



Main Investigation Report

at

Kingscroft Farm, Ranelagh Road, Havant, Hampshire PO9 1FJ

for

Foreman Homes Ltd.

Brockhampton Holdings Ltd.

Portsmouth Water Ltd

Brockhampton Property Investments Ltd.

Reference: 17877/MIR_R27/V1

November 2019

Control Document

Project

Kingscroft Farm, Ranelagh Road, Havant, Hampshire PO9 1FJ

Document Type

Main Investigation Report (MIR)

Document Reference

17877/MIR_R27/V1

Document Status

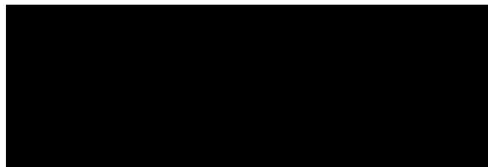
Final – Updated June 2022

Date

November 2019

Prepared by

Olia Kontogianni BSc, MSc.



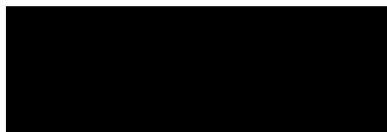
First check by

For Ing R B Higginson BSc, PGDip, CEng, MICE, FGS.



Second check by

C Morrison BSc (Hons), FGS, MEnvSc.



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.

Commission

Foreman Homes Ltd., Brockhampton Holdings Ltd, Portsmouth Water Ltd. and Brockhampton Property Investments Ltd. commissioned Soils Limited to undertake an intrusive ground investigation and prepare a Main Investigation Report on land at Kingscroft Farm, Ranelagh Road, Havant, Hampshire PO9 1FJ. The scope of the investigation was outlined in the Soils Limited quotation reference Q21687/rev102, dated 20th September 2019. This document has been updated at the request of the Clients so as to relate to an updated Illustrative Site Plan provided in June 2022 prior to planning submission and supersedes any previous versions of this report.

This document comprises the Main Investigation Report and incorporates the results, discussion and conclusions to this intrusive works.

This Main Investigation Report must be read in conjunction with the Preliminary Investigation (Desk Study) Report undertaken on the above site by Soils Limited, Report ref: 17877/PIR/V1, dated November 2019 and updated June 2022.

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 2005+A1:2011
- BS EN 1997-1:2004+A1:2013 Eurocode 7
- BS EN ISO 14688-1:2002+A1:2013
- BS EN ISO 14688-2:2004+A1:2013
- BS 10175:2011+A1:2013
- NHBC Standards 2019

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 I2 Analytical Services(I2) 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.

Contents

Section 1	Introduction.....	1
1.1	Objective of Investigation.....	1
1.2	Location	1
1.3	Site Description.....	1
1.4	Proposed Development	2
1.5	Anticipated Geology.....	2
1.5.1	Alluvium	2
1.5.2	River Terrace Deposits	2
1.5.3	Lewes Nodular Chalk Formation.....	3
1.6	Limitations and Disclaimers	3
Section 2	Site Works.....	5
2.1	Proposed Project Works	5
2.1.1	Actual Project Works.....	5
2.2	Ground Conditions	6
2.3	Ground Conditions Encountered in Trial Holes	8
2.3.1	Made Ground and Topsoil	8
2.3.2	River Terrace Deposits	9
2.3.3	Lewes Nodular Chalk Formation.....	10
2.4	Roots	10
2.5	Groundwater	11
Section 3	Discussion of Geotechnical In-Situ and Laboratory Testing	12
3.1	Dynamic Probe Tests.....	12
3.2	Infiltration Tests	12
3.3	Atterberg Limit Tests.....	13
3.4	Particle Size Distribution Tests	13
3.5	Saturation Moisture Content Tests.....	14
3.6	Sulphate and pH Tests	14
Section 4	Foundation Design	15
4.1	General.....	15
4.1.1	Made Ground and Topsoil	15
4.1.2	River Terrace Deposits	16
4.1.3	Lewes Nodular Chalk Formation.....	17

4.1.4	Roots	18
4.1.5	Groundwater	18
4.2	Foundation Scheme General	18
4.2.1	Guidance on Shrinkable Soils	19
4.3	Foundation Scheme	20
4.3.1	Possible Solution Feature	20
4.3.2	Piled Foundations	21
4.3.3	Ground Floor Slab	21
4.4	Subsurface Concrete	22
4.5	Excavations	22
Section 5	Determination of Chemical Analysis	25
5.1	Site Characterisation and Revised Conceptual Site Model	25
5.2	Soil Sampling	25
5.3	Determination of Chemical Analysis	25
Section 6	Qualitative Risk Assessment	27
6.1	Assessment Criteria	27
6.2	Representative Contamination Criteria - Soil	27
6.2.1	Asbestos	27
6.3	Groundwater	28
6.4	Tier 1 Quantitative Risk Assessment	28
6.4.1	Soils	28
6.4.2	Groundwater	28
6.4.3	Soil Gas	29
6.5	Duty of Care	29
6.6	Excavated Material	30
6.7	Re-use of Excavated Material On-site	30
6.8	Imported Material	31
6.9	Discovery Strategy	31

List of Figures

Figure 1 – Site Location Map	34
Figure 2 – Aerial Photograph	35
Figure 3 – Trial Hole Plan	36

List of Tables

Table 2.1 Final Depth of Trial Holes.....	6
Table 2.2 Ground Conditions	8
Table 2.3 Final Depth of Made Ground/Topsoil.....	9
Table 2.4 Final Depth of River Terrace Deposits	9
Table 2.5 Final Depth of Lewes Nodular Chalk Formation	10
Table 2.6 Depth of Root Penetration.....	10
Table 2.7 Groundwater Monitoring.....	11
Table 3.1 Infiltration Rates	13
Table 5.1 Sampling Strategy.....	25
Table 5.2 Chemical Analysis Specification.....	26
Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance.....	27
Table B.1.1 SPT "N" Blow Count Cohesive Classification	
Table B.1.2 SPT "N" Blow Count Granular Classification	
Table B.1.3 Interpretation of SPT "N" Blow Counts in Chalk	
Table B.2.1 Interpretation of DPSH Blow Counts	
Table B.2.2 Interpretation of Atterberg Limit Tests	
Table B.2.3 Interpretation of PSD Tests	
Table B.2.4 Interpretation of SMC Tests	
Table C.1.1 CSM Revised Post Testing	

List of Appendices

Appendix A Field Work

Appendix A.1 Engineers Logs

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Appendix B.2 Interpretation

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Appendix C Chemical Laboratory Testing

Appendix C.1 Conceptual Site Model

Appendix C.2 Chemical Laboratory Results

Appendix C.3 General Assessment Criteria

Appendix D Information Provided by the Client

Section 1 Introduction

1.1 Objective of Investigation

Foreman Homes Ltd., Brockhampton Holdings Ltd, Portsmouth Water Ltd. and Brockhampton Property Investments Ltd. commissioned Soils Limited to undertake an intrusive ground investigation and to prepare a Main Investigation Report (MIR) 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 residential 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.

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) in the Preliminary Investigation Report (Desk Study) undertaken for the site by Soils Limited (ref: 17877/PIR/V1, November 2019 updated June 2022) and/or the Revised Conceptual Site Model presented in Appendix C.1. This document has been updated at the request of the Clients so as to relate to an updated Illustrative Site Plan provided in June 2022 prior to planning submission and supersedes any previous versions of this report.

1.2 Location

The site was located at Kingscroft Farm, Ranelagh Road, Havant, Hampshire PO9 1FJ and had an approximate O.S Land Ranger Grid Reference of SU 707 061.

The site location plan is given in Figure 1.

1.3 Site Description

At the time of the investigation the site of the proposed development comprised a field used for horse grazing. The site was adjacent to residential properties to the north-east and a commercial area/business park to the south and south-west. "Hermitage" stream was bounding the site to the north and to the west and Havant Bypass (A27) delineated the site to the south. Fields and residential properties were noted further to the north and a business centre further to the south across the A27.

Vegetation was noted the site boundaries comprising mature trees and shrubs. The site was generally flat lying with a gentle slope to the southwest and was predominantly covered in grass. The main access was provided by Meyrick Road to the northeast.

An aerial photograph has been included in Figure 2.

1.4 Proposed Development

At the time of this update, the proposal comprised the construction of several residential units with garages and carports. The proposed development would include hard landscaping such as access roads, driveways and pavements and soft landscaping such as public open space and private gardens.

In compiling this report reliance was placed on the Illustrative Site Plan (drawing number 18.099.02, dated April 2022 prepared by HGP Architects. 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 D.

1.5 Anticipated Geology

The 1:50,000 BGS map showed the site to be underlain by the bedrock Lewes Nodular Chalk Formation with overlying superficial River Terrace Deposits to the east and superficial deposits of Alluvium to the west.

1.5.1 Alluvium

Alluvium is the most recent river or estuarine deposit and generally comprises silty clays usually with an appreciable organic content. Lenses of sand and gravel are also commonly found, as are pockets of peat.

The BSI Code of Practice for Foundations, BS8004: 1986, Clause 2.2.2.3.4 Peat and organic soils, includes the caveat that 'all these soils are highly compressible, and even lightly loaded foundations will be subject to considerable settlements over a long period if placed on them. For this reason, these soils are not suitable for carrying the loads for important 'structures'.

1.5.2 River Terrace Deposits

The rivers Test and Itchen have deposited extensive spreads of River Terrace Deposits in the Hampshire area, representative of ancient floodplains. In total, eleven terraces have been recorded. The River Terrace Deposits consist predominantly of gravels made up of sub angular to sub rounded 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.

1.5.3 Lewes Nodular Chalk Formation

Composed of hard to very hard nodular chalks and hardgrounds (which resist scratching by fingernail) with interbedded soft to medium hard chalks (some grainy) and marls; some griotte chalks. The softer chalks become more abundant towards the top. Nodular chalks are typically lumpy and iron-stained (usually marking sponges). Brash is rough and flaggy or rubbly and tends to be dirty. First regular seams of nodular flint, some large, commence near the base and continue throughout.

Chalk is a weak rock and as such it should be noted that the drilling, excavating and sampling process is detrimental to its fabric and structure. Chalk samples that have been machine sampled will therefore appear to be of a lower descriptive grade, as given in CIRIA C574, than the in-situ chalk. Soil sampling and visual observations from open excavations i.e. trial pits would allow chalk description and classification in accordance with CIRIA 574 including commenting for any aperture and discontinuities in the chalk structure.

Erosional features, such as pipes, swallow holes and solution cavities, usually in-filled with drift deposits, are occasionally found in the chalk, sometimes manifesting themselves at the surface as shallow circular depressions. Solution features may be reactivated by the concentrated ingress of water from leaking drains or soakaways. Reactivation may lead to surface collapse.

1.6 Limitations and Disclaimers

This Main Investigation Report relates to the site located at Kingscroft Farm, Ranelagh Road, Havant, Hampshire PO9 1FJ and was prepared for the sole benefit of Foreman Homes Ltd., Brockhampton Holdings Ltd, Portsmouth Water Ltd. and Brockhampton Property Investments Ltd. (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 residential development. The intended investigation, as outlined within the Soils Limited quotation (Q21687, dated 20th September 2019), was to comprise the following items:

- 4No up to a depth of 4.00m bgl windowless sampler boreholes
- 4No up to a depth of 6.00m bgl dynamic probes
- Machine excavated trial pits with infiltration testing to BRE365
- 3No. well installations for groundwater level and soil gas monitoring
- 6 rounds of soil gas monitoring, to include gas flow, methane, carbon dioxide, oxygen, CO, H₂S, VOC + groundwater dip
- Geotechnical laboratory testing
- Contamination laboratory testing

2.1.1 Actual Project Works

The actual project works were undertaken on 1st October 2019 and comprised:

- 5No. Machine excavated trial pits
- Infiltration testing (BRE DG365) within trial pits TP1, TP3 and TP4
- 5No. window sampler boreholes to 4.00m bgl
- Installation of 1No. gas and groundwater monitoring well to 4.00m within WS1,
Installation of 1No. gas and groundwater monitoring well to 4.00m within WS2,
Installation of 1No. gas and groundwater monitoring well to 4.00m within WS4
- 5No. dynamic probes DPSH – SPT equivalent to 5.00m bgl
- Geotechnical laboratory testing
- Contamination laboratory testing

Dual-purpose groundwater/gas monitoring wells were installed within three of the windowless sampling boreholes (WS1, WS2 and WS4), to a depth of 4.00m bgl. All wells were fitted with a gas tap. The response zone of the wells was constructed using slotted HDPE plastic pipe from approximately 1.00m bgl depth. Plain plastic HDPE pipe was used from the end of the response zone to the ground level. The response zone was backfilled with gravel, while bentonite was used to the surface. A flush fitting stopcock cover was concreted at ground level to finish the installation at surface. In the absence of well installations, two boreholes (WS3 and WS5) were backfilled with pea shingle upon completion.

