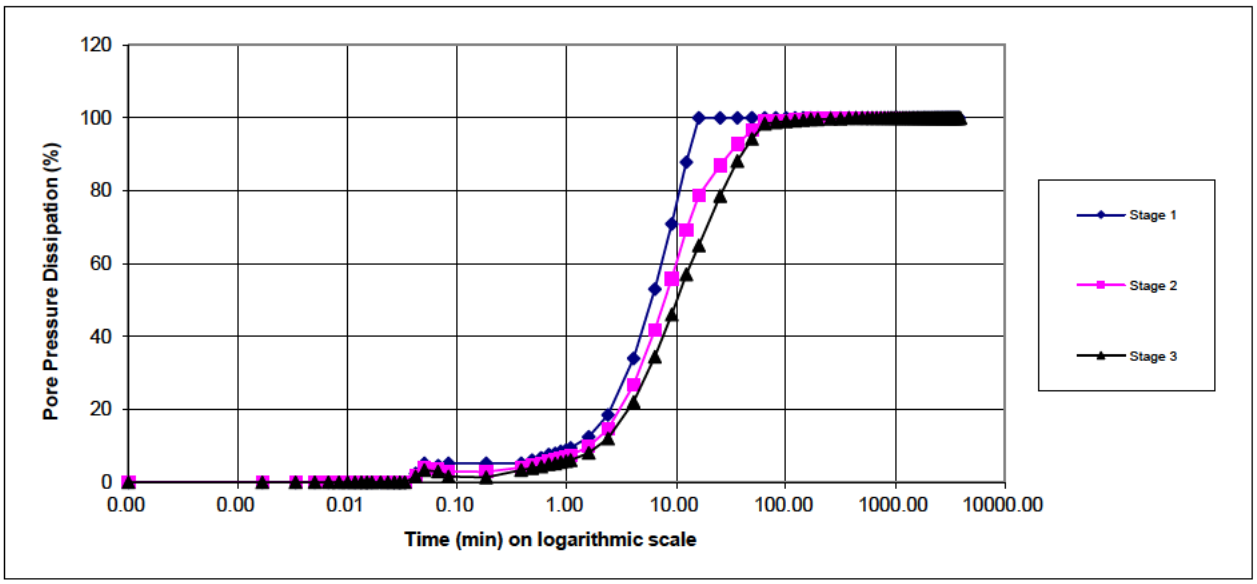
Consolidation Stage





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Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	15.50
Depth	to(m)	15.80

Shearing

Initial Cell Pressure	kPa	400	500	600
Initial Pore Pressure	kPa	90	90	90
Rate of Strain	mm/min	0.4850	0.1482	0.0528
Max Deviator Stress				
Axial Strain		13.097	14.358	15.674
Axial Stress	kPa	872.339	1116.01	1185.00
Cor. Deviator stress	kPa	860.255	1102.67	1171.62
Effective Major Stress	kPa	1179.255	1498.17	1589.62
Effective Minor Stress	kPa	320.000	395.50	418.00
Effective Stress Ratio		3.685	3.788	3.80
s'	kPa	749.627	946.83	1003.81
t'	kPa	429.627	551.33	585.81
Max Effective Priciple Stress Ratio				
Axial Strain		8.449	12.678	14.620
Axial Stress	kPa	860.952	1096.410	1171.511
Cor. Deviator stress	kPa	848.820	1083.411	1158.298
Effective Major Stress	kPa	1152.820	1470.411	1562.298
Effective Minor Stress	kPa	304.000	387.000	404.000
Effective Stress Ratio		3.792	3.800	3.867
s'	kPa	728.410	928.706	983.149
t'	kPa	424.410	541.706	579.149
Shear Resistance Angle	degs			36.0
Cohesion c'	kPa			0

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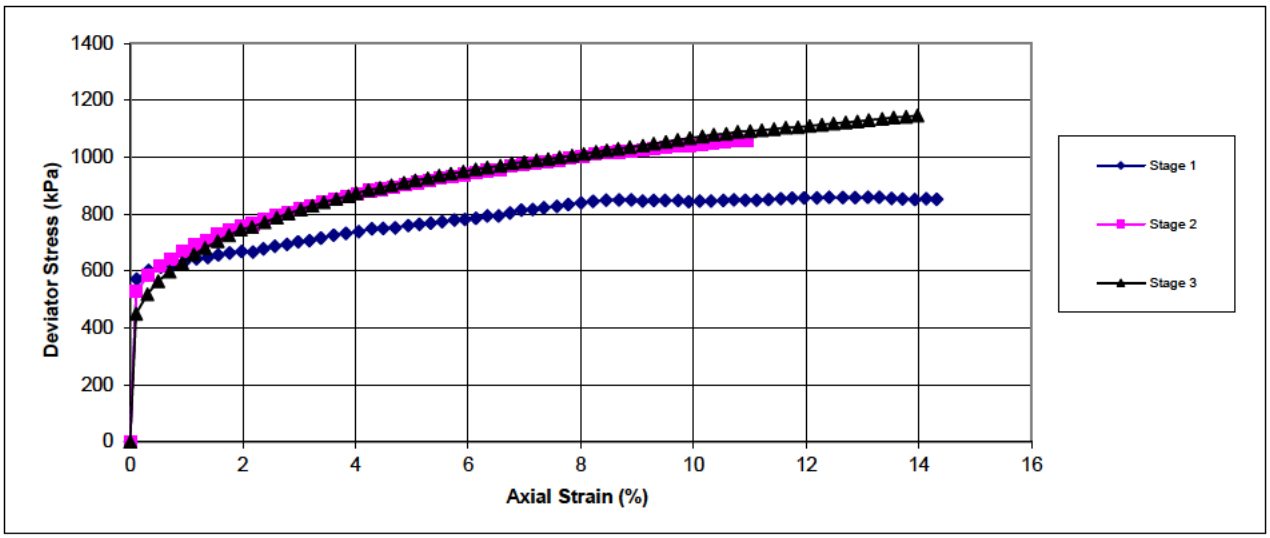
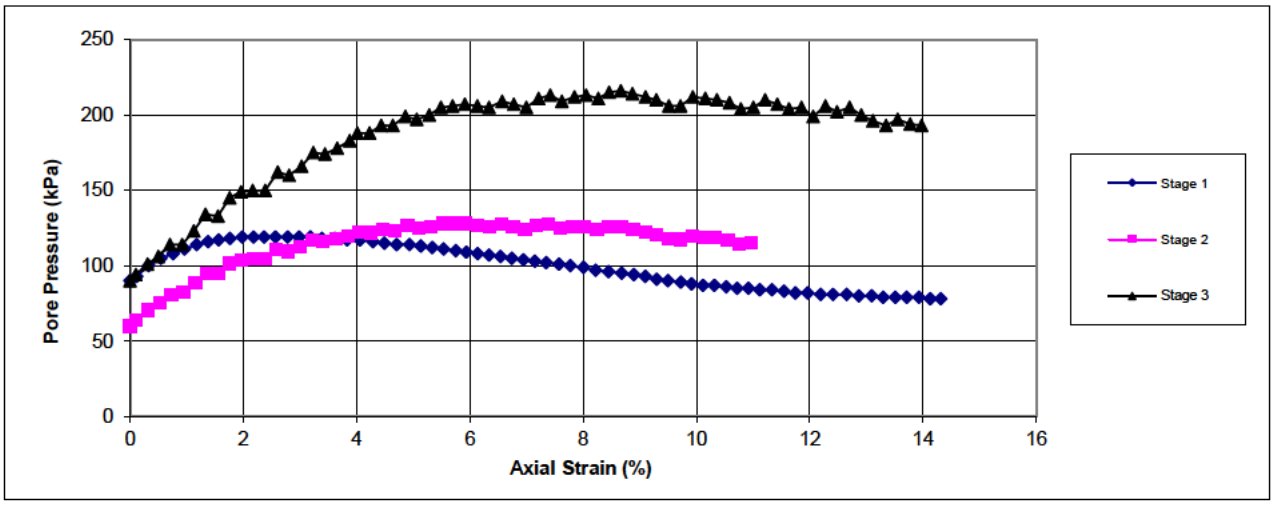
Shearing Stage





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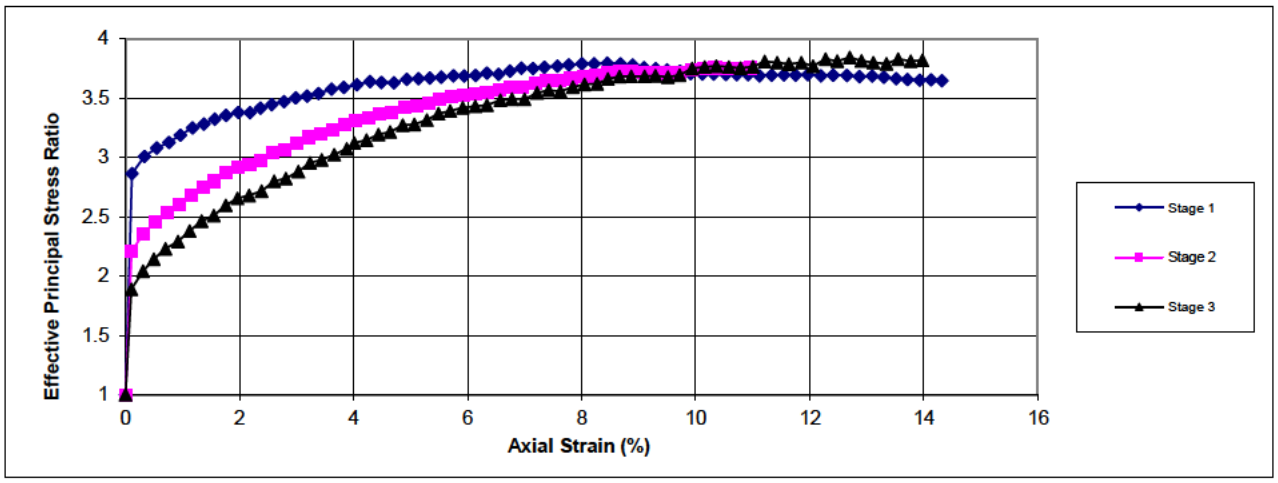
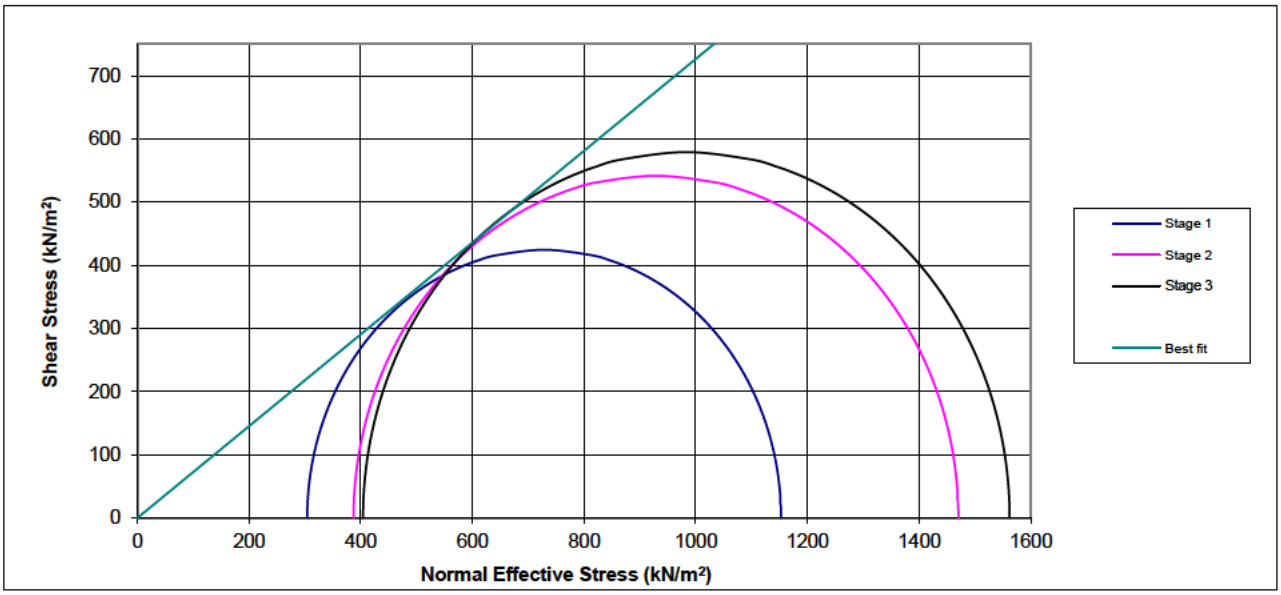
Depth	to(m)	15.80

Shearing Stage





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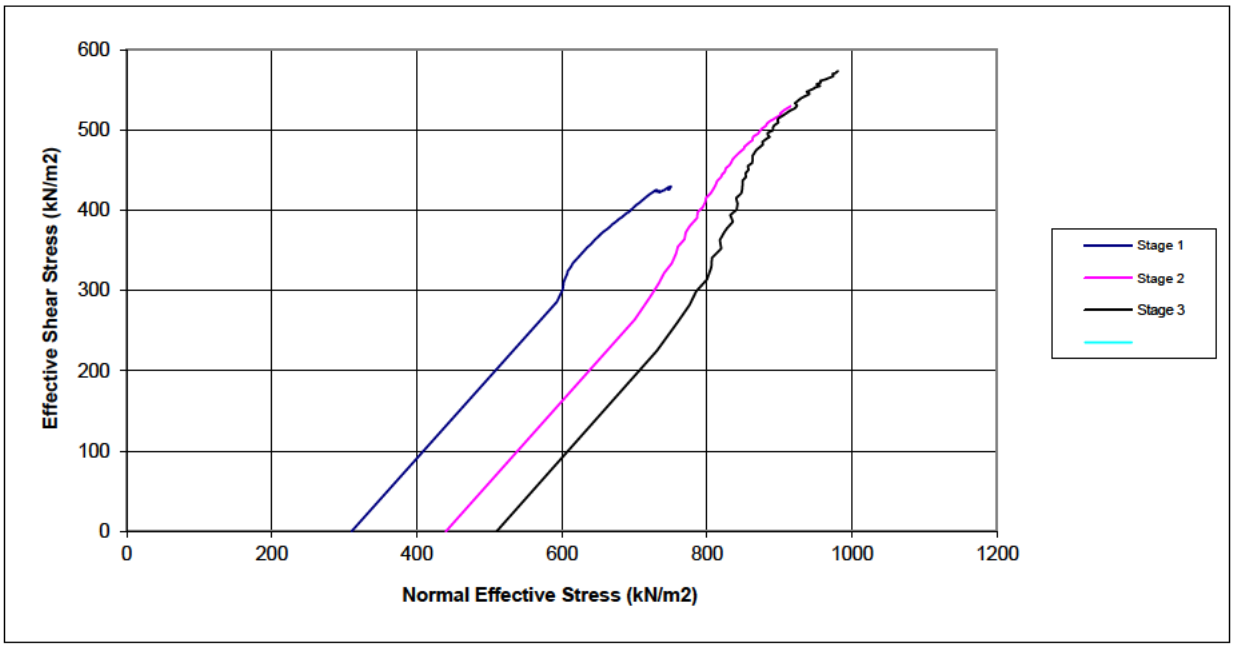
Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	15.50
Depth	to(m)	15.80