Five super heavy dynamic probes, (DP1, DP2, DP3, DP4 and DP5) were driven

prior and adjacent to their corresponding windowless sampling borehole to a depth of 5.00m bgl.

Five trial pits were excavated with a mechanical excavator to depths between 1.95m bgl (TP1) and 3.50m bgl (TP2). The machine excavated trial pits (TP1 – TP5) were backfilled with arisings upon the completion of infiltration testing, where performed, and mounded over to allow for future settlement.

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.

All trial hole locations have been presented in Figure 3.

2.2 Ground Conditions

On 1st October 2019, five windowless sampler boreholes (WS1 - WS5) were drilled, using a Premier windowless sampling drilling rig, each to a depth of 4.00m below ground level (bgl) at locations selected by Soils Limited and approved by the client.

Standpipes were installed within the windowless sampling boreholes (WS1 – WS2 & WS4) to allow for continued monitoring of both groundwater and soil gas, where present.

Five dynamic probes, super heavy, (DP1 – DP5) were driven prior and adjacent to their corresponding windowless sampling borehole each to a depth of 5.00m bgl.

Five trial pits were machine excavated to depths ranging between 1.95m (TP1) and 3.50m bgl (TP2) at locations across the site selected by Soils Limited and approved by the client. Following the construction of the trial holes, infiltration tests were carried within three (TP1, TP3, and TP4) out of the five trial holes. Infiltration tests were undertaken in accordance with the principles of BRE DG365:2016. The results of the infiltration testing are outlined in Section 3.2.

The maximum depths of trial holes have been included in Table 2.1.

Table 2.1 Final Depth of Trial Holes

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)	Probe Hole	Depth (m bgl)
TP1	1.95	WS1	4.00 ^w	DP1	5.00
TP2	3.50	WS2	4.00 ^w	DP2	5.00
TP3	2.60	WS3	4.00	DP3	5.00
TP4	2.30	WS4	4.00 ^w	DP4	5.00
TP5	2.70	WS5	4.00	DP5	5.00
Note: w – well installation					

The approximate trial hole locations are shown on Figure 3.

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.

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.

Chalk is a weak rock and as such it should be noted that the drilling, excavating and sampling process is detrimental to its fabric and structure. Chalk samples that have been machine sampled will therefore appear to be of a lower descriptive grade, as given in CIRIA C574, than the in-situ chalk. Soil sampling and visual observations from open excavations i.e. trial pits would allow chalk description and classification in accordance with CIRIA 574 including commenting for any aperture and discontinuities in the chalk structure.

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 as:

Made Ground/Topsoil (MG/TS)
Alluvium (ALV) [not encountered]
River Terrace Deposits (RTD)
Lewes Nodular Chalk Formation (LPCK)

The ground conditions encountered in the trial holes are summarised in Table 2.2.

It must be noted, whilst anticipated on the western site area, soils of the Alluvium were not encountered within any of the trial holes during the intrusive investigation.

Table 2.2 Ground Conditions

Strata	Period/Age	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
TS/MG	Anthropocene	G.L.	0.10-0.40	0.25	MG: Soft, brown, slightly gravelly, silty, friable CLAY. Occasional fine brick fragments at 0.30m bgl (WS2). Occasional carbonised plant material observed. Frequent fine roots and rootlets noted. TS: Firm, brown, slightly gravelly, silty CLAY to clayey SILT. Abundance of fine roots and rootlets encountered.
RTD	Quaternary	0.10-0.40	1.50-5.00 ¹	3.00	Orangish brown to greyish brown, gravelly, sandy CLAY becoming light brown mottled white, slightly clayey, gravelly, fine to coarse SAND to slightly sandy, gravelly SILT, becoming whitish brown, slightly clayey, sandy fine to coarse angular flint GRAVEL with occasional flint cobbles in a calcareous silt matrix with depth. Gravel was subangular to subrounded clasts of flint, rinded flint and occasional chalk.
LPC K	Turonian	1.50-5.00 ¹	4.00 ¹ -5.00 ^{1,3}	Not proven ²	The Lewes Nodular Chalk Formation comprised off-white weathered structureless CHALK composed of sandy GRAVEL within light brown comminuted calcareous matrix. Gravel was subangular to subrounded clasts of intact chalk and rinded flint.

Note: ¹ Final depth of trial hole. ² Base of strata not encountered. ³ Inferred from dynamic probes

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 one out of the ten trial holes from ground level and persisted to a depth of 0.30m bgl (WS2).

The Made Ground comprised soft, brown, slightly gravelly, silty, friable CLAY with frequent roots and rootlets. Gravel was fine to coarse sub angular flint. Occasional fine brick fragments at 0.30m bgl (WS2). Occasional carbonised plant material observed.

Soils described as Topsoil were encountered in the remaining nine trial holes from ground level and persisted to a maximum depth of 0.40m bgl (WS5/DP5).

The Topsoil comprised firm, brown, slightly gravelly, silty CLAY to clayey SILT.

Gravel was fine to medium, angular flint. Abundance of fine roots and rootlets encountered.

The depths of Topsoil and Made Ground have been included in Table 2.3.

Table 2.3 Final Depth of Made Ground/Topsoil

Trial Hole	Depth (m bgl)	Strata	Probe Hole	Strata	Depth (m bgl)
WS1	0.25	TS	DP1	TS	0.25 ¹
WS2	0.30	MG	DP2	MG	0.30 ¹
WS3	0.30	TS	DP3	TS	0.30 ¹
WS4	0.30	TS	DP4	TS	0.30 ¹
WS5	0.40	TS	DP5	TS	0.40 ¹
TP1	0.10	TS			
TP2	0.30	TS			
TP3	0.20	TS			
TP4	0.20	TS			
TP5	0.25	TS			

Note: ¹Conditions inferred from dynamic probes

2.3.2 River Terrace Deposits

Soils described as River Terrace Deposits were encountered or inferred in all ten trial holes underlying the Topsoil/Made Ground and persisted to depths ranging between 1.50m bgl (WS5/DP5) and 4.40m bgl (DP1).

The soils of the River Terrace Deposits orangish brown to greyish brown, gravelly, sandy CLAY becoming light brown mottled white, slightly clayey, gravelly, fine to coarse SAND to slightly sandy, gravelly SILT, becoming whitish brown, slightly clayey, sandy fine to coarse angular flint GRAVEL with occasional flint cobbles in a calcareous silt matrix with depth. Gravel was subangular to subrounded clasts of flint, rinded flint and occasional chalk.

The final depths of River Terrace Deposits have been included in Table 2.4.

Table 2.4 Final Depth of River Terrace Deposits

Trial Hole	Depth (m bgl)	Probe Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
WS1	4.00 ¹	DP1	4.40 ^{1 2}	TP1	1.95
WS2	4.00 ¹	DP2	4.20 ^{1 2}	TP2	3.50
WS3	2.70	DP3	2.70 ^{1 2}	TP3	2.60
WS4	3.30	DP4	3.30 ^{1 2}	TP4	2.30
WS5	1.50	DP5	1.50 ^{1 2}	TP5	1.90

Note: ¹Final depth of the trial hole ²Conditions inferred from dynamic probes

2.3.3 Lewes Nodular Chalk Formation

Soils described as Lewes Nodular Chalk Formation were encountered or inferred in four out of the ten trial holes underlying the River Terrace Deposits and persisted to the full investigatory depth of 5.00m bgl.

Chalk descriptions from samples obtained from windowless sampler drilling techniques are not in accordance with CIRIA C574 and not representative of the in-situ fabric of the chalk. The description of the chalk has therefore been made and reported from direct observation where encountered within machine excavated trial pit TP5.

Where observed in-situ, the Lewes Nodular Chalk Formation comprised off-white weathered structureless CHALK composed of sandy GRAVEL within light brown comminuted calcareous matrix. Gravel was subangular to subrounded clasts of intact chalk and rinded flint.

The final depths of Lewes Nodular Chalk Formation have been included in Table 2.5.

Table 2.5 Final Depth of Lewes Nodular Chalk Formation

Trial Hole	Depth (m bgl)	Probe Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
WS1	N/E	DP1	5.00 ^{1 2}	TP1	N/E
WS2	N/E	DP2	5.00 ^{1 2}	TP2	N/E
WS3	4.00 ¹	DP3	5.00 ^{1 2}	TP3	N/E
WS4	4.00 ¹	DP4	5.00 ^{1 2}	TP4	N/E
WS5	4.00 ¹	DP5	5.00 ^{1 2}	TP5	2.70 ¹

Note: ¹Final depth of the trial hole ²Conditions inferred from dynamic probes N/E = Not Encountered

2.4 Roots

Roots/rootlets were observed in nine out of the ten trial holes persisting to depths ranging between 0.20m (TP3) and 1.60m bgl (WS3).

The maximum observed depths of root penetration have been included in Table 2.6.

Table 2.6 Depth of Root Penetration

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
WS1	0.25	TP1	1.30
WS2	0.30	TP2	N/E
WS3	1.60	TP3	0.20
WS4	1.10	TP4	1.10
WS5	1.00	TP5	1.00

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.

Vegetation was noted at the site boundaries comprising mature trees and shrubs.

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.

2.5 Groundwater

Groundwater was encountered within one trial hole (TP2) and was struck at a depth of 3.50m bgl within the River Terrace Deposits.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in October (2019), when groundwater levels should be rising from their annual minimum (lowest) elevation, which typically occurs around September to the annual maximum (highest) which typically occurs around March.

Post-works groundwater monitoring was requested by the client. At the time of reporting, three monitoring rounds had been undertaken, with a further three rounds scheduled. The results obtained to date are presented in Table 2.7.

Table 2.7 Groundwater Monitoring

Trial Hole	Depth to Water (m bgl)			Depth of Well (m bgl)
	22/10/19	07/11/2019	19/11/2019	
W S1	DRY	2.36	2.36	4.00
WS2	DRY	2.56	2.68	4.00
WS4	DRY	3.72	DRY	4.00

The report will be updated to include the full results on completion of the monitoring regime.

Section 3 Discussion of Geotechnical In-Situ and Laboratory Testing

3.1 Dynamic Probe Tests

Dynamic probing (DPSH) was undertaken at five locations (DP1 to DP5) adjacent and prior to their corresponding windowless sampling borehole to a depth of 5.00m 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 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 drilling rig was 84.53%. The energy ratio for each location is presented on the individual logs within Appendix A.1.

The River Terrace Deposits recorded equivalent SPT “N60” values between 0 and 47 within cohesive beds and 0 to 40 in granular beds. The cohesive beds were classified as **extremely low to very high strength**, varying with depth, with an inferred undrained cohesive strength of <10 to 235kPa. The granular beds were classified as of **very loose to dense** relative density, varying with depth.

The Lewes Nodular Chalk Formation recorded equivalent SPT “N60” values between <8 and >35, classifying the beds as CIRIA grade **structureless (Dm) to structured chalk (C5- A1)**, varying with depth.