Shearing Stage



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Specimen Details

Borehole		BH01
Sample No.		U1
Depth	from(m)	15.50
Depth	to(m)	15.80

[redacted]

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GEO SITE & TESTING SERVICES LTD

4480

Tim Rudkin
Soils Ltd
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 19-06997

Site Reference:	Stoneham CCRC
Project / Job Ref:	17624
Order No:	None Supplied
Sample Receipt Date:	17/05/2019
Sample Scheduled Date:	17/05/2019
Report Issue Number:	1
Reporting Date:	23/05/2019

[redacted]
Dave Ashworth
Deputy Quality Manager

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DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 19-06997	**Date Sampled**	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	**TP / BH No**	BH01	BH01	BH01	BH01	BH01
Project / Job Ref: 17624	**Additional Refs**	D5	D9	D13	D17	D20
Order No: None Supplied	**Depth (m)**	4.00	9.50	15.00	20.00	24.50
Reporting Date: 23/05/2019	**DETS Sample No**	409129	409130	409131	409132	409133

Determinand	**Unit**	**RL**	**Accreditation**					
pH	pH Units	N/a	**MCERTS**	9.4	8.4	7.6	7.4	7.5
Total Sulphate as SO_4	mg/kg	< 200	NONE	< 200	< 200	1160	2126	872
Total Sulphate as SO_4	%	< 0.02	NONE	< 0.02	< 0.02	0.12	0.21	0.09
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	**MCERTS**	43	< 10	404	1030	260
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	**MCERTS**	0.04	< 0.01	0.40	1.03	0.26
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	0.38	0.69	0.43
Ammonium as NH_4	mg/kg	< 0.5	NONE	11.8	3.7	3.7	5.8	6.5
Ammonium as NH_4	mg/l	< 0.05	NONE	1.18	0.37	0.37	0.58	0.65
W/S Chloride (2:1)	mg/kg	< 1	**MCERTS**	22	9	10	12	10
W/S Chloride (2:1)	mg/l	< 0.5	**MCERTS**	11.1	4.5	5	6.1	5.1
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	**MCERTS**	9	5	< 3	< 3	< 3
Water Soluble Nitrate (2:1) as NO_3	mg/l	< 1.5	**MCERTS**	4.6	2.5	< 1.5	< 1.5	< 1.5
W/S Magnesium	mg/l	< 0.1	NONE	2.1	1.4	16	44	14

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

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Soil Analysis Certificate						
DETS Report No: 19-06997	**Date Sampled**	25/04/19	25/04/19	25/04/19	01/05/19	01/05/19
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	**TP / BH No**	BH02	BH02	BH02	BH03	BH03
Project / Job Ref: 17624	**Additional Refs**	D2	D6	D13	D2	D5
Order No: None Supplied	**Depth (m)**	1.00	6.00	13.00	2.00	5.00
Reporting Date: 23/05/2019	**DETS Sample No**	409134	409135	409136	409137	409138

Determinand	**Unit**	**RL**	**Accreditation**					
pH	pH Units	N/a	**MCERTS**	7.6	7.3	7.2	7.3	7.2
Total Sulphate as SO_4	mg/kg	< 200	NONE	< 200	< 200	769	< 200	< 200
Total Sulphate as SO_4	%	< 0.02	NONE	< 0.02	< 0.02	0.08	< 0.02	< 0.02
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	**MCERTS**	18	< 10	280	< 10	< 10
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	**MCERTS**	0.02	< 0.01	0.28	< 0.01	< 0.01
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	0.23	< 0.02	< 0.02
Ammonium as NH_4	mg/kg	< 0.5	NONE	1.8	5.5	5.9	2.1	2.6
Ammonium as NH_4	mg/l	< 0.05	NONE	0.18	0.55	0.59	0.21	0.26
W/S Chloride (2:1)	mg/kg	< 1	**MCERTS**	6	7	10	5	9
W/S Chloride (2:1)	mg/l	< 0.5	**MCERTS**	2.9	3.6	4.8	2.6	4.5
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	**MCERTS**	3	4	< 3	< 3	< 3
Water Soluble Nitrate (2:1) as NO_3	mg/l	< 1.5	**MCERTS**	1.5	2	< 1.5	< 1.5	< 1.5
W/S Magnesium	mg/l	< 0.1	NONE	0.9	1.1	11	0.5	0.5

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
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Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 19-06997	**Date Sampled**	01/05/19	01/05/19	02/05/19	02/05/19	02/05/19
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	**TP / BH No**	BH03	BH03	BH04	BH04	BH04
Project / Job Ref: 17624	**Additional Refs**	D9	D10	B2	B4	D1
Order No: None Supplied	**Depth (m)**	12.50	14.00	0.60 - 1.10	1.80 - 2.20	3.00
Reporting Date: 23/05/2019	**DETS Sample No**	409139	409140	409141	409142	409143

Determinand	**Unit**	**RL**	**Accreditation**					
pH	pH Units	N/a	**MCERTS**	7.2	7.4	7.2	6.8	6.8
Total Sulphate as SO_4	mg/kg	< 200	NONE	693	826	2066	< 200	< 200
Total Sulphate as SO_4	%	< 0.02	NONE	0.07	0.08	0.21	< 0.02	< 0.02
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	**MCERTS**	227	266	191	< 10	< 10
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	**MCERTS**	0.23	0.27	0.19	< 0.01	< 0.01
Total Sulphur	%	< 0.02	NONE	0.34	0.36	0.12	< 0.02	< 0.02
Ammonium as NH_4	mg/kg	< 0.5	NONE	3.5	8.6	7	3.2	3.4
Ammonium as NH_4	mg/l	< 0.05	NONE	0.35	0.86	0.70	0.32	0.34
W/S Chloride (2:1)	mg/kg	< 1	**MCERTS**	7	8	38	3	9
W/S Chloride (2:1)	mg/l	< 0.5	**MCERTS**	3.7	4.1	19.2	1.7	4.4
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	**MCERTS**	< 3	< 3	68	< 3	4
Water Soluble Nitrate (2:1) as NO_3	mg/l	< 1.5	**MCERTS**	< 1.5	< 1.5	34.2	< 1.5	1.8
W/S Magnesium	mg/l	< 0.1	NONE	11	13	2.9	0.4	0.9

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
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4480

Soil Analysis Certificate						
DETS Report No: 19-06997	**Date Sampled**	01/05/19	23/04/19	01/05/19	29/04/19	
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Stoneham CCRC	**TP / BH No**	WS09	WS10	WS11	HP02	
Project / Job Ref: 17624	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	**Depth (m)**	1.60	0.30	1.30	0.50	
Reporting Date: 23/05/2019	**DETS Sample No**	409144	409145	409146	409147	

Determinand	**Unit**	**RL**	**Accreditation**					
pH	pH Units	N/a	**MCERTS**	6.7	6.6	6.5	6.7	
Total Sulphate as SO_4	mg/kg	< 200	NONE	< 200	< 200	< 200	470	
Total Sulphate as SO_4	%	< 0.02	NONE	< 0.02	< 0.02	< 0.02	0.05	
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	**MCERTS**	< 10	< 10	11	< 10	
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	**MCERTS**	< 0.01	< 0.01	0.01	< 0.01	
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	< 0.02	0.02	
Ammonium as NH_4	mg/kg	< 0.5	NONE	2.2	3.6	2.2	9.6	
Ammonium as NH_4	mg/l	< 0.05	NONE	0.22	0.36	0.22	0.96	
W/S Chloride (2:1)	mg/kg	< 1	**MCERTS**	5	2	6	4	
W/S Chloride (2:1)	mg/l	< 0.5	**MCERTS**	2.3	1.2	3	2	
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	**MCERTS**	< 3	< 3	< 3	13	
Water Soluble Nitrate (2:1) as NO_3	mg/l	< 1.5	**MCERTS**	< 1.5	< 1.5	< 1.5	6.7	
W/S Magnesium	mg/l	< 0.1	NONE	0.4	0.4	0.9	0.7	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-06997	
Soils Ltd	
Site Reference: Stoneham CCRC	
Project / Job Ref: 17624	
Order No: None Supplied	
Reporting Date: 23/05/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
$ 409129	BH01	D5	4.00	17.3	Orange sandy clay
$ 409130	BH01	D9	9.50	14.8	Light brown sand
$ 409131	BH01	D13	15.00	16.7	Black loamy sand
$ 409132	BH01	D17	20.00	16.3	Black loamy sand
$ 409133	BH01	D20	24.50	19	Brown loamy sand
$ 409134	BH02	D2	1.00	8	Light brown sandy clay with stones and chalk
$ 409135	BH02	D6	6.00	14.8	Light brown sand
$ 409136	BH02	D13	13.00	13.3	Brown loamy sand
$ 409137	BH03	D2	2.00	14.2	Orange sand
$ 409138	BH03	D5	5.00	16.7	Light brown sand
$ 409139	BH03	D9	12.50	18.5	Brown loamy clay
$ 409140	BH03	D10	14.00	19.3	Black loamy sand
$ 409141	BH04	B2	0.60 - 1.10	14.1	Black loamy sand with stones and metal
$ 409142	BH04	B4	1.80 - 2.20	5.1	Brown sandy gravel with stones
$ 409143	BH04	D1	3.00	15.3	Orange sand
$ 409144	WS09	None Supplied	1.60	7.1	Brown sandy gravel with stones
$ 409145	WS10	None Supplied	0.30	4.1	Brown sandy gravel with stones
$ 409146	WS11	None Supplied	1.30	9.5	Orange sandy clay with stones
$ 409147	HP02	None Supplied	0.50	8.1	Black loamy sand with stones and vegetation

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

$ samples exceeded recommended holding times

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Lenham Heath
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4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 19-06997
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: None Supplied
Reporting Date: 23/05/2019

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10 C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Appendix C Foundation Design

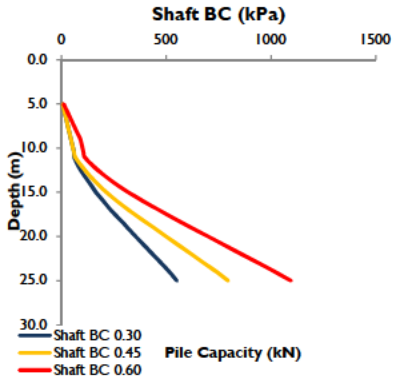
Appendix C.1 Preliminary Pile Design

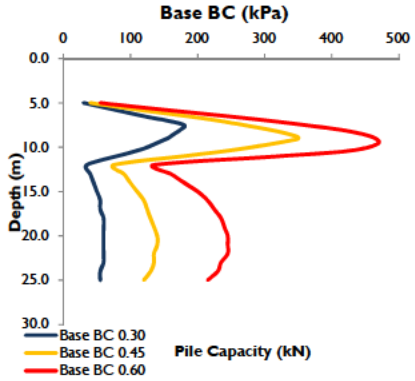
Preliminary Pile Working Loads

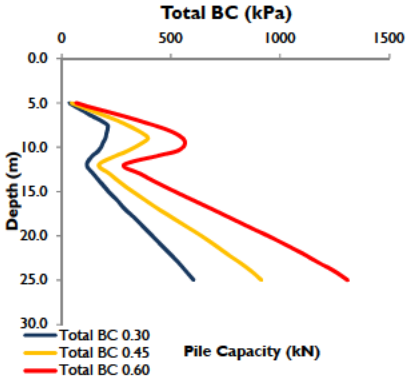
Single Vertically Loaded Pile (kN)

Parameters:		FOS:	Shaft	Base			Alpha Value (α):	0.45	Maximum no. of layers	2
Name:	DVT	Clay:	3	3	GW Level:	0	NC Value:	9		
Job No:	17624	Chalk:	0	0			Specific Chalk Density:	0		
Date:	13.6.19	Gravel:	3	3			Depth to top of strata:	4.5		

Notes:







		Pile Diameter (m):									
Pile Depths		0.3			0.45			0.6			
Material	(m bgl)	Shaft	Base	Total	Shaft	Base	Total	Shaft	Base	Total	Layer
Gravel	5.0	5	30	35	5	40	45	10	55	65	1
Gravel	5.5	10	60	70	10	85	95	20	115	135	1
Gravel	6.0	15	90	105	15	135	150	30	180	210	1
Gravel	6.5	20	120	140	20	185	205	40	245	285	1
Gravel	7.0	25	155	180	25	230	255	50	305	355	1
Gravel	7.5	30	180	210	30	270	300	60	360	420	1
Gravel	8.0	35	175	210	35	305	340	70	410	480	1
Gravel	8.5	40	165	205	40	335	375	80	445	525	1
Gravel	9.0	45	155	200	45	350	395	90	465	555	1
Gravel	9.5	50	140	190	50	320	370	95	470	565	1
Gravel	10.0	55	125	180	55	280	335	100	455	555	1
Gravel	10.5	60	105	165	60	235	295	105	415	520	1
Gravel	11.0	60	80	140	65	180	245	110	325	435	1
Clay	12.0	80	35	115	95	75	170	150	135	285	2
Clay	13.0	105	40	145	130	90	220	200	160	360	2
Clay	14.0	135	45	180	170	100	270	255	180	435	2
Clay	15.0	165	50	215	215	110	325	320	200	520	2
Clay	16.0	200	55	255	265	120	385	390	215	605	2
Clay	17.0	235	55	290	320	125	445	465	225	690	2
Clay	18.0	275	60	335	380	130	510	540	235	775	2
Clay	19.0	315	60	375	440	135	575	620	240	860	2
Clay	20.0	355	60	415	500	140	640	700	245	945	2
Clay	21.0	395	60	455	560	140	700	780	245	1025	2
Clay	22.0	435	60	495	620	135	755	860	245	1105	2
Clay	23.0	475	60	535	680	135	815	940	235	1175	2
Clay	24.0	515	55	570	740	130	870	1020	230	1250	2
Clay	25.0	550	55	605	795	120	915	1095	215	1310	2