A full interpretation of the DPSH tests are outlined in Appendix B.2, Table B.2.1.

3.2 Infiltration Tests

Infiltration tests were performed within trial pits TP1, TP3 and TP4, in order to provide guidance on the suitability of the ground for the adoption of a surface water drainage system. The tests were undertaken in TP1, TP3 and TP4 within the cohesive soils of the River Terrace Deposits following the principles of BRE Digest 365 Soakaway design: 2016. 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. The tests comprised piping clean water via a water tanker into the open trial hole, the drop-in water level over time was then recorded to give an indication of soakage potential.

Three complete infiltration tests were performed in TP4 ending once 75% of the water had drained away. One test was performed in TP1 and two tests in TP2 given daylight restrictions. The test performed in TP1 did not complete within the observation period and the data was extrapolated to calculate an indicative infiltration rate.

In-house software was used to calculate infiltration rates in TP1, TP3 and TP4 and the results outlined in Table 3.1.

Table 3.1 Infiltration Rates

Trial Hole	Test Stratum	Test No.	Infiltration Rate (m/s)	Notes
TP1	RTD	1	7.06×10^{-6}	Data extrapolated after 106mins for a rate to be calculated.
TP3	RTD	1	2.61×10^{-5}	
		2	1.76×10^{-5}	
TP4	RTD	1	3.43×10^{-4}	
		2	2.95×10^{-4}	
		3	2.88×10^{-4}	

Notes: RTD = River Terrace Deposits.

Rates of between 3.43×10^{-4} m/sec and 7.06×10^{-6} m/sec were calculated. The variable infiltration rates observed are indicative of the viable fines content of the River Terrace Deposits underlying the site.

3.3 Atterberg Limit Tests

Atterberg Limit tests were performed on two samples (WS1:1.20m and WS4:1.20m bgl), both obtained from the cohesive beds of River Terrace Deposits. The results were classified in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

The cohesive soils of River Terrace Deposits were classified as **medium** volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

A full interpretation of the Atterberg Limit tests is outlined in Table B.2.2, Appendix B.2 and the laboratory report in Appendix B.3.

3.4 Particle Size Distribution Tests

Particle Size Distribution (PSD) tests were performed on three samples (WS1:3.20m, WS4:2.20m and TP1:1.70m bgl) from the granular soils of River Terrace Deposits.

The PSD tests classified the granular beds of the River Terrace Deposits as **not having a volume change potential** in accordance with both BRE Digest 240 and 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 is outlined in Table B.2.3, Appendix B.2 and the laboratory report in Appendix B.3.

3.5 Saturation Moisture Content Tests

A Saturation Moisture Content (SMC) test was performed on a sample recovered from the soils of Lewes Nodular Chalk Formation (TP5:2.40m bgl). The results were classified based on Table 3.2, CIRIA Publication, Engineering in Chalk, C574, 2002.

The SMC test classified the Lewes Nodular Chalk Formation as high density, with a dry density of **1.72Mg/m³**.

A full interpretation of the SMC test is outlined in Table B.2.4, Appendix B.2 and the laboratory report in Appendix B.3.

3.6 Sulphate and pH Tests

One sample was taken from the cohesive beds of River Terrace Deposits (WS2:1.20m bgl) and one from the granular beds of the River Terrace Deposits (WS2:2.50m bgl) for water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment Special Digest 1, 2005, 'Concrete in Aggressive Ground'.

The tests recorded water soluble sulphate between 10.8mg/l and 34.4mg/l with pH values of 8.4 to 8.7.

The significance of the sulphate and pH test results are discussed in Section 4.4 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 (non-engineered fill)* 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 8004:2015, Clause 4.1.2.2 states, *'Spread foundations should not be placed on non-engineered fill unless such use can be justified on the basis of a thorough ground investigation and detailed design.'*

Soils described as Made Ground were encountered in one out of the ten trial holes from ground level and persisted to a depth of 0.30m bgl (WS2). The Made Ground comprised soft, brown, slightly gravelly, silty, friable CLAY with frequent roots and rootlets. Gravel was fine to coarse sub angular flint. Occasional fine brick fragments at 0.30m bgl (WS2). Occasional carbonised plant material observed.

Soils described as Topsoil were encountered in the remaining nine trial holes from ground level and persisted to a maximum depth of 0.40m bgl (WS5/DP5). The Topsoil comprised firm, brown, slightly gravelly, silty CLAY to clayey SILT. Gravel was fine to medium, angular flint. Abundance of fine roots and rootlets encountered.

The depths of Topsoil and Made Ground have been included in Table 2.3.

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 or inferred in all ten trial holes underlying the Topsoil/Made Ground and persisted to depths ranging between 1.50m bgl (WS5/DP5) and 4.40m bgl (DP1).

The soils of the River Terrace Deposits orangish brown to greyish brown, gravelly, sandy CLAY becoming light brown mottled white, slightly clayey, gravelly, fine to coarse SAND to slightly sandy, gravelly SILT, becoming whitish brown, slightly clayey, sandy fine to coarse angular flint GRAVEL with occasional flint cobbles in a calcareous silt matrix with depth. Gravel was subangular to subrounded clasts of flint, rimmed flint and occasional chalk.

The final depths of River Terrace Deposits have been included in Table 2.4.

The River Terrace Deposits recorded equivalent SPT “N60” values between 0 and 47 within cohesive beds and 0 to 40 in granular beds. The cohesive beds were classified as **extremely low to very high strength**, varying with depth, with an inferred undrained cohesive strength of <10 to 235kPa. The granular beds were classified as of **very loose to dense** relative density, varying with depth.

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

The PSD tests classified the granular beds of the River Terrace Deposits as **not having a volume change potential** in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Soils of the River Terrace Deposits encountered on site were predominantly cohesive reaching up to depths ranging from 1.50m bgl (DP5) to 3.30m bgl (DP4), becoming granular with depth. As such are expected to display low to moderate bearing capacities with moderate to high settlement characteristics. The cohesive soils of the River Terrace Deposits were not considered as a suitable bearing stratum for the proposed development due to likely variations both in composition and deposition thickness. The granular soils of River Terrace Deposits could be considered a suitable bearing stratum for the proposed development providing sufficient bearing capacities could be achieved. However, in the areas of DP1 and DP4, the granular beds were encountered at depths exceeding the depth of traditional shallow foundations. Furthermore, no granular soils were encountered in the area of DP3 and DP5 indicating the unit is not laterally continuous across the site.

Additionally, at the locations of DP1 and DP2 soils of the River Terrace Deposits were encountered to depths of up to 4.30m bgl which could represent an infilled solution feature. Further investigation may be considered in this area to delineate this feature.

In consideration of the above, soils of the River Terrace Deposits may be considered a suitable bearing stratum for shallow foundations on a plot by plot basis depending upon location in the development area, subject to further intrusive investigation.

4.1.3 Lewes Nodular Chalk Formation

Soils described as Lewes Nodular Chalk Formation were encountered or inferred in four out of the ten trial holes underlying the the River Terrace Deposits and persisted to the full investigatory depth of 5.00m bgl.

Chalk descriptions from samples obtained from windowless sampler drilling techniques are not in accordance with CIRIA C574 and not representative of the in-situ fabric of the chalk. The description of the chalk has therefore been made and reported from direct observation where encountered within machine excavated trial pit TP5.

The Lewes Nodular Chalk Formation comprised off-white weathered structureless CHALK composed of sandy GRAVEL within light brown comminuted calcareous matrix. Gravel was subangular to subrounded clasts of intact chalk and rinded flint. The final depths of Lewes Nodular Chalk Formation have been included in Table 2.5.

The Lewes Nodular Chalk Formation recorded equivalent SPT “N60” values between <8 and >35, classifying the beds as **structureless (Dm) to structured chalk (C5- A1)**, varying with depth.

Saturated moisture content testing indicated the chalk was of **high density**, with a dry density of **1.72Mg/m³**.

The bedrock of Lewes Nodular Chalk Formation was not encountered within most of the locations during the investigation (TP1 to TP4, WS1 and WS4).

Chalk descriptions from windowless sampler boreholes are not in accordance with CIRIA C574 and are not representative of in-situ chalk. Chalk descriptions from trial holes are in accordance with CIRIA C574 and are expected to be representative of in-situ chalk. Generally, soils of the Lewes Nodular Chalk Formation are structureless to weak rock and would possess low to moderate bearing and settlement characteristics. The Lewes Nodular Chalk Formation could be suitable as a bearing stratum, however, the depth that the stratum was encountered may be prohibitive for the adoption of strip footings on the areas of DP1, DP2, DP3, DP4, and TP1 to TP5.

It must be noted that the depth to chalk was not constant across the site. The available information presented within Preliminary Investigation Report (Report ref: 17877/PIR, dated November 2019) indicated that there was an inland river crossing

the site moving from the north-east to the south-west.

In the area of DP5, the bedrock of Lewes Nodular Chalk Formation was encountered at a depth suitable for the adoption of shallow foundations, however founding within Grade Dm chalk, encountered within DP3, DP4 and DP5, would significantly lower allowable bearing values. Foundations must bear within a single soil stratum to avoid large differential settlements. Traditional strip foundations onto suitable strength soils of the Lewes Nodular Chalk Formation may be considered on local basis depending upon the location within the development site and subject to additional intrusive investigation.

4.1.4 Roots

Roots/rootlets were observed in nine out of the ten trial holes to depths ranging between 0.20m (TP3) and 1.60m bgl (WS3).

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. Vegetation was noted at the site boundaries comprising mature trees and shrubs.

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.

4.1.5 Groundwater

Groundwater “strike” was encountered within one trial hole (TP2) and was struck at a depth of 3.50m bgl.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in October (2019), when groundwater levels should be rising from their annual minimum (lowest) elevation, which typically occurs around September to the annual maximum (highest) which typically occurs around March.

Further groundwater monitoring was conducted within the standpipes installed on site following completion of site works and has been presented in Table 2.7. At the time of reporting, three rounds had been undertaken and an additional three rounds were scheduled. The report will be updated with the full results on completion of the monitoring regime circa January 2020.

4.2 Foundation Scheme General

At the time of this update, the proposal comprised the construction of several residential units with garages and carports. The proposed development would include hard landscaping such as access roads, driveways and pavements and soft landscaping such as public open space and private gardens

In compiling this report reliance was placed on drawing number 18.099.02, dated April 2022 prepared by HGP Architects. 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 D.

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 Atterberg Limits Tests showed that the cohesive soils of River Terrace Deposits had **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 cohesive soils of River Terrace Deposits. The predominantly cohesive soils of the River Terrace Deposits were encountered at variable depths across the site.

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 River Terrace Deposits due to the likely variability and potential for large load induced settlements both total and differential.

Roots/rootlets were encountered in nine out of the ten trial holes to depths ranging between 0.20m (TP3) and 1.60m bgl (WS3). If roots 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 depth to chalk varied significantly (1.50 to 4.30m bgl) across the site, not being compatible with the construction of shallow foundations in most site areas. In addition, low blow counts (0 and 1 blows) were recorded to depths of 2.30m to 3.10m bgl in DP2, 4.40m to 5.00m bgl in DP3 and up to 3.00m bgl in DP4, suggesting potential solution features on these areas, due to the presence of potential underground issues.

In consideration of the findings of the intrusive investigation, adoption of shallow foundations is not considered suitable as a site-wide founding solution. However, should a mixed foundation solution be considered economically viable, further consideration to shallow foundations may still be given to some areas of the site subject to additional investigation on a plot by plot basis. Notwithstanding this, adoption of dual foundation solutions within the same block would likely make the process both uneconomical and difficult to manage. Therefore, a piled solution is considered as the most viable approach to the development scheme as a whole.