Appendix D Chemical Laboratory Testing

Appendix D.1 Conceptual Site Model

Table D.1.1 CSM Revised Post Testing

Source	Potential Contaminant	Exposure Pathway	Receptor	Initial Assessment from Desk Study and Main Investigation Report Information			Comments	Proposed Investigation
				Severity	Probability	Risk		
Surface wastes and demolition-based Spoil including concrete, glass, plastics, hydrocarbons and asbestos	Metals, hydrocarbons, asbestos, concrete	Inhalation of dust	Site Workers/Site Maintenance	Mild	Likely	Moderate/low	Removal of spoil and wastes from site prior to development will reduce all risks to very low. Hydrocarbon vapour risk and gas risk removed as source is above ground. Risk to construction removed as source is above ground. Water risk unlikely as groundwater probably perched and not in continuity at shallow depth or to underlying water table.	Recommend consultation with asbestos competent asbestos specialist and competent waste person prior to works to determine appropriate measures and any additional analysis required to comply with current guidance and legislation (CAR2012)
			End Users	Mild	Unlikely	Very low		
			Off-site Users	Mild	Likely	Moderate/low		
		~~Inhalation of Vapour/gases (including Radon)~~	~~Site Workers/Site Maintenance~~	-	-	-		
			~~End Users~~	-	-	-		
			~~Off-site Users~~	-	-	-		
	Metals, hydrocarbons	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Mild	Likely	Moderate/low		
			End Users	Mild	Likely	Moderate/low		
	Metals, hydrocarbons	Migration via surface runoff	Surface Water	Minor	Unlikely	Very Low		
		Migration in solution via groundwater	Shallow Aquifer	Minor	Unlikely	Very Low		
			Deep Aquifer	Minor	Unlikely	Very Low		
		~~Direct contact with construction material~~	~~Buried structures~~	-	-	-		
			~~Buried Services~~	-	-	-		
		~~Migration of gases via permeable soils~~	~~Site Workers/Site Maintenance~~	-	-	-		
			~~End Users~~	-	-	-		
			~~Off-site Users~~	-	-	-		
			~~Building and confined spaces~~	-	-	-		
Fuel and oil wastes	Hydrocarbons and metals	Inhalation of dust	Site Workers/Site Maintenance	Minor	Unlikely	Very Low	Oils present at very minor levels at depth in only one confirmed location over 1.5m below ground – BH02. Soil Risk Assessment development following a regime of 9no. monitoring visits designated the sites gassing regime as Characteristic Situation 1, for which now precautionary measures are required in design. It should be noted an underlying piston effect at depth was noted within standpipe BH2(D) and therefore due care should be given to any works which may provide a linkage, access to breach into this lower regime.	No action necessary.
			End Users	Minor	Unlikely	Very Low		
			Off-site Users	Minor	Unlikely	Very Low		
	Hydrocarbons and metals	Inhalation of Vapour/gases (including Radon)	Site Workers/Site Maintenance	Minor	Unlikely	Very Low		
			End Users	Minor	Unlikely	Very Low		
			Off-site Users	Minor	Unlikely	Very Low		
	Hydrocarbons and metals	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Minor	Unlikely	Very Low		
			End Users	Minor	Unlikely	Very Low		
	Hydrocarbons and metals	Migration via surface runoff	Surface Water	Minor	Unlikely	Very Low		
		Migration in solution via groundwater	Shallow Aquifer	Minor	Unlikely	Very Low		
			Deep Aquifer	Minor	Unlikely	Very Low		
		Direct contact with construction material	Buried structures	Minor	Unlikely	Very Low		
			Buried Services	Minor	Unlikely	Very Low		
	Hydrocarbons and metals	Migration of gases via permeable soils	Site Workers/Site Maintenance	Minor	Unlikely	Very Low		
			End Users	Minor	Unlikely	Very Low		
			Off-site Users	Minor	Unlikely	Very Low		
			Building and confined spaces	Minor	Unlikely	Very Low		

Appendix D.2 Chemical Laboratory Results

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t: 01622 850410

DETS Report No: 19-06076

Site Reference:	Stoneham CCRC
Project / Job Ref:	17624
Order No:	17624/CS
Sample Receipt Date:	01/05/2019
Sample Scheduled Date:	01/05/2019
Report Issue Number:	2
Reporting Date:	09/05/2019

[redacted]

Dave Ashworth
Deputy Quality Manager

This report supersedes 19-06076, issue no.1.

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Soil Analysis Certificate						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP01	TP01	TP01	TP01	TP02
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.60	1.00	1.80	0.20
Reporting Date: 09/05/2019	DETS Sample No	405464	405465	405466	405467	405468

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	5.5	5.7	5.7	5.1	5.8
Total Cyanide	mg/kg	< 2	NONE					
Free Cyanide	mg/kg	< 2	NONE					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					
Organic Matter	%	< 0.1	MCERTS	2.6	0.5	0.3	0.3	5.3
Arsenic (As)	mg/kg	< 2	MCERTS	6	5	9	10	8
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	1.8	2.6	0.3	4.9	3
Chromium (Cr)	mg/kg	< 2	MCERTS	16	20	18	23	15
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	20	13	11	16	38
Lead (Pb)	mg/kg	< 3	MCERTS	58	11	8	10	112
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	8	9	10	10	10
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	23	21	26	40	25
Zinc (Zn)	mg/kg	< 3	MCERTS	78	23	27	30	427
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Unit 1, Rose Lane Industrial Estate
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Maidstone
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Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP02	TP03	TP03	TP04	TP04
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.50	0.20	0.60	0.20	0.50
Reporting Date: 09/05/2019	DETS Sample No	405469	405470	405471	405472	405473

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	5.8	5.6	5.2	4.9	4.8
Total Cyanide	mg/kg	< 2	NONE					
Free Cyanide	mg/kg	< 2	NONE					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					
Organic Matter	%	< 0.1	MCERTS	0.5	2.3	0.5	2.3	1.1
Arsenic (As)	mg/kg	< 2	MCERTS	15	6	5	6	5
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	1.7	0.4	< 0.2	0.5	0.4
Chromium (Cr)	mg/kg	< 2	MCERTS	25	13	13	14	15
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	10	23	7	13	7
Lead (Pb)	mg/kg	< 3	MCERTS	24	62	14	50	11
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	10	6	6	6	7
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	43	24	20	24	22
Zinc (Zn)	mg/kg	< 3	MCERTS	63	37	26	47	33
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP05	TP05	TP06	TP06	TP07
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.50	0.20	0.50	0.20
Reporting Date: 09/05/2019	DETS Sample No	405474	405475	405476	405477	405478

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	4.0	4.1	3.4	3.8	3.8
Total Cyanide	mg/kg	< 2	NONE					
Free Cyanide	mg/kg	< 2	NONE					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					
Organic Matter	%	< 0.1	MCERTS	2.1	0.5	3.1	0.6	1.6
Arsenic (As)	mg/kg	< 2	MCERTS	7	8	6	16	7
W/S Boron	mg/kg	< 1	NONE	1.1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.4	< 0.2	0.3	0.3	0.3
Chromium (Cr)	mg/kg	< 2	MCERTS	13	15	16	29	15
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	8	8	8	10	11
Lead (Pb)	mg/kg	< 3	MCERTS	36	12	30	14	31
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	5	7	5	9	5
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	24	29	24	46	25
Zinc (Zn)	mg/kg	< 3	MCERTS	26	26	26	34	31
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
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Maidstone
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Soil Analysis Certificate						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP07	HP01	HP02	HP02	HP03
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.70	0.30	0.50	1.00	0.30
Reporting Date: 09/05/2019	DETS Sample No	405479	405480	405481	405482	405483

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE		Chrysotile present in bundles			
Asbestos Type (S)	PLM Result	N/a	ISO17025		Chrysotile			
pH	pH Units	N/a	MCERTS	4.1	6.4	6.3	6.3	6.5
Total Cyanide	mg/kg	< 2	NONE					
Free Cyanide	mg/kg	< 2	NONE					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					
Organic Matter	%	< 0.1	MCERTS	0.4	6.9	6.6	3	6
Arsenic (As)	mg/kg	< 2	MCERTS	3	14	17	5	11
W/S Boron	mg/kg	< 1	NONE	< 1	1.9	1.4	< 1	1.3
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	2.2	1	0.6	1.6
Chromium (Cr)	mg/kg	< 2	MCERTS	7	31	20	8	24
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	< 4	99	57	47	101
Lead (Pb)	mg/kg	< 3	MCERTS	5	197	307	102	209
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	< 3	16	19	7	13
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	10	23	33	11	23
Zinc (Zn)	mg/kg	< 3	MCERTS	11	481	385	215	541
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
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Soil Analysis Certificate						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	HP04	TPADD1	TPADD1	BH02	TPADD2
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.20	0.40	2.00	0.20
Reporting Date: 09/05/2019	DETS Sample No	405484	405485	405486	405487	405488

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	6.6	6.4	6.6	6.8	6.4
Total Cyanide	mg/kg	< 2	NONE				< 2	
Free Cyanide	mg/kg	< 2	NONE				< 2	
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS				13	
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS				0.01	
Organic Matter	%	< 0.1	MCERTS	6.5	1.6	0.6	0.6	5.9
Arsenic (As)	mg/kg	< 2	MCERTS	9	3	8	5	7
W/S Boron	mg/kg	< 1	NONE	1.8	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	1.4	0.2	0.3	0.2	0.6
Chromium (Cr)	mg/kg	< 2	MCERTS	22	5	14	9	15
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	136	12	9	5	37
Lead (Pb)	mg/kg	< 3	MCERTS	200	30	15	8	106
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	13	3	6	4	8
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	21	7	24	15	22
Zinc (Zn)	mg/kg	< 3	MCERTS	503	54	33	17	164
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TPADD2	TPADD2	TPADD3	TPADD3	TPADD4
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.50	2.10	0.20	0.40	0.30
Reporting Date: 09/05/2019	DETS Sample No	405489	405490	405491	405492	405493

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	6.3	6.2	6.6	6.5	6.8
Total Cyanide	mg/kg	< 2	NONE		< 2			
Free Cyanide	mg/kg	< 2	NONE		< 2			
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS		11			
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS		0.01			
Organic Matter	%	< 0.1	MCERTS	0.4	0.3	6.6	0.2	1.8
Arsenic (As)	mg/kg	< 2	MCERTS	7	6	< 2	4	4
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	1.2	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	0.6	1.1	0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	14	17	20	10	6
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	6	8	42	4	29
Lead (Pb)	mg/kg	< 3	MCERTS	9	10	148	6	174
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	6	10	11	< 3	5
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	26	27	30	12	14
Zinc (Zn)	mg/kg	< 3	MCERTS	23	30	249	15	67
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate							
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	TPADD5	TPADD6				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.20	0.20				
Reporting Date: 09/05/2019	DETS Sample No	405494	405495				

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected			
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	6.2	6.4			
Total Cyanide	mg/kg	< 2	NONE		< 2			
Free Cyanide	mg/kg	< 2	NONE		< 2			
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS		< 10			
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS		< 0.01			
Organic Matter	%	< 0.1	MCERTS	5.9	5.4			
Arsenic (As)	mg/kg	< 2	MCERTS	9	12			
W/S Boron	mg/kg	< 1	NONE	< 1	1			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.7	2.4			
Chromium (Cr)	mg/kg	< 2	MCERTS	19	23			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	68	83			
Lead (Pb)	mg/kg	< 3	MCERTS	262	303			
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	13	18			
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3			
Vanadium (V)	mg/kg	< 2	NONE	27	32			
Zinc (Zn)	mg/kg	< 3	MCERTS	276	808			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
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Tel : 01622 850410

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP01	TP01	TP01	TP01	TP02
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.60	1.00	1.80	0.20
Reporting Date: 09/05/2019	DETS Sample No	405464	405465	405466	405467	405468

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.33
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	1.10
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	1.01
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.69
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.67
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.96
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.31
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.67
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.53
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.48
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	6.8

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

DETS Ltd
Unit 1, Rose Lane Industrial Estate
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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP02	TP03	TP03	TP04	TP04
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.50	0.20	0.60	0.20	0.50
Reporting Date: 09/05/2019	DETS Sample No	405469	405470	405471	405472	405473

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

DETS Ltd
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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP05	TP05	TP06	TP06	TP07
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.50	0.20	0.50	0.20
Reporting Date: 09/05/2019	DETS Sample No	405474	405475	405476	405477	405478

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP07	HP01	HP02	HP02	HP03
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.70	0.30	0.50	1.00	0.30
Reporting Date: 09/05/2019	DETS Sample No	405479	405480	405481	405482	405483

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	0.19	0.21	0.24	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.13	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.61	0.38	0.84	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.54	0.31	0.78	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.40	0.20	0.50	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	0.42	0.22	0.52	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.77	0.35	0.97	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.24	< 0.1	0.30	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.56	0.21	0.66	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.64	0.20	0.60	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	0.63	0.15	0.48	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	5.1	2.2	5.9	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	HP04	TPADD1	TPADD1	BH02	TPADD2
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.20	0.40	2.00	0.20
Reporting Date: 09/05/2019	DETS Sample No	405484	405485	405486	405487	405488

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	0.15	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	0.13	0.51	< 0.1	0.13	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	0.17	< 0.1	1.06	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	0.18	< 0.1	0.99	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	0.93	2.12	< 0.1	5.08	0.24
Anthracene	mg/kg	< 0.1	MCERTS	0.37	0.69	< 0.1	0.78	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	2.07	4.78	< 0.1	3.01	0.79
Pyrene	mg/kg	< 0.1	MCERTS	1.91	4.26	< 0.1	3.99	0.78
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	1.37	3.07	< 0.1	1.87	0.55
Chrysene	mg/kg	< 0.1	MCERTS	1.58	2.90	< 0.1	2.82	0.65
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	5.57	5.79	< 0.1	5	1.16
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	1.45	1.79	< 0.1	1.57	0.33
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	5.44	4.91	< 0.1	2.75	0.86
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	7.18	4.66	< 0.1	1.28	0.77
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	0.91	0.50	< 0.1	0.20	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	6.20	4.11	< 0.1	0.81	0.70
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	35.1	40.6	< 1.6	31.3	6.8