4.3.1 Possible Solution Feature

The available information presented within Preliminary Investigation Report (Report ref: 17877/PIR, dated November 2019) indicated a moderate risk regarding Ground Dissolution features on site.

The investigation identified the presence of a possible solution feature in the areas of DP/WS1 and DP/WS2 where marked increases in thickness of the River Terrace Deposits were noted. Additionally, the investigation identified the presence of possible solution features in the form of a “soft spot”, where low blow counts (0-1) were recorded, corresponding to the soils having “extremely low” cohesive strengths. The possible features were encountered within three locations (DP2, DP3 and DP4).

Erosional features, such as pipes, swallow holes and solution cavities, usually infilled with drift deposits, are occasionally found in the chalk, sometimes manifesting themselves at the surface as shallow circular depressions, however given the development undertaken in the area it would not be possible to visually identify any such features. Subsequent collapse of erosional features is usually as a result of localised intense inflow of water into the feature.

Considering the information presented above it was concluded that such geohazards are caused by localised erosion of the upper surface of the chalk. This could potentially lead to unacceptable settlements if conventional foundations are adopted. The possible features were encountered within four locations (DP1, DP2, DP3 and DP4), where part of the proposed development was to take place. Similar features may be present in other areas on site. If the configuration of the proposed development changes, Soils Limited must be informed as this may invalidate the foundation recommendations given within this report.

Where shallow foundations are being considered, further investigation should be conducted in the areas of WS/DP1 to WS/D4 where the possible solution features were encountered in order to delineate the size of the features and to establish the most appropriate foundation solution for that area. Ideally, additional probing of the foundation trench lines would be needed to ensure that other areas of deep River Terrace Deposits / possible solution features in the form of a “soft spot” are not present.

Solution features may be reactivated by the concentrated ingress of water from leaking drains or soakaways. Reactivation may lead to surface collapse. Therefore, attention must be drawn in order to ensure that no soakaways are constructed near that area.

4.3.2 Piled Foundations

If adopted the piled foundations must be taken through any Topsoil/Made Ground and River Terrace Deposits into suitable strength soils of the Lewes Nodular Chalk 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.

Further intrusive investigation via cable percussive boreholes or CPTu probes would be required to obtain soil parameters at greater depth to inform the design of a piled solution.

4.3.3 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.”

The NHBC states that where their Practice notes dictate a foundation depth of 1.5m bgl or greater, then suspended slabs must be adopted for the proposed development.

4.4 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts 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 8.4 and 8.7. The classification given was determined using the mobile groundwater case, in the view of groundwater being encountered. 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.

4.5 Excavations

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

Deeper excavations taken into the Lewes Nodular Chalk Formation are likely to be stable in the short term, depending on the thickness of overlying River Terrace Deposits. 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. Groundwater monitoring was ongoing at the time of reporting.

4.6 Surface Water Disposal

Infiltration testing was undertaken in TP1, TP3 and TP4 within the cohesive soils of the River Terrace Deposits following the principles of BRE Digest 365 Soakaway design: 2016. The tests comprised piping water via a water tanker into the open trial hole, the

drop-in water level over time was then recorded to give an indication of soakage potential.

Infiltration rates of between 7.06×10^{-6} m/sec and 3.43×10^{-4} m/sec were calculated from the test locations. The estimated rate of **7.06×10^{-6}** m/sec (TP1) should be used for the construction of conventional soakaways.

The available information presented within Preliminary Investigation Report (Report ref: 17877/PIR, dated November 2019) indicated a moderate risk regarding Ground Dissolution features on site. The investigation identified the presence of a possible solution feature in the areas of DP/WS1 and DP/WS2 where marked increases in thickness of the River Terrace Deposits were noted. Additionally, the investigation identified the presence of possible solution features in the form of a “soft spot”, where low blow counts (0-1) were recorded, corresponding to the soils having “extremely low” cohesive strengths. The possible features were encountered within three locations (DP2, DP3 and DP4).

Occasional erosional features, such as pipes, swallow holes and solution cavities, usually in-filled with drift deposits, are found in the chalk within this area. These features sometimes manifesting themselves at the surface, as shallow circular depressions.

Dissolution features can form due to manmade features such as deneholes. These features can then be reactivated or caused to collapse by the concentrated ingress of water from leaking drains or soakaways.

In line with current guidance (BRE Digest 365, NHBC and CIRIA C574) soakaways should be located remote from the proposed foundations, ideally greater than 20m away from the face of any existing or proposed footing.

In respect to the control of drainage CIRIA C574, Engineering in Chalk; 2002 states;

- “Concentrated ingress of water into the chalk can initiate new dissolution features, particularly in low-density chalk, and destabilise the loose backfill of existing ones. For this reason, any soakaways should be sited well away from foundations for structures, roads or railways, as indicated below:
- In areas where dissolution features are known to be prevalent, soakaways should be avoided if at all possible but, if unavoidable, should be sited at least 20m away from any foundations;
- Where the chalk is of low density, or its density is not known, soakaways should be sited at least 10m away from any foundations;
- Where the chalk is of medium density (or higher), the closest part of the soakaway should be at least 5m away from any foundations.

- For drainage systems, flexible jointed pipes should be used wherever possible; particular care should be taken for the avoidance of leaks in both water supply and drainage pipework.

As the Chalk is a vitally important aquifer, the Environment Agency and local authority must be consulted when planning soakaway installations where chalk lies below the site even where it is mantled with superficial deposits.

Consultation with the Environment Agency must be sought regarding any use which may have an impact on groundwater resources.

Section 5 Determination of Chemical Analysis

5.1 Site Characterisation and Revised Conceptual Site Model

The Preliminary Investigation Report undertaken by Soils Limited (report ref: 17877/PIR dated November 2019 and updated to V1 June 2022) identified a very low to moderate risk of ground contamination and from previous usage of the site and offsite sources.

The Main Investigation Report identified Made Ground up to a depth of 0.30m bgl (WS2/DP2). The Made Ground comprised soft, brown, slightly gravelly, silty, friable CLAY. Gravel was fine to coarse sub angular flint. Occasional fine brick fragments noted at 0.30m bgl (WS2). Occasional carbonised plant material observed. Frequent fine roots and rootlets were noted.

Superficial soils of the River Terrace Deposits were encountered underlying the Made Ground. Shallow groundwater was not encountered within the Made Ground during the investigation.

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 CSM identified potential sources and a both targeted and non-targeted sampling pattern was adopted as appropriate to these sources. Table 5.1 outlines the sampling undertaken.

Table 5.1 Sampling Strategy

Sam ple	Strategy	Proposed Use
W S1:0.20	Topsoil – Cohesive soils	Beneath proposed hardstanding car park area
WS2:0.20	Made Ground – Cohesive soils	Beneath proposed garden area
WS3:0.50	Superficial cohesive soils	Beneath proposed garden area
WS4:0.50	Superficial cohesive soils	Beneath proposed garden area
WS5:0.20	Topsoil – Cohesive soils	Beneath proposed garden area
TP1:0.20	Superficial cohesive soils	Beneath proposed garden area

5.3 Determination of Chemical Analysis

The driver for determination of the analysis suite was the information obtained from the

Preliminary Investigation Report and Main Investigation Report intrusive investigation.
Table 5.2 outlines the specification for each sample tested.

Table 5.2 Chemical Analysis Specification

Substance	Locations: Depths (m bgl)						
	W S1:0.20 ^S	W S2:0.20 ^S	W S3:0.50 ^S	W S4:0.50 ^S	W S5:0.20 ^S	W S5:0.50 ^S	TP1:0.20 ^S
Asbestos Screen	✓	✓	✓	✓	✓	✓	✓
Total Phenols	✓	✓	✓	✓	✓	✓	✓
Organic Matter	✓	✓	✓	✓	✓	✓	✓
pH	✓	✓	✓	✓	✓	✓	✓
Metals	✓	✓	✓	✓	✓	✓	✓
Metalloids	✓	✓	✓	✓	✓	✓	✓
Organics	✓	✓	✓	✓	✓	✓	✓
BTEX							
WAC		✓	✓				

Notes: **Metals:** Cd, Cr, Pb, Hg, Ni, Se, CN, S, Cu, Zn, Bo, V. **metalloids:** As. **organics:** USEPA 16 speciated PAH, TPH Texas
Asbestos screening was undertaken in accordance with HSG 248. ^S = Soil sample.

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 C.3.

6.2 Representative Contamination Criteria - Soil

At the time of this update, the proposal comprised the construction of several residential units with garages and carports. The proposed development would include hard landscaping such as access roads, driveways and pavements and soft landscaping such as public open space and private gardens.

In compiling this report reliance was placed on the Illustrative Site Plan (drawing number 18.099.02, dated April 2022 prepared by HGP Architects. 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.

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) for the proposed "Residential with plant uptake" land-use scenario, which was considered the most appropriate given the type of proposed redevelopment.

Table 6.1 outlines the samples that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix C.2.

Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance

Substance	Sam ple locations where SGV, C4SL or S4UL adopted were exceeded for the 'Residential with plant uptake' land-use scenario
None	None

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 3.3%**. For each soil sample tested, the Soil Organic Matter recorded was used to derive the appropriate guideline value for organic determinants.

In summary, none of the samples tested showed concentrations in excess of the relevant C4SL and S4UL for a 'Residential with plant uptake' land-use scenario.

6.2.1 Asbestos

Asbestos Containing Material (ACM) was not detected within any of the samples tested. Whilst asbestos containing material was not identified in any of the samples

tested it is possible that asbestos is present in other 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 Groundwater

Groundwater was not recovered from the standpipes installed within WS1, WS2 and WS4 since groundwater sampling and testing was not within the client's brief.

Groundwater was only encountered within one trial hole (TP2) and was struck at a depth of 3.50m bgl. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in October (2019), when groundwater levels should be rising from their annual minimum (lowest) elevation, which typically occurs around September to the annual maximum (highest) which typically occurs around March.

Further groundwater monitoring was conducted within the standpipes installed on site following completion of site works and has been presented in Table 2.7. At the time of reporting, three rounds had been undertaken and an additional three rounds were scheduled. The report will be updated with the full results on completion of the monitoring regime circa January 2020.

6.4 Tier 1 Quantitative Risk Assessment

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

6.4.1 Soils

None of the samples tested showed concentrations in excess of the relevant C4SL and S4UL for a "Residential with plant uptake" land-use scenario.

The Tier 1 Quantitative risk assessment therefore established that there was no risk to the human health receptors, to construction workers or future end users.

6.4.2 Groundwater

From information provided by the Preliminary Investigation Report (ref: 17877/PIR), the Environment Agency Hydrogeological Maps stated that the superficial River Terrace Deposits where a Principal Aquifer and could support shallow groundwater. The bedrock Lewes Nodular Chalk Formation was identified as a Principal Aquifer. The overall groundwater vulnerability was based on Secondary Aquifer soils of High Vulnerability, soils which are highly permeable and may be highly productive and able to support large abstractions for public supply and other purposes.

Groundwater sampling and testing was outside the scope of this investigation.

However, as there were no concentrations of determinants in excess of their relevant Environmental Quality Standards (EQS) of the relevant soil screening values for the most onerous land use scenario, “residential with plant uptake”, it is considered that there is a negligible risk to groundwater receptor.

6.4.3 Soil Gas

The Preliminary Investigation Report (ref: 17877/PIR), undertaken on the site identified a low to moderate risk of soil gas onsite associated with offsite sources.

The site was situated within an area where protection or risk assessment against the ingress of radon was required. The site location within an area of 1km grid square were in bands of elevated radon potential. Maximum radon potential was 3-5%.

Radon protection measures are typically only required when the radon potential is 5-10% and therefore it is possible that radon protection measures will not be required as part of the proposed development, however, consultation with the local Building Control department at the Local Authority is recommended as they will be able to advise on whether or not radon protection measures are required in new developments within the site's vicinity. It is not possible in the course of a survey or inspection to determine whether radon gas is present as the gas is colourless and odourless. Tests can be undertaken to assess the concentration of radon in existing structures.

To quantify the risk posed to the site from the identified sources, a soil gas risk assessment was recommended. This comprised six soil gas monitoring visits undertaken over a period of approximately three months.

Readings of the concentrations of oxygen, methane, carbon dioxide, carbon monoxide, hydrogen sulphide, flow rates, atmospheric pressure and groundwater levels were taken (where possible) after installation of the wells. In addition, monitoring with a Photo-Ionisation Detector (PID) was undertaken in each well to check for the presence of volatile organic compounds (VOCs).

At the time of reporting, monitoring of the wells installed within WS1, WS2 and WS4 had been undertaken on three occasions, with three more visits scheduled. The results of the monitoring will be provided as an addendum Soils Gas Risk Assessment on completion of the monitoring regime, scheduled to complete January 2020.

6.5 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.

6.6 Excavated Material

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 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 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. Further consideration of results using HazWasteOnline™ can be undertaken on request to give an indication of potentially hazardous properties in the materials analysed.

WAC testing was undertaken on two samples (WS2:0.20m and WS3:0.50m bgl) and the laboratory results are presented in Appendix C.2.

6.7 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.

6.8 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.

6.9 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 and construction phases for the redevelopment of the site.

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 competent and appropriate third-party Engineer/Environmental consultant notified immediately. An approval from the Local authority must be sought prior to implementing any proposed mitigation action.

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.

List of Figures

Figure 1 – Site Location Map	34
Figure 2 – Aerial Photograph	35
Figure 3 – Trial Hole Plan	36

List of Appendices

Appendix A Field Work

Appendix A.1 Engineers Logs

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Appendix B.2 Interpretation

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Appendix C Chemical Laboratory Testing

Appendix C.1 Conceptual Site Model

Appendix C.2 Chemical Laboratory Results

Appendix C.3 General Assessment Criteria

Appendix D Information Provided by the Client

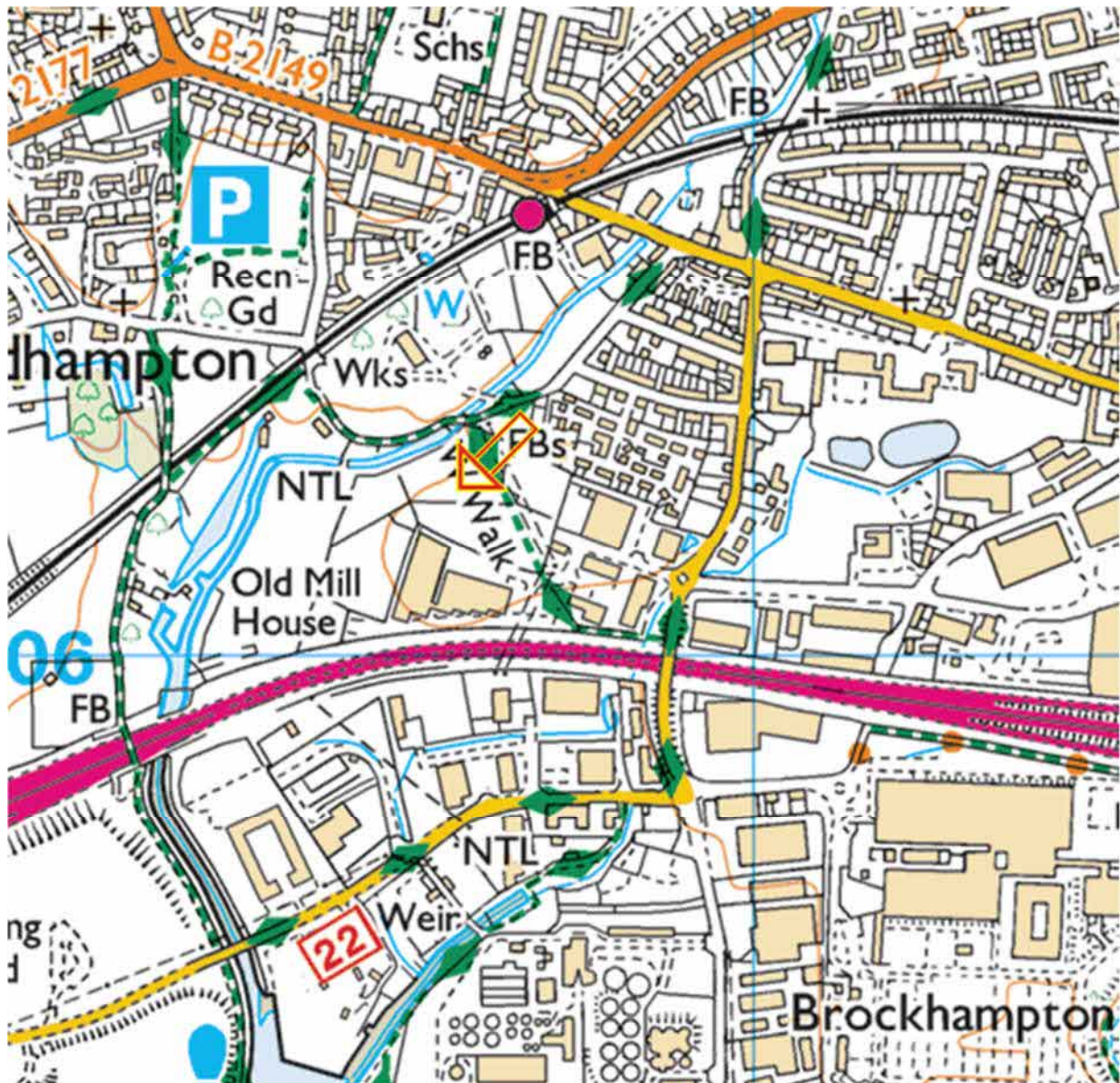


Figure 1 – Site Location Map

Job Number

17877

Project

Kingscroft Farm, Ranelagh Road, Havant, Hampshire
PO9 1FJ

Client

Foreman Homes Ltd.
Brockhampton Holdings Ltd
Portsmouth Water Ltd
Brockhampton Property Investments Ltd.

Date

November 2019



Figure 2 – Aerial Photograph

Project

Kingscroft Farm, Ranelagh Road,
Havant, Hampshire PO9 1FJ

Client

Foreman Homes Ltd.
Brockhampton Holdings Ltd.
Portsmouth Water Ltd.
Brockhampton Property
Investments Ltd.

Date

November 2019

Job Number

17877



**Figure 3 – Trial Hole Plan****Project**

Kingscroft Farm, Ranelagh Road,
Havant, Hampshire PO9 1FJ

Client

Foreman Homes Ltd.
Brockhampton Holdings Ltd.
Portsmouth Water Ltd.
Brockhampton Property
Investments Ltd.

Date

November 2019

Job Number

17877



Appendix A Field Work

Appendix A.1 Engineers Logs

Water Strike	Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend
	Depth	Type	Results			
				0.10		
				0.80		
				0.90		
				1.30		
				1.90		
				1.95		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend
	Depth	Type	Results			
				0.30		
				1.70		
				3.50		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend
	Depth	Type	Results			
				0.20		
				0.50		
				1.00		
				2.60		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend
	Depth	Type	Results			
				0.20		
				1.10		
				2.25		
				2.30		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend
	Depth	Type	Results			
				0.25		
				1.00		
				1.90		
				2.70		

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				0.25	
				(1.00)	
				1.25	
				(1.05)	
				2.30	
				2.50	
				(0.30)	
				2.80	
				3.00	
				(1.00)	
				4.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				(0.30) 0.30	
				(0.80)	
				1.10	
				(0.50)	
				1.60	
				(2.40)	
				4.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				(0.30) 0.30	
				(0.70)	
				1.00	
				(0.60)	
				1.60	
				(0.55)	
				2.15	
				(0.55)	
				2.70	
				(1.30)	
				4.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				(0.30) 0.30	
				(0.60) 0.90	
				(1.00) 1.90 2.00	
				(0.70) 2.70	
				(0.60) 3.30	
				(0.70) 4.00	

Samples & In Situ Testing			Strata Details			
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	
				(0.40)		
				0.40		
				(0.60)		
				1.00		
				(0.50)		
				1.50		
				(2.50)		
4.00						

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)

Chalk samples recovered are disturbed by the sampling process. Therefore, it is difficult to assess an accurate chalk grade for in accordance with CIRIA C574 ‘Engineering in

Chalk'. In the absence of a standardised correlation between SPT "N" values and chalk grade for the most recent chalk classification (CIRIA C574) a broad indication of the in-situ chalk grade can be assessed using a paper by T.R.M. Wakeling from a site in Mundford, Norfolk, which compares SPT "N" values to the old Spink & Norbury chalk classification. From the Spink & Norbury classification it is possible to infer a basic CIRIA Grade (structureless or structured), as outlined in Table B.1.3.

Table B.1.3 Interpretation of SPT "N" Blow Counts in Chalk

SPT "N" Value Range	Spink & Norbury Grade	Inferred CIRIA Grade
<8	VI	Structureless (Dm)
8 – 15	V	Structureless (Dc)
15 – 20	IV	Structured chalk (C5 – A1)
20 - 25	III	Structured chalk (C5 – A1)
25 - 35	II	Structured chalk (C5 – A1)
>35	I	Structured chalk (C5 – A1)

Note:

Appendix B.2 Interpretation

Table B.2.1 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density/Approximate CIRIA Chalk Grade
DP1	RTD (cohesive) 0.25 – 2.10 Gravelly CLAY	4 - 24	Very low to high ($C_u = 20 - 120\text{kPa}$)
	RTD (granular) ¹ 2.10 – 4.40 Gravelly SAND/Sandy GRAVEL	4 - 32	Very loose to dense
	LPCK ¹ 4.40 – 5.00 Chalk	12 - 15	Structureless (Dc) to Structured chalk (C5 – A1)
DP2	RTD (cohesive) 0.30 – 1.60 Gravelly CLAY	4 – 32	Very low to very high ($C_u = 20 - 160\text{kPa}$)
	RTD (granular) ¹ 1.60 – 4.20 Gravelly SAND/Sandy GRAVEL	0 - 40	Very loose to dense
	LPCK ¹ 4.20 – 5.00 Chalk	15 - 19	Structureless (Dc) to Structured chalk (C5 – A1)
DP3	RTD (cohesive) 0.30 – 2.70 Gravelly CLAY/SILT	4 - 47	Very low to very high ($C_u = 20 - 235\text{kPa}$)
	LPCK ¹ 2.70 – 5.00 Chalk	<8 - >35	Structureless (Dm) to Structured chalk (C5 – A1)
DP4	RTD (cohesive) 0.30 – 2.00 & 2.70 – 3.30 Gravelly CLAY	0 - 16	Extremely low to high ($C_u = <10 - 80\text{kPa}$)
	RTD (granular) ¹ 2.00 – 2.70 Gravelly SAND	4 - 20	Very loose to medium dense
	LPCK ¹ 3.30 – 5.00 Chalk	12 - 27	Structureless (Dc) to Structured chalk (C5 – A1)
DP5	RTD (cohesive) 0.40 – 1.50 Gravelly CLAY/SILT	8 - 28	Low to high ($C_u = 40 - 140\text{kPa}$)
	LPCK ¹ 1.50 – 5.00 Chalk	<8 - 27	Structureless (Dm) to Structured chalk (C5 – A1)

Note: ¹ Ground conditions inferred past the base of windowless sampler boreholes.