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TPADD2	TPADD2	TPADD3	TPADD3	TPADD4
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.50	2.10	0.20	0.40	0.30
Reporting Date: 09/05/2019	DETS Sample No	405489	405490	405491	405492	405493

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.25
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.12	< 0.1	0.46
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.11	< 0.1	0.35
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.18
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.21
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.14	< 0.1	0.28
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.16
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.17
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.12
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	2.2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Speciated PAHs							
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	TPADD5	TPADD6				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.20	0.20				
Reporting Date: 09/05/2019	DETS Sample No	405494	405495				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Fluoranthene	mg/kg	< 0.1	MCERTS	0.21	0.14			
Pyrene	mg/kg	< 0.1	MCERTS	0.19	0.13			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.13	< 0.1			
Chrysene	mg/kg	< 0.1	MCERTS	0.16	< 0.1			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.25	0.17			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.13	< 0.1			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.16	< 0.1			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.14	< 0.1			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP01	TP01	TP01	TP01	TP02
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.60	1.00	1.80	0.20
Reporting Date: 09/05/2019	DETS Sample No	405464	405465	405466	405467	405468

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	9
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	12	< 6	< 6	< 6	50
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	12	< 6	< 6	< 6	59

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP02	TP03	TP03	TP04	TP04
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.50	0.20	0.60	0.20	0.50
Reporting Date: 09/05/2019	DETS Sample No	405469	405470	405471	405472	405473

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	< 6	< 6	< 6	< 6	< 6
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	< 6	< 6	< 6	< 6	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP05	TP05	TP06	TP06	TP07
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.50	0.20	0.50	0.20
Reporting Date: 09/05/2019	DETS Sample No	405474	405475	405476	405477	405478

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	19	< 6	23	< 6	< 6
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	19	< 6	23	< 6	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

DETS Ltd
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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP07	HP01	HP02	HP02	HP03
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.70	0.30	0.50	1.00	0.30
Reporting Date: 09/05/2019	DETS Sample No	405479	405480	405481	405482	405483

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	5	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	87	< 1	16	< 1
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	< 6	1227	< 6	368	< 6
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	< 6	1319	< 6	385	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	29/04/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	HP04	TPADD1	TPADD1	TPADD2	TPADD2
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.30	0.20	0.40	0.20	0.50
Reporting Date: 09/05/2019	DETS Sample No	405484	405485	405486	405488	405489

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	24	10	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	140	59	< 1	11	< 1
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	934	621	< 6	207	< 6
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	1097	690	< 6	218	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19	29/04/19	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Stoneham CCRC	TP / BH No	TPADD3	TPADD3	TPADD4	TPADD5	
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 17624/CS	Depth (m)	0.20	0.40	0.30	0.20	
Reporting Date: 09/05/2019	DETS Sample No	405491	405492	405493	405494	

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	2	
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	58	< 6	< 6	64	
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	58	< 6	< 6	66	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Stoneham CCRC	TP / BH No	BH02	TPADD2	TPADD6		
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 17624/CS	Depth (m)	2.00	2.10	0.20		
Reporting Date: 09/05/2019	DETS Sample No	405487	405490	405495		

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3		
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3		
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10		
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21		
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	7	< 2	< 2		
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	45	< 3	< 3		
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	87	< 10	< 10		
Aromatic (C5 - C35)	mg/kg	< 21	NONE	139	< 21	< 21		
Total >C5 - C35	mg/kg	< 42	NONE	139	< 42	< 42		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Stoneham CCRC	TP / BH No	BH02	TPADD2	TPADD6		
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 17624/CS	Depth (m)	2.00	2.10	0.20		
Reporting Date: 09/05/2019	DETS Sample No	405487	405490	405495		

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5		
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - PCB (7 Congeners)						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Stoneham CCRC	TP / BH No	BH02	TPADD2	TPADD6		
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 17624/CS	Depth (m)	2.00	2.10	0.20		
Reporting Date: 09/05/2019	DETS Sample No	405487	405490	405495		

Determinand	Unit	RL	Accreditation					
PCB Congener 28	mg/kg	< 0.008	NONE	< 0.008	< 0.008	< 0.008		
PCB Congener 52	mg/kg	< 0.008	NONE	< 0.008	< 0.008	< 0.008		
PCB Congener 101	mg/kg	< 0.008	NONE	< 0.008	< 0.008	< 0.008		
PCB Congener 118	mg/kg	< 0.008	NONE	< 0.008	< 0.008	< 0.008		
PCB Congener 138	mg/kg	< 0.008	NONE	< 0.008	< 0.008	< 0.008		
PCB Congener 153	mg/kg	< 0.008	NONE	< 0.008	< 0.008	0.012		
PCB Congener 180	mg/kg	< 0.008	NONE	< 0.008	< 0.008	< 0.008		
Total PCB (7 Congeners)	mg/kg	< 0.1	NONE	< 0.1	< 0.1	< 0.1		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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UKAS TESTING 4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 19-06076		**Date Sampled**	29/04/19			**Landfill Waste Acceptance Criteria Limits**		
Soils Ltd		**Time Sampled**	None Supplied			**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Site Reference: Stoneham CCRC		**TP / BH No**	HP01					
Project / Job Ref: 17624		**Additional Refs**	None Supplied					
Order No: 17624/CS		**Depth (m)**	0.30					
Reporting Date: 09/05/2019		**DETS Sample No**	405480					
Determinand	**Unit**	**MDL**						
TOC[MU]	%	< 0.1	4			3%	5%	6%
Loss on Ignition	%	< 0.01	9.80			--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05			6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1			1	--	--
Mineral Oil[MU]	mg/kg	< 10	241			500	--	--
Total PAH[MU]	mg/kg	< 1.7	5.4			100	--	--
pH[MU]	pH Units	N/a	6.4			--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1			--	To be evaluated	To be evaluated
Eluate Analysis			**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**	
Arsenic[U]			< 0.01			< 0.1	0.5	2	25
Barium[U]			< 0.02			< 0.2	20	100	300
Cadmium[U]			< 0.0005			< 0.005	0.04	1	5
Chromium[U]			< 0.005			< 0.05	0.5	10	70
Copper[U]			0.02			0.2	2	50	100
Mercury[U]			< 0.0005			< 0.01	0.01	0.2	2
Molybdenum[U]			0.002			0.02	0.5	10	30
Nickel[U]			< 0.007			< 0.07	0.4	10	40
Lead[U]			< 0.005			< 0.05	0.5	10	50
Antimony[U]			0.0099			0.10	0.06	0.7	5
Selenium[U]			< 0.005			< 0.05	0.1	0.5	7
Zinc[U]			0.043			0.43	4	50	200
Chloride[U]			1			14	800	15000	25000
Fluoride[U]			< 0.5			< 5	10	150	500
Sulphate[U]			6			58	1000	20000	50000
TDS			96			961	4000	60000	100000
Phenol Index			< 0.01			< 0.1	1	-	-
DOC			21.4			214	500	800	1000
Leach Test Information								
Sample Mass (kg)			0.10					
Dry Matter (%)			87.8					
Moisture (%)			14					
Stage 1								
Volume Eluate L10 (litres)			0.89					

Results are expressed on a dry weight basis, after correction for moisture content where applicable
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U Denotes ISO17025 accredited test

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UKAS TESTING 4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 19-06076		**Date Sampled**	29/04/19				**Landfill Waste Acceptance Criteria Limits**			
Soils Ltd		**Time Sampled**	None Supplied				**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**	
Site Reference: Stoneham CCRC		**TP / BH No**	HP02							
Project / Job Ref: 17624		**Additional Refs**	None Supplied							
Order No: 17624/CS		**Depth (m)**	1.00							
Reporting Date: 09/05/2019		**DETS Sample No**	405482							
Determinand	**Unit**	**MDL**								
TOC[MU]	%	< 0.1	1.8				3%	5%	6%	
Loss on Ignition	%	< 0.01	4.55				--	--	10%	
BTEX[MU]	mg/kg	< 0.05	< 0.05				6	--	--	
Sum of PCBs	mg/kg	< 0.1	< 0.1				1	--	--	
Mineral Oil[MU]	mg/kg	< 10	< 10				500	--	--	
Total PAH[MU]	mg/kg	< 1.7	5.9				100	--	--	
pH[MU]	pH Units	N/a	6.3				--	>6	--	
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1				--	To be evaluated	To be evaluated	
Eluate Analysis			**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**			
Arsenic[U]			< 0.01			< 0.1	0.5	2	25	
Barium[U]			< 0.02			< 0.2	20	100	300	
Cadmium[U]			< 0.0005			< 0.005	0.04	1	5	
Chromium[U]			< 0.005			< 0.05	0.5	10	70	
Copper[U]			0.02			0.2	2	50	100	
Mercury[U]			< 0.0005			< 0.01	0.01	0.2	2	
Molybdenum[U]			0.001			0.01	0.5	10	30	
Nickel[U]			< 0.007			< 0.07	0.4	10	40	
Lead[U]			0.007			0.07	0.5	10	50	
Antimony[U]			< 0.0060			< 0.06	0.06	0.7	5	
Selenium[U]			< 0.005			< 0.05	0.1	0.5	7	
Zinc[U]			0.056			0.56	4	50	200	
Chloride[U]			< 1			< 10	800	15000	25000	
Fluoride[U]			< 0.5			< 5	10	150	500	
Sulphate[U]			1			14	1000	20000	50000	
TDS			63			630	4000	60000	100000	
Phenol Index			< 0.01			< 0.1	1	-	-	
DOC			10.8			108	500	800	1000	
Leach Test Information										
Sample Mass (kg)			0.11							
Dry Matter (%)			83.5							
Moisture (%)			19.8							
Stage 1										
Volume Eluate L10 (litres)			0.88							

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Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 19-06076		**Date Sampled**	29/04/19			**Landfill Waste Acceptance Criteria Limits**		
Soils Ltd		**Time Sampled**	None Supplied			**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Site Reference: Stoneham CCRC		**TP / BH No**	HP04					
Project / Job Ref: 17624		**Additional Refs**	None Supplied					
Order No: 17624/CS		**Depth (m)**	0.30					
Reporting Date: 09/05/2019		**DETS Sample No**	405484					
Determinand	**Unit**	**MDL**						
TOC[MU]	%	< 0.1	3.8			3%	5%	6%
Loss on Ignition	%	< 0.01	8.60			--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05			6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1			1	--	--
Mineral Oil[MU]	mg/kg	< 10	116			500	--	--
Total PAH[MU]	mg/kg	< 1.7	36.2			100	--	--
pH[MU]	pH Units	N/a	6.6			--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1			--	To be evaluated	To be evaluated
Eluate Analysis			**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**	
Arsenic[U]			< 0.01			< 0.1	0.5	2	25
Barium[U]			< 0.02			< 0.2	20	100	300
Cadmium[U]			< 0.0005			< 0.005	0.04	1	5
Chromium[U]			0.006			0.06	0.5	10	70
Copper[U]			0.02			0.2	2	50	100
Mercury[U]			< 0.0005			< 0.01	0.01	0.2	2
Molybdenum[U]			0.004			0.04	0.5	10	30
Nickel[U]			< 0.007			< 0.07	0.4	10	40
Lead[U]			< 0.005			< 0.05	0.5	10	50
Antimony[U]			0.0107			0.11	0.06	0.7	5
Selenium[U]			< 0.005			< 0.05	0.1	0.5	7
Zinc[U]			0.033			0.33	4	50	200
Chloride[U]			1			11	800	15000	25000
Fluoride[U]			< 0.5			< 5	10	150	500
Sulphate[U]			8			75	1000	20000	50000
TDS			101			1010	4000	60000	100000
Phenol Index			< 0.01			< 0.1	1	-	-
DOC			30.6			306	500	800	1000
Leach Test Information								
Sample Mass (kg)			0.11					
Dry Matter (%)			85.7					
Moisture (%)			16.8					
Stage 1								
Volume Eluate L10 (litres)			0.89					

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UKAS TESTING
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Bulk Analysis Certificate						
DETS Report No: 19-06076	Date Sampled	29/04/19	29/04/19	29/04/19		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Stoneham CCRC	TP / BH No	TPADD3 ACM	HP01 ACM	HP04 ACM		
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 17624/CS	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 09/05/2019	DETS Sample No	405496	405497	405498		

Determinand	Unit	RL	Accreditation					
Asbestos Type (S)	PLM Result	N/a	ISO17025	Chrysotile	Chrysotile	Chrysotile		
Sample Matrix (S)	Material Type	N/a	NONE	Cement	Cement	Cement(s)		

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification) that is in accordance with the Health and Safety Executive HSG 248 Appendix 2.