Table B.2.2 Interpretation of Atterberg Limit Tests

Stratum	Moisture Content (%)	Plasticity Index (%)	Passing 425 μ m Sieve (%)	Modified Plasticity Index (%)	Soil Classification	Volume Change Potential	
						BRE	NHBC
RTD	19 - 23	25 - 31	100	25 - 31	CI	Medium	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 μ m are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 μ m and some particles, 'rock flour' for example, can be finer than 2 μ m 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.2.3 Interpretation of PSD Tests

Location	Depth (m bgl)	Soil Description	Volume Change Potential		Passing 63 μ m Sieve (%)
			BRE	NHBC	
WS1	3.20	Brown sandy silty clayey GRAVEL	No	No	14
WS4	2.20	Brown sandy silty clayey GRAVEL	No	No	14
TP1	1.70	Brown sandy silty clayey GRAVEL with cobbles.	No	No	10

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 63 μ m sieve. NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63 μ m 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)

Table B.2.4 Interpretation of SMC Tests

Location	Depth (m bgl)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Moisture Content (%)	Saturation Moisture Content (%)	Density Classification (CIRIA)
TP1	2.40	2.11	1.72	23	21	High

Note: (The Determination of Saturation Moisture Content of Chalk Tests were made in accordance with BS 1377: Part 2: 1990 Clauses 3.3)

Appendix B.3 Geotechnical In-Situ and Laboratory Results

Project Name:	Kingscroft Farm	Project No.	17877	Co-ords:		Hole Type	DP
Location:	Kingscroft Farm, Ranelagh Road, Havant, Hampshire, PO9 1FJ	Level:	m AOD			Scale	1:50
Client:	Foreman Homes	Dates:	01/10/2019			Logged By	

Depth (m)	Blows/100mm					Torque (Nm)
	10	20	30	40		
1	1 2 1 1 2 2 3 3 2 2 2 3 2 2 1					5
2	3 6 8 6 4 3 3 2 1					
3	3 3 4 5 5 6 5 3 3 4 4 5 5 4 3 3 3 3 3 3					70
4	3 4 4 5 5 4 3 4 3 3 3 3 3 3 3					
5	3 3 3 3 3 3 3 3 3 3 3					60
6						
7						
8						
9						
10						
Remarks		Fall Height 750mm	Cone Base Diameter 50.5mm			
		Hammer Weight 63.5kg	Final Depth 5m			
		Probe Type DPSH-B	Energy Ratio (Er) 84.53%			

Project Name:	Kingscroft Farm	Project No.	17877	Co-ords:		Hole Type	DP
Location:	Kingscroft Farm, Ranelagh Road, Havant, Hampshire, PO9 1FJ	Level:	m AOD			Scale	1:50
Client:	Foreman Homes	Dates:	01/10/2019			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
1	1 1 1 1 1 2 2 3 4 3 6 5 8 6 5 4 10 8 6				5
2	6 5 5 3 2 1 1 1 1 0 1 1 1 1 2 4 4 5 6 6 7 7 5 5 4 5 4 5 4 4 4				20
3					15
4					40
5					15
6					
7					
8					
9					
10					
Remarks		Fall Height 750mm	Cone Base Diameter 50.5mm		
		Hammer Weight 63.5kg	Final Depth 5m		
		Probe Type DPSH-B	Energy Ratio (Er) 84.53%		



Project Name:	Kingscroft Farm	Project No.	17877	Co-ords:		Hole Type	DP
Location:	Kingscroft Farm, Ranelagh Road, Havant, Hampshire, PO9 1FJ	Level:	m AOD			Scale	1:50
Client:	Foreman Homes	Dates:	01/10/2019			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
0					
0.1					
0.2					
0.3					
0.4					
0.5					
0.6					
0.7					
0.8					
0.9					
1.0					5
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
2.0					10
2.1					
2.2					
2.3					
2.4					
2.5					
2.6					
2.7					
2.8					
2.9					
3.0					10
3.1					
3.2					
3.3					
3.4					
3.5					
3.6					
3.7					
3.8					
3.9					
4.0					30
4.1					
4.2					
4.3					
4.4					
4.5					
4.6					
4.7					
4.8					
4.9					
5.0					50
5.1					
5.2					
5.3					
5.4					
5.5					
5.6					
5.7					
5.8					
5.9					
6.0					
6.1					
6.2					
6.3					
6.4					
6.5					
6.6					
6.7					
6.8					
6.9					
7.0					
7.1					
7.2					
7.3					
7.4					
7.5					
7.6					
7.7					
7.8					
7.9					
8.0					
8.1					
8.2					
8.3					
8.4					
8.5					
8.6					
8.7					
8.8					
8.9					
9.0					
9.1					
9.2					
9.3					
9.4					
9.5					
9.6					
9.7					
9.8					
9.9					
10.0					
Remarks		Fall Height	750mm	Cone Base Diameter	50.5mm
		Hammer Weight	63.5kg	Final Depth	5m
		Probe Type	DPSH-B	Energy Ratio (Er)	84.53%





Contract Number: 46249

Client Ref: **17877**

Report Date: **31-10-2019**

Client PO: **17877**

Client **Soils Limited**
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

Contract Title: **Kingscroft Farm**
For the attention of: **Tim Rudkin**

Date Received: **22-10-2019**

Date Completed: **31-10-2019**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	2
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	2
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	3
Saturated Moisture Content of chalk (SMC) BS 1377:1990 - Part 2 : 3.3 - * UKAS	1
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

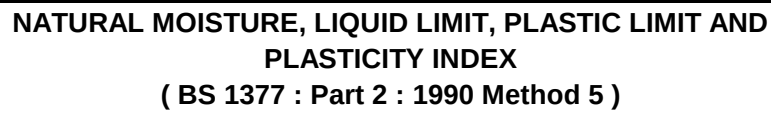
@ - denotes non accredited tests

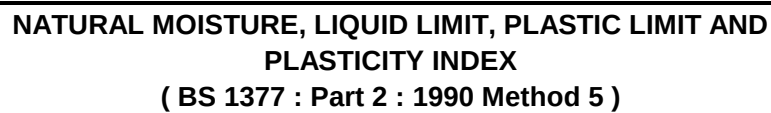
This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

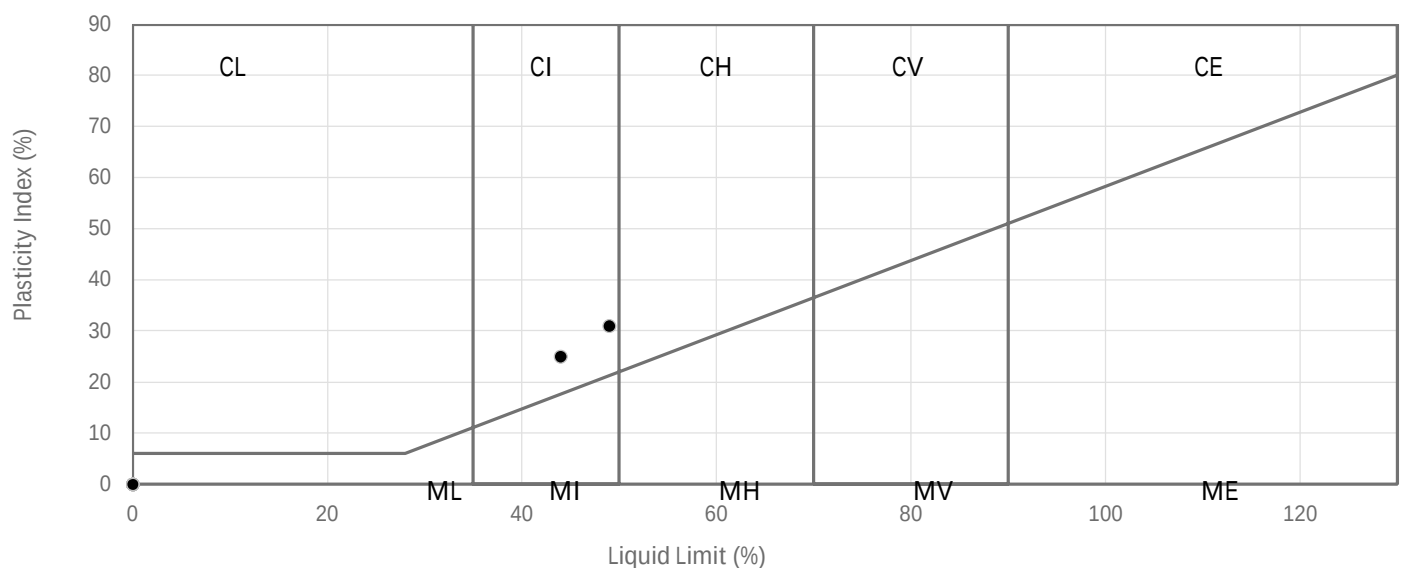
Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)

Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

[illegible]

[illegible]

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION





Contract Number	46249	
Site Name	Kingscroft Farm.	
Date Tested	22/10/2019	

[illegible]

<u>Key</u>	<u>Reported As</u>	<u>Clause</u>
------------	--------------------	---------------

Moisture Content	%	3.2
Bulk Density	Mg/m ³	7.2
Dry Density	Mg/m ³	7.2
SMC	%	3.3.6

If there is a NON-STANDARD in the remarks next to the reported SMC result this means there was no lump of chalk of sufficient volume (300mL-500mL) present in the samples received to meet the testing requirements of the stated standard.

Operators	Checked	30/10/2019	Emma Sharp
CJ	Approved	31/10/2019	Paul Evans





PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number **46249**

Borehole/Pit No. **WS1**

Site Name **Kingscroft Farm.**

Sample No.

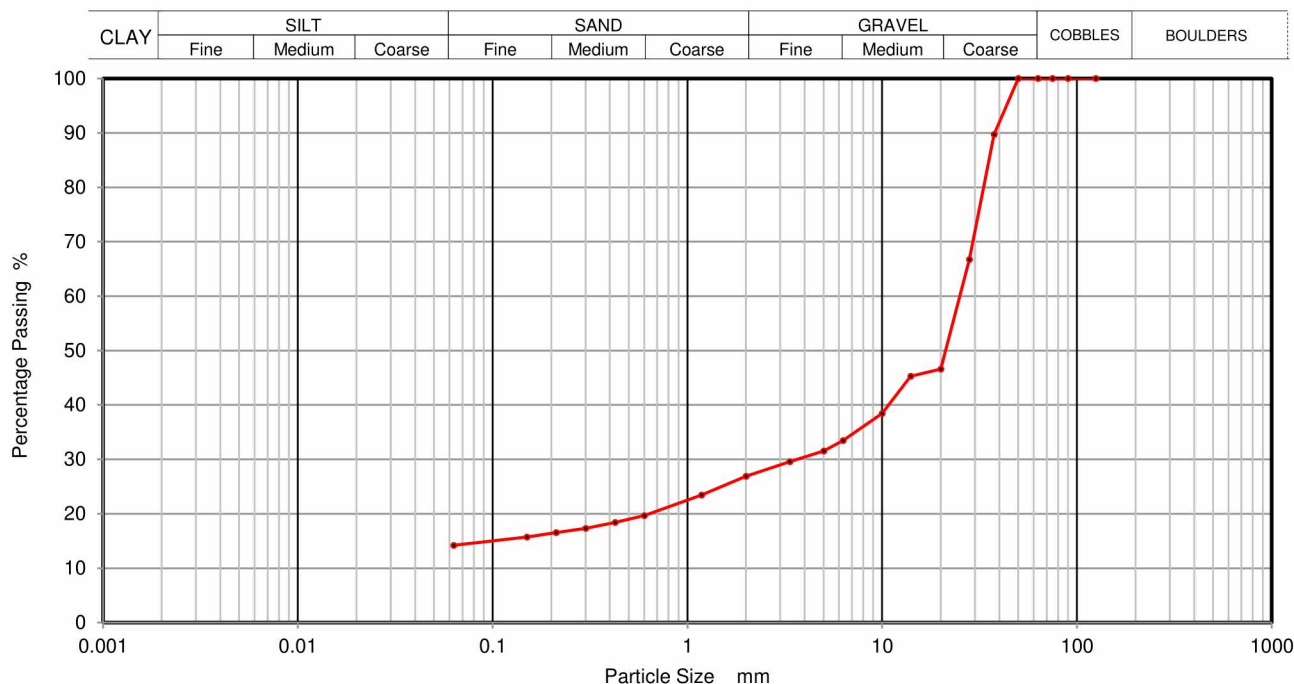
Soil Description **Brown sandy silty clayey GRAVEL.**

Depth Top **3.20**

Depth Base

Date Tested **24/10/2019**

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	90		
28	67		
20	47		
14	45		
10	38		
6.3	33		
5	32		
3.35	30		
2	27		
1.18	23		
0.6	20		
0.425	18		
0.3	17		
0.212	17		
0.15	16		
0.063	14		

Sample Proportions	% dry mass
Cobbles	0
Gravel	73
Sand	13
Silt and Clay	14

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/10/2019	Wayne Honey
RO/MH	Approved	31/10/2019	Paul Evans





PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number **46249**

Borehole/Pit No. **WS4**

Site Name **Kingscroft Farm.**

Sample No.

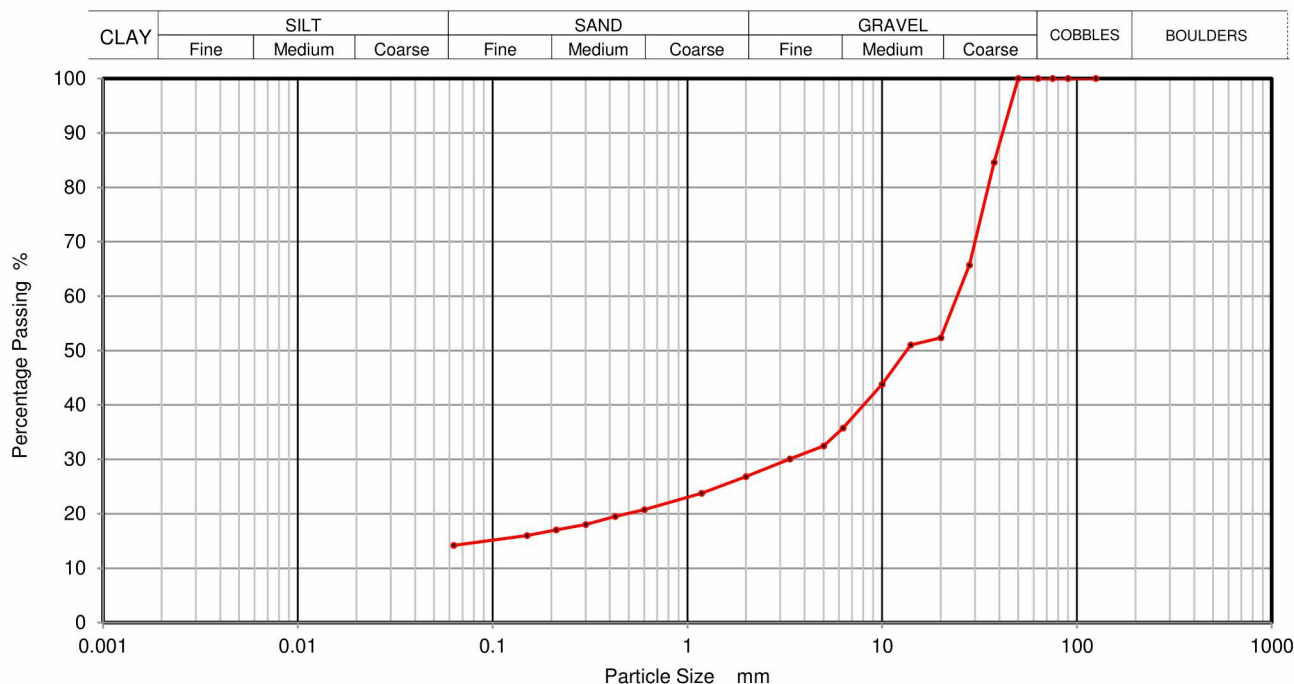
Soil Description **Brown sandy silty clayey GRAVEL**

Depth Top **2.20**

Depth Base

Date Tested **24/10/2019**

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	85		
28	66		
20	52		
14	51		
10	44		
6.3	36		
5	32		
3.35	30		
2	27		
1.18	24		
0.6	21		
0.425	19		
0.3	18		
0.212	17		
0.15	16		
0.063	14		

Sample Proportions	% dry mass
Cobbles	0
Gravel	73
Sand	13
Silt and Clay	14

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/10/2019	Wayne Honey
RO/MH	Approved	31/10/2019	Paul Evans





PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number **46249**

Borehole/Pit No. **TP1**

Site Name **Kingscroft Farm.**

Sample No.

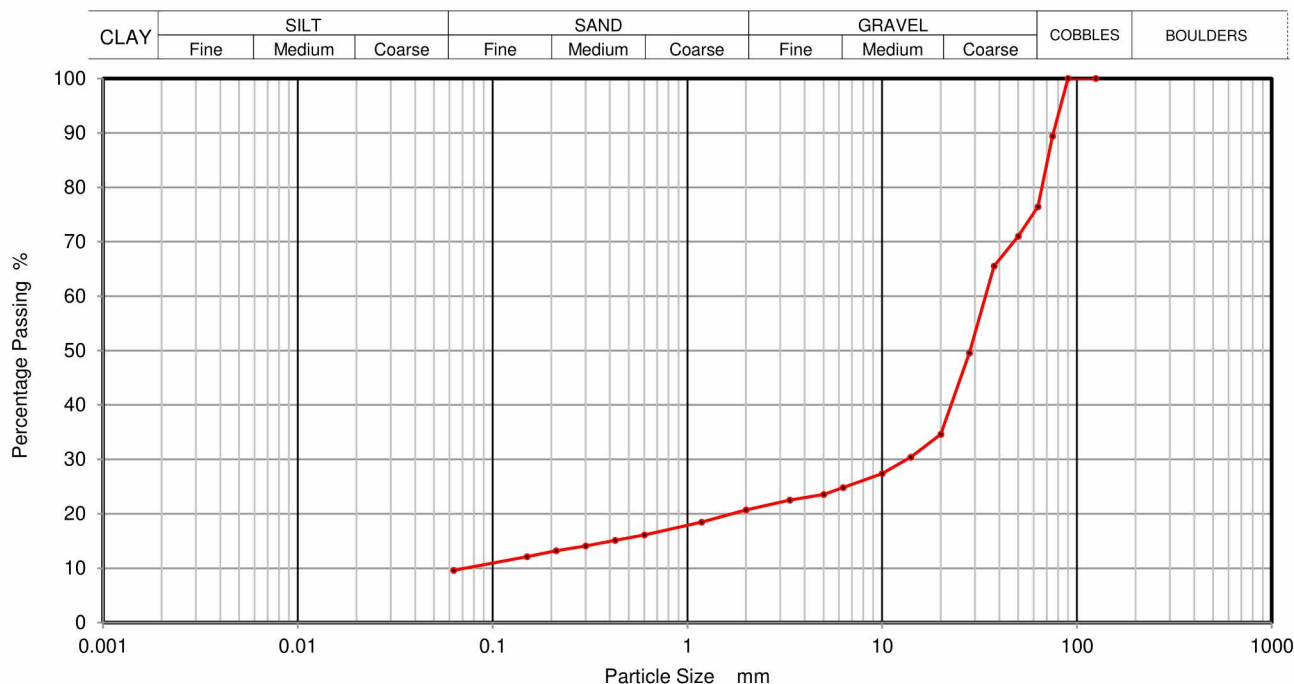
Soil Description **Brown sandy silty clayey GRAVEL. With cobbles**

Depth Top **1.70**

Depth Base

Date Tested **24/10/2019**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	89		
63	76		
50	71		
37.5	66		
28	50		
20	35		
14	30		
10	27		
6.3	25		
5	24		
3.35	22		
2	21		
1.18	18		
0.6	16		
0.425	15		
0.3	14		
0.212	13		
0.15	12		
0.063	10		

Sample Proportions	% dry mass
Cobbles	24
Gravel	55
Sand	11
Silt and Clay	10

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	30/10/2019	Wayne Honey
RO/MH	Approved	31/10/2019	Paul Evans





Tim Rudkin
Soils Ltd
Unit 11
Sun Valley Business Park
Winnall Close
Winchester
Hampshire
SO23 0LB

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

e: tr@soilslimited.co.uk

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-66697

Project / Site name:	Kingscroft Farm	Samples received on:	17/10/2019
Your job number:	17877	Samples instructed on:	17/10/2019
Your order number:		Analysis completed by:	24/10/2019
Report Issue Number:	1	Report issued on:	24/10/2019
Samples Analysed:	2 soil samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-66697

Project / Site name: Kingscroft Farm

Lab Sample Number				1334872	1334873			
Sample Reference				WS2	WS2			
Sample Number				None Supplied	None Supplied			
Depth (m)				1.20	2.50			
Date Sampled				Deviating	Deviating			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)								
Stone Content	%	0.1	NONE	12	< 0.1			
Moisture Content	%	N/A	NONE	6.7	9.7			
Total mass of sample received	kg	0.001	NONE	0.57	0.72			

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.4	8.7			
Total Sulphate as SO ₄	%	0.005	MCERTS	0.028	0.057			
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.034	0.011			
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	34.4	10.8			
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	1.0	2.5			
Total Sulphur	%	0.005	MCERTS	0.009	0.020			
Ammonium as NH ₄	mg/kg	0.5	MCERTS	< 0.5	1.3			
Ammonium as NH ₄ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	0.13			
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0			

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	5.1	< 5.0			
Magnesium (leachate equivalent)	mg/l	2.5	NONE	2.5	< 2.5			



Analytical Report Number : 19-66697

Project / Site name: Kingscroft Farm

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1334872	WS2	None Supplied	1.20	Brown clay and sand with stones and gravel
1334873	WS2	None Supplied	2.50	Light brown clay and sand with chalk and gravel.

Analytical Report Number : 19-66697

Project / Site name: Kingscroft Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammonium as NH ₄ in soil	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 °C)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Sample ID	Other ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS2		S	19-66697	1334872	a			
WS2		S	19-66697	1334873	a			

Appendix C Chemical Laboratory Testing

Appendix C.1 Conceptual Site Model

Table C.1.1 CSM Revised Post Testing

Source	Potential Contaminant	Exposure Pathway	Receptor	Initial Assessment from Preliminary Investigation Report Information			Comments	Proposed Investigation
				Severity	Probability	Risk		
Local Authority Recorded Landfill Sites, Potentially Infilled Land (Water), Registered Landfill Sites Off-site sources from which potential contamination would have migrated onto the site.	Soil-gas	Inhalation of Vapour/gases (including Radon)	Site Workers/Site Maintenance	Mild	Likely	Moderate/Low	Potentially infilled land (water) and recorded landfilled sites within 0 – 250m to the site. Potential disposal of hazardous waste in unlined pits or ponds poses a threat to human health via migration of contaminants. Risk for release of soil-gas as putrescible materials contained in the landfill may gradually decay.	Ground workers should follow regulations on health and safety during development (HSE, 1991). Soil gas monitoring ongoing at the time of reporting.
			End Users	Medium	Likely	Moderate		
			Off-site Users	Mild	Low	Low		
	Soil-gas	Migration of gases via permeable soils (including radon)	Site Workers/Site Maintenance	Mild	Likely	Moderate/Low	Potential migration of contaminants in solution via groundwater, given that the site was underlain by permeable geology. Potential risk to end-users, off-site users and site workers via inhalation of dust and direct contact, due to residential gardens within the proposed development.	
			End Users	Medium	Likely	Moderate		
			Off-site Users	Mild	Low	Low		
			Building and confined spaces	Medium	Likely	Moderate		