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

RL: Reporting Limit

Subcontracted analysis (S)

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Soil Analysis Certificate - Sample Descriptions
DETS Report No: 19-06076
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: 17624/CS
Reporting Date: 09/05/2019

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
405464	TP01	None Supplied	0.30	11	Brown sandy clay with stones
405465	TP01	None Supplied	0.60	3.3	Brown sandy clay with stones
405466	TP01	None Supplied	1.00	14.5	Brown clayey sand
405467	TP01	None Supplied	1.80	17.1	Brown clayey sand
405468	TP02	None Supplied	0.20	12.1	Brown sandy clay with stones and brick
405469	TP02	None Supplied	0.50	7.1	Brown sandy clay with stones
405470	TP03	None Supplied	0.20	12.9	Brown sandy clay with stones
405471	TP03	None Supplied	0.60	11.6	Brown sandy clay with stones
405472	TP04	None Supplied	0.20	11.9	Brown sandy clay with stones and vegetation
405473	TP04	None Supplied	0.50	13.9	Brown sandy clay
405474	TP05	None Supplied	0.30	8.7	Brown sandy clay with stones and vegetation
405475	TP05	None Supplied	0.50	7.9	Brown sandy clay with stones
405476	TP06	None Supplied	0.20	8.6	Brown sandy clay with stones and vegetation
405477	TP06	None Supplied	0.50	6.2	Brown gravelly sand with stones
405478	TP07	None Supplied	0.20	11.1	Brown sandy clay with stones and vegetation
405479	TP07	None Supplied	0.70	6	Brown gravelly sand with stones
405480	HP01	None Supplied	0.30	12.2	Black sandy gravel with stones
405481	HP02	None Supplied	0.50	19.1	Black sandy clay with stones
405482	HP02	None Supplied	1.00	16.5	Black sandy clay with stones
405483	HP03	None Supplied	0.30	14.2	Black loamy sand with stones
405484	HP04	None Supplied	0.30	14.3	Black loamy sand with stones and vegetation
405485	TPADD1	None Supplied	0.20	5.8	Black loamy sand with stones and concrete
405486	TPADD1	None Supplied	0.40	9.1	Brown sandy clay with stones
405487	BH02	None Supplied	2.00	8.7	Brown sandy clay with stones
405488	TPADD2	None Supplied	0.20	15.2	Brown loamy sand with stones and brick
405489	TPADD2	None Supplied	0.50	9.1	Brown sandy clay with stones
405490	TPADD2	None Supplied	2.10	11.7	Brown sandy gravel with stones and chalk
405491	TPADD3	None Supplied	0.20	11.6	Brown loamy gravel with stones and vegetation
405492	TPADD3	None Supplied	0.40	5.4	Light brown sandy gravel with stones
405493	TPADD4	None Supplied	0.30	11.2	Black loamy sand with stones and brick
405494	TPADD5	None Supplied	0.20	13.5	Black loamy sand with stones and vegetation
405495	TPADD6	None Supplied	0.20	16.5	Black loamy sand with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 19-06076
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: 17624/CS
Reporting Date: 09/05/2019

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

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DETS Report No: 19-06151

Site Reference:	Stoneham CCRC
Project / Job Ref:	17624
Order No:	17624/CS
Sample Receipt Date:	02/05/2019
Sample Scheduled Date:	02/05/2019
Report Issue Number:	2
Reporting Date:	10/05/2019

[redacted]

Dave Ashworth
Deputy Quality Manager

This report supersedes 19-06151, issue no.1.

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Soil Analysis Certificate						
DETS Report No: 19-06151	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS01	WS01	WS04	WS04	WS10
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.10	0.60	0.20	0.50	0.10
Reporting Date: 10/05/2019	DETS Sample No	405719	405720	405721	405722	405723

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	7.4	7.1		6.3	5.4
Organic Matter	%	< 0.1	MCERTS	0.7	1.4		5.7	4.6
Arsenic (As)	mg/kg	< 2	MCERTS	4	4		18	11
W/S Boron	mg/kg	< 1	NONE	< 1	< 1		< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.2	< 0.2		0.8	0.4
Chromium (Cr)	mg/kg	< 2	MCERTS	10	13		17	14
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2		< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	27	8		43	35
Lead (Pb)	mg/kg	< 3	MCERTS	37	25		230	279
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1		< 1	1.9
Nickel (Ni)	mg/kg	< 3	MCERTS	6	6		16	9
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3		< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	13	24		35	37
Zinc (Zn)	mg/kg	< 3	MCERTS	48	29		276	208
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2		< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate						
DETS Report No: 19-06151	Date Sampled	None Supplied				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	WS10				
Project / Job Ref: 17624	Additional Refs	None Supplied				
Order No: 17624/CS	Depth (m)	1.00				
Reporting Date: 10/05/2019	DETS Sample No	405724				

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected				
pH	pH Units	N/a	MCERTS	5.8				
Organic Matter	%	< 0.1	MCERTS	0.8				
Arsenic (As)	mg/kg	< 2	MCERTS	17				
W/S Boron	mg/kg	< 1	NONE	< 1				
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3				
Chromium (Cr)	mg/kg	< 2	MCERTS	32				
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				
Copper (Cu)	mg/kg	< 4	MCERTS	15				
Lead (Pb)	mg/kg	< 3	MCERTS	17				
Mercury (Hg)	mg/kg	< 1	NONE	< 1				
Nickel (Ni)	mg/kg	< 3	MCERTS	15				
Selenium (Se)	mg/kg	< 3	NONE	< 3				
Vanadium (V)	mg/kg	< 2	NONE	60				
Zinc (Zn)	mg/kg	< 3	MCERTS	45				
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				

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Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06151	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS01	WS01	WS04	WS10	WS10
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.10	0.60	0.50	0.10	1.00
Reporting Date: 10/05/2019	DETS Sample No	405719	405720	405722	405723	405724

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.20	0.32	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.61	0.77	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.57	0.64	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.27	0.30	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.37	0.43	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.50	0.51	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.17	0.18	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.31	0.30	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.25	0.28	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.24	0.22	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	3.5	4	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06151	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS01	WS01	WS04	WS10	WS10
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.10	0.60	0.50	0.10	1.00
Reporting Date: 10/05/2019	DETS Sample No	405719	405720	405722	405723	405724

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	2	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	3	< 1	4	7	< 1
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	43	< 6	24	58	< 6
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	46	< 6	28	67	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-06151	
Soils Ltd	
Site Reference: Stoneham CCRC	
Project / Job Ref: 17624	
Order No: 17624/CS	
Reporting Date: 10/05/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 405719	WS01	None Supplied	0.10	1.2	Brown sandy gravel with stones and concrete
^ 405720	WS01	None Supplied	0.60	8.1	Brown loamy sand with stones
^ 405722	WS04	None Supplied	0.50	19.4	Black loamy sand with stones
^ 405723	WS10	None Supplied	0.10	7.4	Brown loamy sand with vegetation
^ 405724	WS10	None Supplied	1.00	4.8	Light brown sandy clay with stones and chalk

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

^ no sampling date provided; unable to confirm if samples are within acceptable holding times

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 19-06151
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: 17624/CS
Reporting Date: 10/05/2019

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

4480

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DETS Report No: 19-06326

Site Reference:	Stoneham CCRC
Project / Job Ref:	17624
Order No:	17624
Sample Receipt Date:	07/05/2019
Sample Scheduled Date:	07/05/2019
Report Issue Number:	1
Reporting Date:	13/05/2019

[redacted]

Dave Ashworth
Deputy Quality Manager

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Soil Analysis Certificate						
DETS Report No: 19-06326	Date Sampled	03/05/19	03/05/19	03/05/19		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Stoneham CCRC	TP / BH No	Sample 1	Sample 2	Sample 3		
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 17624	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 13/05/2019	DETS Sample No	406482	406483	406484		

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected		
pH	pH Units	N/a	MCERTS	7.2	7.6	7.2		
Organic Matter	%	< 0.1	MCERTS	6.2	5.2	5.2		
Arsenic (As)	mg/kg	< 2	MCERTS	11	11	7		
W/S Boron	mg/kg	< 1	NONE	1.2	1.1	1.1		
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	1.6	7.3	1.4		
Chromium (Cr)	mg/kg	< 2	MCERTS	26	77	18		
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		
Copper (Cu)	mg/kg	< 4	MCERTS	216	2160	251		
Lead (Pb)	mg/kg	< 3	MCERTS	141	321	77		
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	MCERTS	16	56	12		
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3		
Vanadium (V)	mg/kg	< 2	NONE	24	24	16		
Zinc (Zn)	mg/kg	< 3	MCERTS	488	2400	469		
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06326	Date Sampled	03/05/19	03/05/19	03/05/19		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Stoneham CCRC	TP / BH No	Sample 1	Sample 2	Sample 3		
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 17624	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 13/05/2019	DETS Sample No	406482	406483	406484		

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Phenanthrene	mg/kg	< 0.1	MCERTS	0.25	< 0.1	0.12		
Anthracene	mg/kg	< 0.1	MCERTS	0.13	< 0.1	< 0.1		
Fluoranthene	mg/kg	< 0.1	MCERTS	0.85	0.18	0.46		
Pyrene	mg/kg	< 0.1	MCERTS	0.78	0.18	0.45		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.74	< 0.1	0.55		
Chrysene	mg/kg	< 0.1	MCERTS	0.41	< 0.1	0.23		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.84	0.17	0.60		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.20	< 0.1	0.17		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.58	0.12	0.47		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.74	< 0.1	0.65		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.45	< 0.1	0.37		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	6	< 1.6	4.1		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06326	Date Sampled	03/05/19	03/05/19	03/05/19		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Stoneham CCRC	TP / BH No	Sample 1	Sample 2	Sample 3		
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 17624	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 13/05/2019	DETS Sample No	406482	406483	406484		

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	55	< 1	< 1		
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	47	< 1	< 1		
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	80	< 1	< 1		
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	234	7	7		
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	2036	172	92		
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	2452	179	99		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING 4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

				Landfill Waste Acceptance Criteria Limits		
DETS Report No: 19-06326	**Date Sampled**	03/05/19		**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Soils Ltd	**Time Sampled**	None Supplied				
Site Reference: Stoneham CCRC	**TP / BH No**	Sample 1				
Project / Job Ref: 17624	**Additional Refs**	None Supplied				
Order No: 17624	**Depth (m)**	None Supplied				
Reporting Date: 13/05/2019	**DETS Sample No**	406482				

Determinand	**Unit**	**MDL**						
TOC[MU]	%	< 0.1	3.6				3%	5%	6%
Loss on Ignition	%	< 0.01	11.10				--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05				6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1				1	--	--
Mineral Oil[MU]	mg/kg	< 10	558				500	--	--
Total PAH[MU]	mg/kg	< 1.7	6				100	--	--
pH[MU]	pH Units	N/a	7.2				--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	5.5				--	To be evaluated	To be evaluated

Eluate Analysis		**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]		< 0.01			< 0.1	0.5	2	25
Barium[U]		0.11			1.1	20	100	300
Cadmium[U]		< 0.0005			< 0.005	0.04	1	5
Chromium[U]		< 0.005			< 0.05	0.5	10	70
Copper[U]		0.02			0.2	2	50	100
Mercury[U]		< 0.0005			< 0.01	0.01	0.2	2
Molybdenum[U]		0.003			0.03	0.5	10	30
Nickel[U]		< 0.007			< 0.07	0.4	10	40
Lead[U]		< 0.005			< 0.05	0.5	10	50
Antimony[U]		< 0.0060			< 0.06	0.06	0.7	5
Selenium[U]		< 0.005			< 0.05	0.1	0.5	7
Zinc[U]		0.064			0.64	4	50	200
Chloride[U]		< 1			< 10	800	15000	25000
Fluoride[U]		< 0.5			< 5	10	150	500
Sulphate[U]		381			3808	1000	20000	50000
TDS		562			5618	4000	60000	100000
Phenol Index		< 0.01			< 0.1	1	-	-
DOC		19.9			199	500	800	1000
Leach Test Information								
Sample Mass (kg)		0.10						
Dry Matter (%)		90.3						
Moisture (%)		10.8						
Stage 1								
Volume Eluate L10 (litres)		0.89						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING 4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 19-06326		**Date Sampled**	03/05/19				**Landfill Waste Acceptance Criteria Limits**	
Soils Ltd		**Time Sampled**	None Supplied				**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Site Reference: Stoneham CCRC		**TP / BH No**	Sample 2						
Project / Job Ref: 17624		**Additional Refs**	None Supplied						
Order No: 17624		**Depth (m)**	None Supplied						
Reporting Date: 13/05/2019		**DETS Sample No**	406483						
Determinand	**Unit**	**MDL**							
TOC[MU]	%	< 0.1	3				3%	5%	6%
Loss on Ignition	%	< 0.01	9.80				--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05				6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1				1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10				500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7				100	--	--
pH[MU]	pH Units	N/a	7.6				--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	2.3				--	To be evaluated	To be evaluated
Eluate Analysis			**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]			< 0.01			< 0.1	0.5	2	25
Barium[U]			< 0.02			< 0.2	20	100	300
Cadmium[U]			< 0.0005			< 0.005	0.04	1	5
Chromium[U]			< 0.005			< 0.05	0.5	10	70
Copper[U]			0.03			0.3	2	50	100
Mercury[U]			< 0.0005			< 0.01	0.01	0.2	2
Molybdenum[U]			0.005			0.05	0.5	10	30
Nickel[U]			< 0.007			< 0.07	0.4	10	40
Lead[U]			< 0.005			< 0.05	0.5	10	50
Antimony[U]			0.0207			0.21	**0.06**	0.7	5
Selenium[U]			< 0.005			< 0.05	0.1	0.5	7
Zinc[U]			0.034			0.34	4	50	200
Chloride[U]			< 1			< 10	800	15000	25000
Fluoride[U]			< 0.5			< 5	10	150	500
Sulphate[U]			3			33	1000	20000	50000
TDS			72			720	4000	60000	100000
Phenol Index			< 0.01			< 0.1	1	-	-
DOC			22.1			221	500	800	1000
Leach Test Information									
Sample Mass (kg)			0.10						
Dry Matter (%)			94.6						
Moisture (%)			5.8						
Stage 1									
Volume Eluate L10 (litres)			0.90						

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UKAS TESTING 4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 19-06326		**Date Sampled**	03/05/19				**Landfill Waste Acceptance Criteria Limits**		
Soils Ltd		**Time Sampled**	None Supplied				**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Site Reference: Stoneham CCRC		**TP / BH No**	Sample 3						
Project / Job Ref: 17624		**Additional Refs**	None Supplied						
Order No: 17624		**Depth (m)**	None Supplied						
Reporting Date: 13/05/2019		**DETS Sample No**	406484						
Determinand	**Unit**	**MDL**							
TOC[MU]	%	< 0.1	3				3%	5%	6%
Loss on Ignition	%	< 0.01	9.06				--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05				6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1				1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10				500	--	--
Total PAH[MU]	mg/kg	< 1.7	4.1				100	--	--
pH[MU]	pH Units	N/a	7.2				--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	3.7				--	To be evaluated	To be evaluated
Eluate Analysis			**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]			< 0.01			< 0.1	0.5	2	25
Barium[U]			< 0.02			< 0.2	20	100	300
Cadmium[U]			< 0.0005			< 0.005	0.04	1	5
Chromium[U]			< 0.005			< 0.05	0.5	10	70
Copper[U]			0.03			0.3	2	50	100
Mercury[U]			< 0.0005			< 0.01	0.01	0.2	2
Molybdenum[U]			0.003			0.03	0.5	10	30
Nickel[U]			< 0.007			< 0.07	0.4	10	40
Lead[U]			< 0.005			< 0.05	0.5	10	50
Antimony[U]			0.0116			0.12	**0.06**	0.7	5
Selenium[U]			< 0.005			< 0.05	0.1	0.5	7
Zinc[U]			0.051			0.51	4	50	200
Chloride[U]			< 1			< 10	800	15000	25000
Fluoride[U]			< 0.5			< 5	10	150	500
Sulphate[U]			1			13	1000	20000	50000
TDS			92			920	4000	60000	100000
Phenol Index			< 0.01			< 0.1	1	-	-
DOC			29			290	500	800	1000
Leach Test Information									
Sample Mass (kg)			0.10						
Dry Matter (%)			88.8						
Moisture (%)			12.8						
Stage 1									
Volume Eluate L10 (litres)			0.89						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-06326	
Soils Ltd	
Site Reference: Stoneham CCRC	
Project / Job Ref: 17624	
Order No: 17624	
Reporting Date: 13/05/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
406482	Sample 1	None Supplied	None Supplied	9.7	Black loamy sand with stones and concrete
406483	Sample 2	None Supplied	None Supplied	5.4	Brown loamy sand with stones and concrete
406484	Sample 3	None Supplied	None Supplied	11.3	Brown loamy sand with stones and concrete