Appendix C.2 Chemical Laboratory Results



Tim Rudkin

Soils Ltd
Unit 11
Sun Valley Business Park
Winnall Close
Winchester
Hampshire
SO23 0LB

e: tr@soilslimited.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-66694

Project / Site name:	Kingscroft Farm	Samples received on:	17/10/2019
Your job number:	17877	Samples instructed on:	17/10/2019
Your order number:		Analysis completed by:	24/10/2019
Report Issue Number:	1	Report issued on:	24/10/2019
Samples Analysed:	7 soil samples		

Signed

Zina Abdul Razzak
Senior Quality Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-66694

Project / Site name: Kingscroft Farm

Lab Sample Number				1334851	1334852	1334853	1334854	1334855
Sample Reference				WS1	WS2	WS3	WS4	WS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.20	0.50	0.50	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)								
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	17	18	9.9	12	17
Total mass of sample received	kg	0.001	NONE	0.86	0.87	0.86	0.94	0.95

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
------------------	------	-----	-----------	--------------	--------------	--------------	--------------	--------------

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.6	6.7	7.3	7.7	7.1
Organic Matter	%	0.1	MCERTS	2.5	3.3	0.3	< 0.1	3.3

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
----------------------------	-------	---	--------	-------	-------	-------	-------	-------

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.33
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.29
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.28
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.30
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.43
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.14
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.32
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	< 0.80	2.09
-----------------------------	-------	-----	--------	--------	--------	--------	--------	------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	11	17	17	13
Boron (water soluble)	mg/kg	0.2	MCERTS	0.8	1.1	1.0	1.2	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	0.4	< 0.2	< 0.2	0.3
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	30	30	33	26
Copper (aqua regia extractable)	mg/kg	1	MCERTS	39	34	18	17	36
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	93	12	13	86
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.6	< 0.3	< 0.3	0.8
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	19	23	25	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	3.2
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	46	44	47	55	44
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	63	65	43	47	77

Petroleum Hydrocarbons

TPH Texas (C6 - C8)	mg/kg	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH Texas (C8 - C10)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Texas (C10 - C12)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH Texas (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
TPH Texas (C16 - C21)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Texas (C21 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	12
TPH Texas (C6 - C40)	mg/kg	10	NONE	< 10	< 10	< 10	< 10	12

Analytical Report Number: 19-66694

Project / Site name: Kingscroft Farm

Lab Sample Number				1334856	1334857			
Sample Reference				WS5	TP1			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.50	0.20			
Date Sampled				Deviating	Deviating			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)								
Stone Content	%	0.1	NONE	< 0.1	< 0.1			
Moisture Content	%	N/A	NONE	8.6	17			
Total mass of sample received	kg	0.001	NONE	0.94	1.0			

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected			
------------------	------	-----	-----------	--------------	--------------	--	--	--

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.4	7.0			
Organic Matter	%	0.1	MCERTS	1.0	2.8			

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0			
----------------------------	-------	---	--------	-------	-------	--	--	--

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80			
-----------------------------	-------	-----	--------	--------	--------	--	--	--

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.6	12			
Boron (water soluble)	mg/kg	0.2	MCERTS	1.6	1.4			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.4			
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	26			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	19	33			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	97			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	16			
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	40	41			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	52	61			

Petroleum Hydrocarbons

TPH Texas (C6 - C8)	mg/kg	0.1	ISO 17025	< 0.1	< 0.1			
TPH Texas (C8 - C10)	mg/kg	10	MCERTS	< 10	< 10			
TPH Texas (C10 - C12)	mg/kg	1	MCERTS	< 1.0	< 1.0			
TPH Texas (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0			
TPH Texas (C16 - C21)	mg/kg	10	MCERTS	< 10	< 10			
TPH Texas (C21 - C40)	mg/kg	10	MCERTS	< 10	< 10			
TPH Texas (C6 - C40)	mg/kg	10	NONE	< 10	< 10			



Analytical Report Number : 19-66694

Project / Site name: Kingscroft Farm

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1334851	WS1	None Supplied	0.20	Brown loam and clay with gravel and vegetation.
1334852	WS2	None Supplied	0.20	Brown loam and clay with gravel and vegetation.
1334853	WS3	None Supplied	0.50	Light brown clay and sand with vegetation.
1334854	WS4	None Supplied	0.50	Light brown clay and sand with vegetation.
1334855	WS5	None Supplied	0.20	Brown loam and clay with gravel and clinker
1334856	WS5	None Supplied	0.50	Brown loam and clay.
1334857	TP1	None Supplied	0.20	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 19-66694

Project / Site name: Kingscroft Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphénylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH Texas (Soil)	Determination of dichloromethane/hexane extractable hydrocarbons in soil by GC-MS.	In-house method	L064-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample ID	Other ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TP1		S	19-66694	1334857	a			
WS1		S	19-66694	1334851	a			
WS2		S	19-66694	1334852	a			
WS3		S	19-66694	1334853	a			
WS4		S	19-66694	1334854	a			
WS5		S	19-66694	1334855	a			
WS5		S	19-66694	1334856	a			

**Tim Rudkin**

Soils Ltd
Unit 11
Sun Valley Business Park
Winnall Close
Winchester
Hampshire
SO23 0LB

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

e: tr@soilslimited.co.uk

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 19-66695

Project / Site name:	Kingscroft Farm	Samples received on:	17/10/2019
Your job number:	17877	Samples instructed on:	17/10/2019
Your order number:		Analysis completed by:	24/10/2019
Report Issue Number:	1	Report issued on:	24/10/2019
Samples Analysed:	2 10:1 WAC samples		

Signed:

Zina Abdul Razzak
Senior Quality Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

i2 Analytical

7 Woodshots Meadow
Croxley Green Business Park
Watford, WD18 8YS

Telephone: 01923 225404
Fax: 01923 237404
email: reception@i2analytical.com

Waste Acceptance Criteria Analytical Results							
Report No:	19-66695						
					Client: SOILSLTD		
Location	Kingscroft Farm						
Lab Reference (Sample Number)	1334868 / 1334869				Landfill Waste Acceptance Criteria		
Sampling Date					Limits		
Sample ID	WS2				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Depth (m)	0.20						
Solid Waste Analysis							
TOC (%)**	1.8				3%	5%	6%
Loss on Ignition (%) **	5.7				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	2.0				100	--	--
pH (units)**	7.0				--	>6	--
Acid Neutralisation Capacity (mol / kg)	0.0000				--	To be evaluated	To be evaluated
Eluate Analysis							
	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0038			0.0314	0.5	2	25
Barium *	0.0142			0.118	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0019			0.016	0.5	10	70
Copper *	0.014			0.11	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0014			0.0120	0.5	10	30
Nickel *	0.0035			0.029	0.4	10	40
Lead *	0.0056			0.047	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0097			0.080	4	50	200
Chloride *	1.9			16	800	4000	25000
Fluoride	0.44			3.6	10	150	500
Sulphate *	1.7			14	1000	20000	50000
TDS*	35			290	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	8.29			68.8	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.87						
Dry Matter (%)	82						
Moisture (%)	18						
Results are expressed on a dry weight basis, after correction for moisture content where applicable.							
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation				** = MCERTS accredited			
Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.							
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.							

i2 Analytical

7 Woodshots Meadow
Croxley Green Business Park
Watford, WD18 8YS

Telephone: 01923 225404
Fax: 01923 237404
email: reception@i2analytical.com

Waste Acceptance Criteria Analytical Results								
Report No:	19-66695							
					Client: SOILSLTD			
Location	Kingscroft Farm							
Lab Reference (Sample Number)	1334870 / 1334871				Landfill Waste Acceptance Criteria			
Sampling Date					Limits			
Sample ID	WS3				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Depth (m)	0.50							
Solid Waste Analysis								
TOC (%)**	0.5				3%	5%	6%	
Loss on Ignition (%) **	2.7				--	--	10%	
BTEX (µg/kg) **	< 10				6000	--	--	
Sum of PCBs (mg/kg) **	< 0.007				1	--	--	
Mineral Oil (mg/kg)	< 10				500	--	--	
Total PAH (WAC-17) (mg/kg)	< 0.9				100	--	--	
pH (units)**	7.7				--	>6	--	
Acid Neutralisation Capacity (mol / kg)	1.8				--	To be evaluated	To be evaluated	
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test			
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
Arsenic *	< 0.0011			< 0.0110	0.5	2	25	
Barium *	0.0020			0.0184	20	100	300	
Cadmium *	< 0.0001			< 0.0008	0.04	1	5	
Chromium *	< 0.0004			< 0.0040	0.5	10	70	
Copper *	0.0031			0.028	2	50	100	
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2	
Molybdenum *	0.0004			< 0.0040	0.5	10	30	
Nickel *	< 0.0003			< 0.0030	0.4	10	40	
Lead *	0.0011			0.010	0.5	10	50	
Antimony *	< 0.0017			< 0.017	0.06	0.7	5	
Selenium *	< 0.0040			< 0.040	0.1	0.5	7	
Zinc *	0.0016			0.015	4	50	200	
Chloride *	1.1			10	800	4000	25000	
Fluoride	0.16			1.5	10	150	500	
Sulphate *	1.6			14	1000	20000	50000	
TDS*	12			110	4000	60000	100000	
Phenol Index (Monhydric Phenols) *	< 0.010			< 0.10	1	-	-	
DOC	5.04			46.5	500	800	1000	
Leach Test Information								
Stone Content (%)	< 0.1							
Sample Mass (kg)	0.86							
Dry Matter (%)	90							
Moisture (%)	9.9							
Results are expressed on a dry weight basis, after correction for moisture content where applicable.					* = UKAS accredited (liquid eluate analysis only)			
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation					** = MCERTS accredited			
Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.								
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.								



Analytical Report Number : 19-66695

Project / Site name: Kingscroft Farm

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1334868	WS2	None Supplied	0.20	Brown loam and clay with gravel and vegetation.
1334870	WS3	None Supplied	0.50	Light brown clay and sand with vegetation.



Analytical Report Number : 19-66695

Project / Site name: Kingscroft Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
----------------------	-------------------------------	-----------------------------	---------------	--------------------	----------------------

Sample ID	Other ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS2		L	19-66695	1334869	a			
WS2		S	19-66695	1334868	a			
WS3		L	19-66695	1334871	a			
WS3		S	19-66695	1334870	a			

Appendix C.3 General Assessment Criteria

Appendix D Information Provided by the Client



Please Note:
This drawing must not be scaled, dimensions to be checked on site and any discrepancies are to be highlighted to the Architect prior to construction.
Prior to the commencement of any works, the Contractor is to check and / or determine all construction details including checking existing site levels and dimensions.
This drawing is to be read in conjunction with all other project drawings, construction notes and / or project specifications including those by other project consultants and specialists. All discrepancies should be reported immediately.
Design subject to detail development / approval.
Measurements and accommodation schedules subject to amendments following coordinated input by others.
Costings cannot be finalised until approval /confirmation by relevant authorities and Client.

Further design information:



E	Amended to client's comments	21.06.22	VP/HJE
D	Access amended to highways' design	17.05.22	VP/HJE
C	Amended to client's comments	13.05.22	VP/HJE
B	Red line removed	26.04.22	VP/HJE
A	Amended to client comments	11.04.22	DW/HJE

Rev.	Description	DATE	DB / CB
------	-------------	------	---------

Date	Apr '22
Drawn By/Checked By	VP / HJE
Scale	1:1000 @ A2
Revision	E
Project	Land at Kingscroft Farm Meyrick Road, Havant
Title	Illustrative Site Plan
Dwg#	18.099.02
Status	Sketch

Furzehall Farm, Wickham Road
Fareham, Hampshire
PO16 7JH
01329 283 225
email@hgp-architects.co.uk
www.hgp-architects.co.uk
HGP Architects Ltd.
Copyright Reserved

Unit 1, Station Industrial Park,
Duncan Rd, Southampton
SO31 1BX
0330 333 7365
info@foremanhomes.co.uk

Soils Limited
Geotechnical & Environmental Consultants

Newton House
Cross Road, Tadworth
Surrey KT20 5SR

T 01737 814221
W soilslimited.co.uk