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 19-06326
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: 17624
Reporting Date: 13/05/2019

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

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DETS Report No: 19-06639

Site Reference:	Stoneham CCRC
Project / Job Ref:	17624
Order No:	17624/CS
Sample Receipt Date:	13/05/2019
Sample Scheduled Date:	13/05/2019
Report Issue Number:	1
Reporting Date:	17/05/2019

[redacted]

Dave Ashworth
Deputy Quality Manager

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Soil Analysis Certificate						
DETS Report No: 19-06639	Date Sampled	02/05/19	02/05/19	02/05/19	02/05/19	02/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP101	TP102	TP103	TP104	TP105
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.20	0.50	0.50	0.40	0.30
Reporting Date: 17/05/2019	DETS Sample No	407706	407707	407708	407709	407710

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	4.3	6.5	6.8	5.8	6.6
Organic Matter	%	< 0.1	MCERTS	0.6	3.3	3.7	0.8	1.3
Arsenic (As)	mg/kg	< 2	MCERTS	< 2	5	6	< 2	3
W/S Boron	mg/kg	< 1	NONE	< 1	1.1	1.8	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	3	11	12	3	7
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	< 4	8	11	< 4	11
Lead (Pb)	mg/kg	< 3	MCERTS	23	33	230	12	26
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	< 3	5	6	< 3	5
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	5	20	21	5	11
Zinc (Zn)	mg/kg	< 3	MCERTS	6	36	34	7	63
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate							
DETS Report No: 19-06639	Date Sampled	02/05/19	02/05/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	TP106	SP1				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.30	0.30				
Reporting Date: 17/05/2019	DETS Sample No	407711	407712				

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected			
pH	pH Units	N/a	MCERTS	6.4	7.4			
Organic Matter	%	< 0.1	MCERTS	4.8	4			
Arsenic (As)	mg/kg	< 2	MCERTS	9	40			
W/S Boron	mg/kg	< 1	NONE	2.5	8.3			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.7	1.6			
Chromium (Cr)	mg/kg	< 2	MCERTS	16	29			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	39	259			
Lead (Pb)	mg/kg	< 3	MCERTS	190	146			
Mercury (Hg)	mg/kg	< 1	NONE	1.2	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	11	16			
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3			
Vanadium (V)	mg/kg	< 2	NONE	28	30			
Zinc (Zn)	mg/kg	< 3	MCERTS	263	668			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06639	Date Sampled	02/05/19	02/05/19	02/05/19	02/05/19	02/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP101	TP102	TP103	TP104	TP105
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.20	0.50	0.50	0.40	0.30
Reporting Date: 17/05/2019	DETS Sample No	407706	407707	407708	407709	407710

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.16	0.44
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.14
Fluoranthene	mg/kg	< 0.1	MCERTS	0.19	0.15	0.21	0.44	1.72
Pyrene	mg/kg	< 0.1	MCERTS	0.17	0.14	0.19	0.36	1.69
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.36	1.23
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.19	1.16
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.12	< 0.1	0.39	1.66
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.17	0.61
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.28	1.39
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.37	1.12
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.12
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.23	0.91
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	2.9	12.2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Speciated PAHs							
DETS Report No: 19-06639	Date Sampled	02/05/19	02/05/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	TP106	SP1				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.30	0.30				
Reporting Date: 17/05/2019	DETS Sample No	407711	407712				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Phenanthrene	mg/kg	< 0.1	MCERTS	0.18	< 0.1			
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Fluoranthene	mg/kg	< 0.1	MCERTS	0.41	< 0.1			
Pyrene	mg/kg	< 0.1	MCERTS	0.35	< 0.1			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.38	< 0.1			
Chrysene	mg/kg	< 0.1	MCERTS	0.19	< 0.1			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.41	< 0.1			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.16	< 0.1			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.33	< 0.1			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.44	< 0.1			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.28	< 0.1			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	3.1	< 1.6			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06639	Date Sampled	02/05/19	02/05/19	02/05/19	02/05/19	02/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	TP101	TP102	TP103	TP104	TP105
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.20	0.50	0.50	0.40	0.30
Reporting Date: 17/05/2019	DETS Sample No	407706	407707	407708	407709	407710

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	1	3	1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	1	3	2	4	10
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	48	34	7	54	74
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	49	39	12	58	85

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded							
DETS Report No: 19-06639	Date Sampled	02/05/19	02/05/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	TP106	SP1				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.30	0.30				
Reporting Date: 17/05/2019	DETS Sample No	407711	407712				

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	0.09			
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	12			
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	6			
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	1	4			
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	6	< 1			
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	84	< 6			
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	91	21			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Sample Descriptions
DETS Report No: 19-06639
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: 17624/CS
Reporting Date: 17/05/2019

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
$ 407706	TP101	None Supplied	0.20	3.6	Brown loamy clay with stones and vegetation
$ 407707	TP102	None Supplied	0.50	11.9	Brown loamy clay with stones and vegetation
$ 407708	TP103	None Supplied	0.50	11.4	Brown loamy clay with stones and vegetation
$ 407709	TP104	None Supplied	0.40	3.6	Brown loamy clay with stones and vegetation
$ 407710	TP105	None Supplied	0.30	8.4	Brown loamy clay with stones and vegetation
$ 407711	TP106	None Supplied	0.30	11.5	Brown loamy clay with stones and vegetation
$ 407712	SP1	None Supplied	0.30	23.5	Black loam with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

$ samples exceeded recommended holding times

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 19-06639
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: 17624/CS
Reporting Date: 17/05/2019

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Chris Swainston
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DETS Report No: 19-06640

Site Reference:	Stoneham CCRC
Project / Job Ref:	17624
Order No:	17624/CS
Sample Receipt Date:	13/05/2019
Sample Scheduled Date:	13/05/2019
Report Issue Number:	1
Reporting Date:	17/05/2019

[redacted]

Dave Ashworth
Deputy Quality Manager

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Soil Analysis Certificate						
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19	03/05/19	03/05/19	03/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS06	WS06	WS07	WS08	WS09
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.20	0.50	0.20	0.10	0.20
Reporting Date: 17/05/2019	DETS Sample No	407713	407714	407715	407716	407717

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	7.1		4.3	5.5	
Total Cyanide	mg/kg	< 2	NONE					
Free Cyanide	mg/kg	< 2	NONE					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					
Organic Matter	%	< 0.1	MCERTS	0.8		0.5	3.9	
Arsenic (As)	mg/kg	< 2	MCERTS	4		2	6	
W/S Boron	mg/kg	< 1	NONE	< 1		< 1	1	
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2		< 0.2	< 0.2	
Chromium (Cr)	mg/kg	< 2	MCERTS	6		5	15	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2		< 2	< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	11		< 4	10	
Lead (Pb)	mg/kg	< 3	MCERTS	31		8	47	
Mercury (Hg)	mg/kg	< 1	NONE	< 1		< 1	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS	4		< 3	6	
Selenium (Se)	mg/kg	< 3	NONE	< 3		< 3	< 3	
Vanadium (V)	mg/kg	< 2	NONE	9		7	26	
Zinc (Zn)	mg/kg	< 3	MCERTS	40		8	34	
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2		< 2	< 2	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate						
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19	03/05/19	03/05/19	03/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS09	WS12	WS101	WS102	WS103
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.50	0.10	0.40	0.20	0.40
Reporting Date: 17/05/2019	DETS Sample No	407718	407719	407720	407721	407722

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	5.7	4.2	4.1	6.3	6.3
Total Cyanide	mg/kg	< 2	NONE					< 2
Free Cyanide	mg/kg	< 2	NONE					< 2
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					14
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					0.01
Organic Matter	%	< 0.1	MCERTS	1.4	1.4	1.3	1.7	1.6
Arsenic (As)	mg/kg	< 2	MCERTS	3	3	5	3	4
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	1.9	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	13	10	12	6	6
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	7	< 4	5	11	7
Lead (Pb)	mg/kg	< 3	MCERTS	15	19	10	82	40
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	5	4	4	4	3
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	15	7	20	11	11
Zinc (Zn)	mg/kg	< 3	MCERTS	22	11	20	57	35
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate						
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19	03/05/19	03/05/19	03/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS103	WS104	WS104	WS105	WS105
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.80	0.35	0.80	0.10	0.40
Reporting Date: 17/05/2019	DETS Sample No	407723	407724	407725	407726	407727

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE				Chrysotile present as bundles	
Asbestos Type (S)	PLM Result	N/a	ISO17025				Chrysotile	
pH	pH Units	N/a	MCERTS	6.2	6.6	6.3		6.2
Total Cyanide	mg/kg	< 2	NONE		< 2			
Free Cyanide	mg/kg	< 2	NONE		< 2			
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS		11			
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS		0.01			
Organic Matter	%	< 0.1	MCERTS	0.9	1.1	3		5
Arsenic (As)	mg/kg	< 2	MCERTS	7	11	6		6
W/S Boron	mg/kg	< 1	NONE	1.1	1.2	1.9		4.3
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2		0.4
Chromium (Cr)	mg/kg	< 2	MCERTS	17	20	13		13
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		< 2
Copper (Cu)	mg/kg	< 4	MCERTS	7	15	12		12
Lead (Pb)	mg/kg	< 3	MCERTS	13	43	24		59
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1		< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	7	13	7		6
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3		< 3
Vanadium (V)	mg/kg	< 2	NONE	27	25	21		21
Zinc (Zn)	mg/kg	< 3	MCERTS	24	37	43		189
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19	03/05/19	03/05/19	03/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS06	WS07	WS08	WS09	WS12
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.20	0.20	0.10	0.50	0.10
Reporting Date: 17/05/2019	DETS Sample No	407713	407715	407716	407718	407719

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	0.11	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.35	< 0.1	0.19	< 0.1	0.27
Pyrene	mg/kg	< 0.1	MCERTS	0.47	< 0.1	0.17	< 0.1	0.24
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.44	< 0.1	< 0.1	< 0.1	0.32
Chrysene	mg/kg	< 0.1	MCERTS	0.25	< 0.1	< 0.1	< 0.1	0.11
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.47	< 0.1	< 0.1	< 0.1	0.29
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.18	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.36	< 0.1	< 0.1	< 0.1	0.20
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.46	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.30	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	3.4	< 1.6	< 1.6	< 1.6	< 1.6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19	03/05/19	03/05/19	03/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS101	WS102	WS103	WS103	WS104
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.40	0.20	0.40	0.80	0.35
Reporting Date: 17/05/2019	DETS Sample No	407720	407721	407722	407723	407724

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	1.26	< 0.1	1.91
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.13	0.44	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.39	27	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.26	14.30	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	0.11	0.36	11.40	0.14
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.16	2.53	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.19	0.33	0.32	5.26	0.29
Pyrene	mg/kg	< 0.1	MCERTS	0.13	0.25	0.24	3.67	0.23
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.11	0.12	1.38	0.13
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	0.14	0.14	1.23	0.14
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.20	0.37	0.44	0.80	0.31
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.11	0.22	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.29	0.38	0.56	0.28
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.29	0.50	0.32	0.28
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	0.18	0.46	0.18	0.17
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	2.1	5.3	69.3	3.9

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Speciated PAHs							
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	WS104	WS105				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.80	0.40				
Reporting Date: 17/05/2019	DETS Sample No	407725	407727				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthylene	mg/kg	< 0.1	MCERTS	0.12	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	2.13	< 0.1			
Fluorene	mg/kg	< 0.1	MCERTS	2.20	< 0.1			
Phenanthrene	mg/kg	< 0.1	MCERTS	2.60	0.14			
Anthracene	mg/kg	< 0.1	MCERTS	0.79	< 0.1			
Fluoranthene	mg/kg	< 0.1	MCERTS	2.49	0.51			
Pyrene	mg/kg	< 0.1	MCERTS	2.04	0.41			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.86	0.18			
Chrysene	mg/kg	< 0.1	MCERTS	1.03	0.17			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.83	0.37			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.22	< 0.1			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.57	0.33			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.39	< 0.1			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.23	< 0.1			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	16.5	2.1			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19	03/05/19	03/05/19	03/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS06	WS07	WS08	WS09	WS12
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.20	0.20	0.10	0.50	0.10
Reporting Date: 17/05/2019	DETS Sample No	407713	407715	407716	407718	407719

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	2	< 1	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	8	< 1	4	< 1	3
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	83	< 6	43	< 6	55
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	93	< 6	47	< 6	58

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19	03/05/19	03/05/19	03/05/19
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Stoneham CCRC	TP / BH No	WS101	WS102	WS103	WS104	WS105
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17624/CS	Depth (m)	0.40	0.20	0.80	0.80	0.40
Reporting Date: 17/05/2019	DETS Sample No	407720	407721	407723	407725	407727

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	31	3	5
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	277	56	3
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	2	349	155	2
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	< 6	11	504	325	18
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	< 6	14	1160	539	28

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - TPH CWG Banded							
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	WS103	WS104				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.40	0.35				
Reporting Date: 17/05/2019	DETS Sample No	407722	407724				

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3			
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3			
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10			
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	5			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	5	< 3			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	53	< 10			
Aromatic (C5 - C35)	mg/kg	< 21	NONE	58	< 21			
Total >C5 - C35	mg/kg	< 42	NONE	58	< 42			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - BTEX / MTBE								
DETS Report No: 19-06640		Date Sampled	03/05/19	03/05/19				
Soils Ltd		Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC		TP / BH No	WS103	WS104				
Project / Job Ref: 17624		Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS		Depth (m)	0.40	0.35				
Reporting Date: 17/05/2019		DETS Sample No	407722	407724				

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2			
Toluene	ug/kg	< 5	MCERTS	< 5	< 5			
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2			
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2			
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2			
MTBE	ug/kg	< 5	MCERTS	< 5	< 5			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - PCB (7 Congeners)							
DETS Report No: 19-06640	Date Sampled	03/05/19	03/05/19				
Soils Ltd	Time Sampled	None Supplied	None Supplied				
Site Reference: Stoneham CCRC	TP / BH No	WS103	WS104				
Project / Job Ref: 17624	Additional Refs	None Supplied	None Supplied				
Order No: 17624/CS	Depth (m)	0.40	0.35				
Reporting Date: 17/05/2019	DETS Sample No	407722	407724				

Determinand	Unit	RL	Accreditation					
PCB Congener 28	mg/kg	< 0.008	NONE	< 0.008	< 0.008			
PCB Congener 52	mg/kg	< 0.008	NONE	< 0.008	< 0.008			
PCB Congener 101	mg/kg	< 0.008	NONE	< 0.008	< 0.008			
PCB Congener 118	mg/kg	< 0.008	NONE	< 0.008	< 0.008			
PCB Congener 138	mg/kg	< 0.008	NONE	< 0.008	< 0.008			
PCB Congener 153	mg/kg	< 0.008	NONE	< 0.008	< 0.008			
PCB Congener 180	mg/kg	< 0.008	NONE	< 0.008	< 0.008			
Total PCB (7 Congeners)	mg/kg	< 0.1	NONE	< 0.1	< 0.1			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 19-06640	
Soils Ltd	
Site Reference: Stoneham CCRC	
Project / Job Ref: 17624	
Order No: 17624/CS	
Reporting Date: 17/05/2019	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
407713	WS06	None Supplied	0.20	6.6	Brown loamy sand with stones and vegetation
407715	WS07	None Supplied	0.20	5.1	Brown gravelly sand with stones
407716	WS08	None Supplied	0.10	13.8	Brown sandy clay with stones and vegetation
407718	WS09	None Supplied	0.50	7.6	Brown sandy clay with stones
407719	WS12	None Supplied	0.10	3.9	Brown sandy clay with stones and vegetation
407720	WS101	None Supplied	0.40	8.6	Brown sandy clay with stones and vegetation
407721	WS102	None Supplied	0.20	7.7	Brown loamy sand with stones and vegetation
407722	WS103	None Supplied	0.40	10	Brown gravelly clay with stones and brick
407723	WS103	None Supplied	0.80	10	Brown gravelly clay with stones
407724	WS104	None Supplied	0.35	7.6	Brown gravelly sand with stones
407725	WS104	None Supplied	0.80	17.7	Brown clayey gravel with stones
407727	WS105	None Supplied	0.40	17.1	Brown clayey sand with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 19-06640
Soils Ltd
Site Reference: Stoneham CCRC
Project / Job Ref: 17624
Order No: 17624/CS
Reporting Date: 17/05/2019

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Appendix D.3 General Assessment Criteria

HUMAN HEALTH RISK ASSESSMENT

1.1 Introduction

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC).

GAC are conservative values adopted to ensure that they are applicable to the majority of possible contaminated site. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC derived by a third party or the Environment Agency/ DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC to ensure that they are used appropriately. Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific values for relevant soil contaminants based on the site specific conditions.

1.2 General Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

1.2.1 Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:
• EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
• EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
• EA CLEA Bulletin (2009).
• CLEA software version 1.04 (2009)
• Toxicological reports and SGV technical notes.

The CLEA guidance and tools:
1. do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.
2. do not cover risks to the environment, such as groundwater, ecosystems or buildings.
3. do not provide a definitive test for telling when human health risks are significant.
4. are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.

1.3 Soil Guideline Values (2009)

The EA are publishing a series of SGV reports for a selection of common contaminants relevant to the assessment of land contamination.
SGV's are generic assessment criteria based on CLEA standard land-uses and can be used to simplify the assessment of human health risks from long-term exposure to

chemical contamination in soil. They do not cover short-term exposure (i.e. construction and maintenance workers), acute exposure or other risks such as fire, suffocation or explosion, as might arise from an accumulation of gases such as methane and carbon dioxide, or either odour or aesthetic issues.

SGV's represent 'trigger values', indicators that soil concentrations above the SGV level may pose a possibility of *significant harm* to human health. The converse, where soil concentrations are less that the SGV, is that the long-term human health risks are considered to be tolerable or minimal.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.4 Ongoing development of CLEA based guidance

The EA is involved in a programme of publishing SGV's and related toxicity data (the TOX reports). As at July 2009 ten SGV's and matching TOX reports had been published. Soil Assessment Criteria (SAC's) may be derived using toxicity data from the updated TOX reports, where these are published, or from the original TOX reports. SGV reports also take account of recent updates for plant uptake and other factors.

- GAC's developed by CLEA guidance and given in this report will need to be assessed against updated TOX reports and SGV's when these are published.
- SGV reports may give values that differ from the GAC's used in this report.
- These variations may materially alter the remediation requirement for the site, requiring either an increase or decrease in the extent, type and cost of remediation.

1.5 Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

ICRCL 70/90: *Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing*.

1.6 Other Generic Assessment Criteria

If an SGV is not available for a substance identified in the soil then the range of Generic Assessment Criteria published from a collaborative research by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH) are used for example. In the case of Lead, Category 4 screening levels (C4SLs) have replaced the AtRisk Soil SSV.

1.6.1 EIC/AGS/CL: AIRE

The report represents the collaborative effort of risk assessors from 26 EIC and AGS member companies to produce generic assessment criteria (GAC) for soils for human health risk assessment. The project involved the collation and review of physico-chemical data, toxicological data and information on background

exposure for 44 contaminants sometimes encountered on land affected by contamination in the UK and the derivation of GAC for 351 of these using the CLEA model (v1.06). The GAC are intended to complement soil guideline values (SGV) produced by the Environment Agency of England and Wales and the 2nd edition GAC produced by LQM and CIEH (Nathanail et al, 2009). All three sets of assessment criteria have been derived in general accordance with the Environment Agency of England and Wales Contaminated Land Exposure Assessment (CLEA) guidance and thus the combined efforts of these three groups have resulted in a useful set of screening criteria for the assessment of risks to human health from soil contamination for more than 120 potentially contaminative substances.

1.6.2 Category 4 screening levels (C4SLs) (2014)

A new statutory DEFRA guidance recently (i.e. August 2014) published some GACs with a more pragmatic (but still strongly precautionary) approach in their derivation called the Category 4 screening levels (C4SLs). These values provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land. They are intended as generic screening values, (ii) they describe a level of risk that whilst above 'minimal' is still 'low' and (iii) they provide a 'higher simple test' for deciding that land is suitable for use and definitely not contaminated. These values were derived for four generic land uses: residential, commercial, allotments, and public open space.

1.6.3 LQM/CIEH Suitable 4 Use Level (S4UL) (2015)

The new S4UL's ((Nathanail *et al*, 2015), was developed for around 85 substances and are intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants. The S4ULs were:

- based on Health Criteria Values, updated to reflect changes since 2009
- derived for the standard CLEA land uses and the two public open space scenarios developed by Defra SP1010
- developed for ca 85 substances (those previously covered by the LQM/CIEH GAC and the SGV substances);
- Compliant with SR2 and the long standing principle of 'suitable for use' and reflecting changes to exposure parameters produced by Defra SP1010.

For derivation of these Generic Assessment Criteria reference must be made to: Nathanial, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (3nd edition)*. **Land Quality Press**. 2015.

1.7 Standard Land-use Scenarios

The standard land-use scenarios used to develop conceptual exposure models are presented in the following sections:

1.7.1 Residential

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
- Building type is a two-storey small terraced house.

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur.

1.7.2 Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
- There is no building.

1.7.3 Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- Critical receptor is a working female adult (aged 16 to 65 years old).
- Exposure duration is a working lifetime of 49 years.
- Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
- Building type is a three-storey office (pre 1970).

1.7.4 Public Open Space within Residential Area

The generic scenario refers to any grassed area 0.05 ha and that is close to Housing.

- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil
- Predominantly used by children for playing and may be used for activities such as a football kick about
- Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
- older children as the critical receptor on basis that they will use site most frequently (Age class 4-9)
- ingestion rate 75 $mg.day^{-1}$

1.7.5 *Public Open Space Park*

This generic scenario refers to any public park that is more than 0.5ha in area:

- Public park (>0.5 ha), predominantly grassed and may also contain children's play equipment and border areas of soil containing flowers or shrubs (75% cover)
- Female child age classes 1-6
- Soil ingestion rate of 50 $mg.day^{-1}$
- Occupancy period outdoors = 2 $hours.day^{-1}$
- Exposure frequency of 170 days.year-1 for age classes 2-18 and 85
- $days.year^{-1}$ for age class 1
- Outdoor exposure pathways only (no tracking back).

1.8 Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an SGV/GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaking to develop site specific values for relevant soil contaminants.

- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
- Developing more accurate parameters using site data.

1.9 Current Criteria

Table 1 presents the current Generic Assessment Criteria and reference should be made to the original publications if needed.

1.10 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) and Category 4 screening levels (C4SLs) (2014) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CL:AIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CL:AIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

Treatment of Hot-Spots
• A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
• Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.

Land Use				Residential With or Without Plant Uptake						Allotments			Commercial			Public Open Space (POS)								
				With home-grown produce			Without home-grown produce									Residential			Park					
			SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
Type	Contaminants	Species	Year																			Name	Authority	Date
	Antimony		2010						550						7500							EIC/AGS/ CL:AIRE	EIC/AGS/ CL:AIRE	2010
Metals	Arsenic		2014			37			40			49			640			79			168	C4SL	DEFRA	2014
			2015			37			40			40			640			79			170	S4UL	LQM/CIEH	2015
	Beryllium		2015			1.7			1.7			35			12			2.2			63	S4UL	LQM/CIEH	2015
	Boron		2015			290			11000			45			240000			21000			46000	S4UL	LQM/CIEH	2015
	Cadmium		2015			11			85			1.9			190			120			532	S4UL	LQM/CIEH	2015
			2014			26			149			4.9			410			220			880	C4SL	DEFRA	2014
	Chromium	III	2015			910			910			18000			8600			1500			33000	S4UL	LQM/CIEH	2015
		VI	2014			21			21			170			49			23			250	C4SL	DEFRA	2014
		VI	2015			6			6			1.8			33			7.7			220	S4UL	LQM/CIEH	2015
	Copper		2015			2400			7100			520			68000			12000			44000	S4UL	LQM/CIEH	2015
	Lead					200			310			80			2330			630			1300	C4SL	DEFRA	2014
	Mercury	Elemental	2012			1.0			1.0			26			26							SGV	DEFRA	2012
			2015			1.2			1.2			21			58			16			30	S4UL	LQM/CIEH	2015
		Inorganic	2012			170			170			80			36000							SGV	DEFRA	2012
			2015			40			56			19			1100			120			240	S4UL	LQM/CIEH	2015
		Methyl	2012			11			11			8			410							SGV	DEFRA	2012
			2015			11			15			6			320			40			68	S4UL	LQM/CIEH	2015
	Nickel		2012			130			130			230			1800							SGV	DEFRA	2012
			2015			130			180			53			980			230			800	S4UL	LQM/CIEH	2015
	Selenium		2012			350			350			120			13000							SGV	DEFRA	2012
			2015			250			430			88			12000			1100			1800	S4UL	LQM/CIEH	2015
	Vanadium		2015			410			1200			91			9000			2000			5000	S4UL	LQM/CIEH	2015
	Zinc		2015			3700			40000			620			730000			81000			170000	S4UL	LQM/CIEH	2015
BTEX & MTBE	Benzene		2012			0.33			0.33			0.07			95							SGV	DEFRA	2012
			2014			0.87			3.3			0.18			98			140			230	C4SL	DEFRA	2014
			2015	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	S4UL	LQM/CIEH	2015
	Toluene		2012			610			610			120			4400							SGV	DEFRA	2012
			2015	130	290	660	880	1900	3900	22	51	120	65000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015
	Ethylbenzene		2012			350			350			90			2800							SGV	DEFRA	2012
			2015	47	110	260	83	190	440	16	39	91	4700	13000	27000	24000	24000	25000	17000	22000	27000	S4UL	LQM/CIEH	2015
	Xylenes	o-xylene	2012			250			250			160			2600							SGV	DEFRA	2012
			2015	60	140	330	88	210	480	28	67	160	6600	15000	33000	41000	42000	43000	17000	24000	33000	S4UL	LQM/CIEH	2015
		m-xylene	2012			240			240			180			3500							SGV	DEFRA	2012
			2015	59	140	320	82	190	450	31	74	170	6200	14000	31000	41000	42000	43000	17000	24000	32000	S4UL	LQM/CIEH	2015
		p-xylene	2012			230			230			160			3200							SGV	DEFRA	2012
			2015	56	130	310	79	180	310	29	69	160	5900	14000	30000	41000	42000	43000	17000	23000	31000	S4UL	LQM/CIEH	2015
Petroleum Hydrocarbons Fractions	Aliphatic >C5 - C6		2015	42	78	160	42	78	160	730	1700	3900	3200	5900	12000	570000	590000	600000	95000	130000	180000	S4UL	LQM/CIEH	2015
	Aliphatic >C6 - C8		2015	100	230	530	100	230	530	2300	5600	13000	7800	17000	40000	600000	610000	620000	150000	220000	320000	S4UL	LQM/CIEH	2015
	Aliphatic >C8 - C10		2015	27	65	150	27	65	150	320	770	1700	2000	4800	11000	13000	13000	13000	14000	18000	21000	S4UL	LQM/CIEH	2015
	Aliphatic >C10 - C12		2015	130	330	760	130	330	770	2200	4400	7300	9700	23000	47000	13000	13000	13000	21000	23000	24000	S4UL	LQM/CIEH	2015
	Aliphatic >C12 - C16		2015	1100	2400	4300	1100	2400	4400	11000	13000	13000	59000	82000	90000	13000	13000	13000	25000	25000	26000	S4UL	LQM/CIEH	2015
	Aliphatic >C16 - C35		2015	65000	92000	110000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aliphatic >C35 - C44		2015	65000	92000	140000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aromatic >C5 - C7		2015	70	140	300	370	690	1400	13	27	57	26000	46000	86000	56000	56000	56000	76000	84000	92000	S4UL	LQM/CIEH	2015
	Aromatic >C7 - C8		2015	130	290	660	860	1800	3900	22	51	120	56000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015
	Aromatic >C8 - C10		2015	34	83	190	47	110	270	8.6	21	51	3500	8100	17000	5000	5000	5000	7200	8500	9300	S4UL	LQM/CIEH	2015
	Aromatic >C10 - C12		2015	74	180	380	250	590	1200	13	31	74	16000	28000	34000	5000	5000	5000	9200	9700	10000	S4UL	LQM/CIEH	2015
	Aromatic >C12 - C16		2015	140	330	660	1800	2300	2500	23	57	130	36000	37000	38000	5100	5100	5000	10000	10000	10000	S4UL	LQM/CIEH	2015
	Aromatic >C16 - C21		2015	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	S4UL	LQM/CIEH	2015

Land Use				Residential With or Without Plant Uptake						Allotments			Commercial			Public Open Space (POS)								
				With home-grown produce			Without home-grown produce									Residential			Park					
			SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	Name	Authority	Date
Type	Contaminants	Species	Year																					
	Aromatic >C21 - C35		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aromatic >C34 - C44		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aliphatic + Aromatic >C44 - C70			1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
Polycyclic Aromatic Hydrocarbons (PAH's) (mg/kg)	Acenaphthene		2015	210	510	1100	3000	4700	6000	34	85	200	84000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Acenaphthylene		2015	170	420	920	2900	4600	6000	28	69	160	83000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Anthracene		2015	2400	5400	11000	31000	35000	37000	380	950	2200	520000	54000	540000	74000	74000	74000	150000	150000	150000	S4UL	LQM/CIEH	2015
	Benzo(a)anthracene		2015	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	S4UL	LQM/CIEH	2015
	Benzo(a)pyrene		2014			5			5.3			5.7			76			10			21	C4SL	DEFRA	2014
			2015	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	S4UL	LQM/CIEH	2015
	Benzo(b)fluoranthene		2015	2.6	3.3	3.7	3.9	4.0	4.0	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16	S4UL	LQM/CIEH	2015
	Benzo(ghi)perylene		2015	320	340	250	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	S4UL	LQM/CIEH	2015
	Benzo(k)fluoranthene		2015	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	S4UL	LQM/CIEH	2015
	Chrysene		2015	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	S4UL	LQM/CIEH	2015
	Dibenz(a,h)anthracene		2015	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	S4UL	LQM/CIEH	2015
	Fluoranthene		2015	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400	S4UL	LQM/CIEH	2015
	Fluorene		2015	170	400	860	2800	3800	4500	27	67	160	63000	68000	71000	9900	9900	9900	20000	20000	20000	S4UL	LQM/CIEH	2015
	Indeno(1,2,3-cd)pyrene		2015	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	S4UL	LQM/CIEH	2015
	Naphthalene		2015	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190	460	1100	4900	4900	4900	1200	1900	3000	S4UL	LQM/CIEH	2015
	Phenanthrene		2015	95	220	440	1300	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	S4UL	LQM/CIEH	2015
	Pyrene		2015	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	S4UL	LQM/CIEH	2015
	Coal Tar(Bap as surrogate matter)		2015	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	S4UL	LQM/CIEH	2015
Chloroalkanes & alkenes	1,2 Dichloroethane		2015	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	S4UL	LQM/CIEH	2015
	1,1,1 Trichloroethane		2015	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000	76000	100000	S4UL	LQM/CIEH	2015
	1,1,2,2 Tetrachloroethane		2015	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	S4UL	LQM/CIEH	2015
	1,1,1,2 Tetrachloroethane		2015	1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	110	250	560	1400	1400	1400	1500	1800	2100	S4UL	LQM/CIEH	2015
	Tetrachloroethene		2015	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	42	95	1400	1400	1400	810	1100	1500	S4UL	LQM/CIEH	2015
	Tetrachloromethane (Carbon Tetrachloride)		2015	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	S4UL	LQM/CIEH	2015
	Trichloroethene		2015	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	S4UL	LQM/CIEH	2015
	Trichloromethane		2015	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	S4UL	LQM/CIEH	2015
	Vinyl Chloride (cloroethene)		2015	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	S4UL	LQM/CIEH	2015
Explosives	2,4,6 Trinitrotoluene		2015	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	S4UL	LQM/CIEH	2015
	RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)		2015	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000	51000	53000	S4UL	LQM/CIEH	2015
	HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)		2015	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000	23000	24000	S4UL	LQM/CIEH	2015
Pesticides	Aldrin		2015	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	S4UL	LQM/CIEH	2015
	Dieldrin		2015	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	S4UL	LQM/CIEH	2015
	Atrazine		2015	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	S4UL	LQM/CIEH	2015
	Dichlorvos		2015	0.032	0.066	0.14	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	S4UL	LQM/CIEH	2015
	Alpha - Endosulfan		2015	7.4	18	41	160	280	410	1.2	2.9	6.8	5600	7400	8400	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015
	Beta - Endosulfan		2015	7	17	39	190	320	440	1.1	2.7	6.4	6300	7800	8700	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015
	Alpha -Hexachlorocyclohexanes		2015	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	S4UL	LQM/CIEH	2015
	Beta -Hexachlorocyclohexanes		2015	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	S4UL	LQM/CIEH	2015
	Gamma -Hexachlorocyclohexanes		2015	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	S4UL	LQM/CIEH	2015
Chlorobenzenes	Chlorobenzene		2015	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300	2000	2900	S4UL	LQM/CIEH	2015
	1,2-Dichlorobenzene		2015	23	55	130	24	57	130	94	230	540	2000	4800	11000	90000	95000	98000	24000	36000	51000	S4UL	LQM/CIEH	2015
	1,3-Dichlorobenzene		2015	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	S4UL	LQM/CIEH	2015
	1,4-Dichlorobenzene		2015	61	150	350	61	150	350	15	37	88	4400	10000	25000	17000	17000	1700	36000	36000	36000	S4UL	LQM/CIEH	2015
	1,2,3,-Trichlorobenzene		2015	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770	1100	1600	S4UL	LQM/CIEH	2015
	1,2,4,-Trichlorobenzene		2015	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700	2600	4000	S4UL	LQM/CIEH	2015
	1,3,5,-Trichlorobenzene		2015	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380	580	860	S4UL	LQM/CIEH	2015

Land Use			Residential With or Without Plant Uptake						Allotments			Commercial			Public Open Space (POS)								
			With home-grown produce			Without home-grown produce									Residential			Park					
		SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	Name	Authority	Date
Type	Contaminants Species	Year																					
	1,2,3,4,-Tetrachlorobenzene	2015	15	36	78	24	56	120	4.4	11	26	1700	3080	4400	830	830	830	*1500*	*1600*	*1600*	S4UL	LQM/CIEH	2015
	1,2,3,5,- Tetrachlobenzene	2015	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	*49*	*120*	*240*	78	79	79	*110*	*120*	*130*	S4UL	LQM/CIEH	2015
	1,2,4, 5,- Tetrachlobenzene	2015	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	*42*	*72*	*96*	13	13	13	25	26	26	S4UL	LQM/CIEH	2015
	Pentachlrobenzene	2015	5.8	12	22	19	30	38	1.2	3.1	7	*640*	*770*	*830*	100	100	100	190	190	190	S4UL	LQM/CIEH	2015
	Hexachlorobenzene	2015	*1.8*	*3.3*	4.9	*4.1*	*5.7*	*6.7*	0.47	1.1	2.5	*110*	120	120	16	16	16	30	30	30	S4UL	LQM/CIEH	2015
Phenols & Chlorophenols																							
	Phenols	2012			420			420			280			*3200*							SGV	DEFRA	2012
		2015	120	200	380	440	690	1200	23	42	83	*440*	*690*	*1300*	*440*	*690*	*1300*	*440*	*690*	*1300*	S4UL	LQM/CIEH	2015
	Chlorophenols (4 Congeners)	2015	0.87	2	4.5	94	150	210	0.13	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	S4UL	LQM/CIEH	2015
	Pentachlorophenols	2015	0.22	0.52	1.2	27	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	S4UL	LQM/CIEH	2015
Others																							
	Carbon Disulphide	2015	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	S4UL	LQM/CIEH	2015
	Hexachloro-1,3-Butadiene	2015	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	S4UL	LQM/CIEH	2015
	Sum of PCDDs, PCDFs and dioxin-like PCB's.	2012			8			8			8			240							SGV	DEFRA	2012

NOTE

Priority	Guideline (mg kg $^{-1}$)
1	Site Specific Assessment Criteria (SSAC) (Soils Limited)
2	2014: Category 4 Screening Level (C4SL) (Contaminated Land: Application in Real Environment (CL:ARE), 2014)
3	2012: Soil Guideline Value (SGV) (Environment Agency, 2009)
4	2015: Suitable 4 Use Level (S4UL) (Nathanail *et al*, 2015)

For Generic Risk Assessment, the values in Bold have priority

Table reviewed February 2018

Appendix E Information Provided by the Client

Figured dimensions only are to be used. All dimensions to be checked onsite. Differences between drawings and between drawings and specification or bills of quantites to be reported to the PRC Group.

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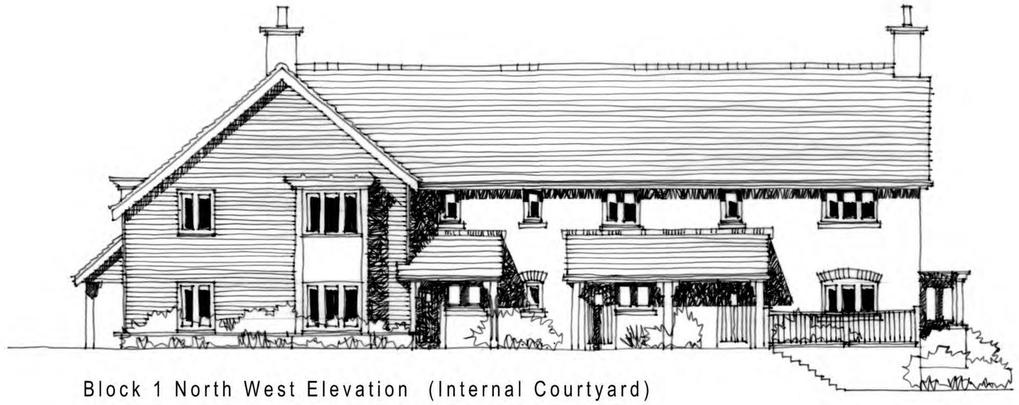
Revisions: Drawn / Chkd: Date:

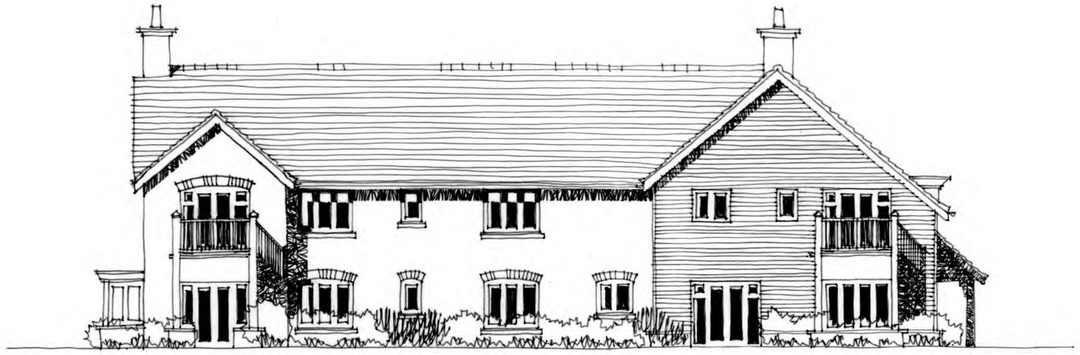


Block 1 North West Elevation (Internal Courtyard)

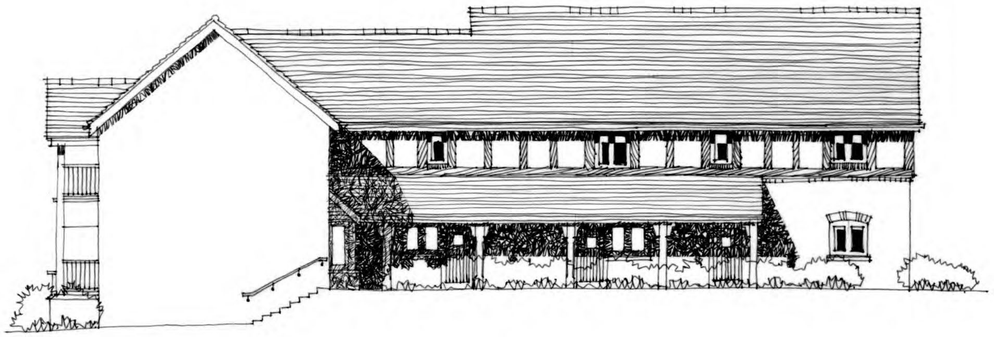
North East Elevation

Block 2 North West Elevation

South West Elevation



Block 1 South East Elevation



Block 2 South East Elevation (Internal Courtyard)

0 1 2 3 4 5 10m

Scale 1:100

Client:
CINNAMON CARE CAPITAL

Project:
BURCOT GRANGE
PHASE 2

Drawing Title:
ASSISTED LIVING UNITS
ELEVATIONS - BLOCKS 1 & 2

Scale @ A1:	Checked by :	Date :
1:100	CG	June 2018

Job No:	Stage :	Drawing No :	Rev :
10940	PL	008	-

Issue Status:
☐ Construction ☐ Preliminary
☐ Information ☐ Approval
☐ Tender

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G:\10940 Burcot Grange\2_Planning\Drg Sheets\10940_PL_008 - ALU Elevations Block 1 & 2.dwg

Client:
CINNAMON RETIREMENT LIVING

Project:
PARK FARM
STONEHAM, HANTS

Drawing Title:
FEASIBILITY
VARIATION 4
SKETCH LAYOUT - SCHEMATIC

Scale @ A1: 1:500
Checked by :
Date : MAR 2109

Job No: 11042
Stage : FE
Drawing No : Rev : SK004

Issue Status:
☐ Construction ☐ Preliminary
☐ Information ☐ Approval
☐ Tender

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