



Main Investigation Report

at

30-32 Queens View, Netley, Southampton, Hampshire SO31 5EA

for

Eastleigh Borough Council

Reference: 20870/MIR Rev1.01

April 2024

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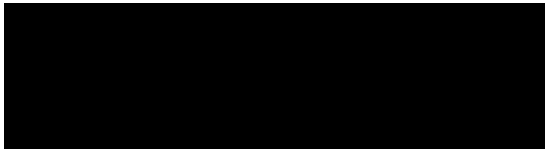
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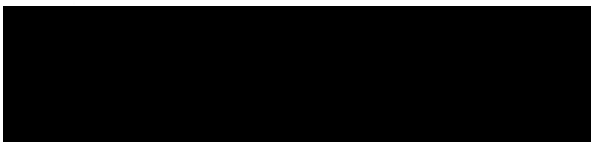
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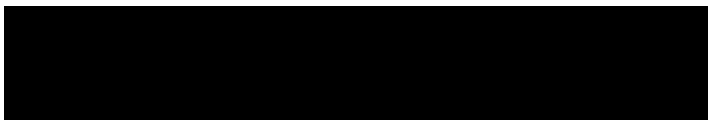
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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

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



Commission

This document comprises the Main Investigation Report (MIR) and incorporates the results, discussion, and conclusions to this intrusive works. General site data is recorded below:

Commission Record	
Client	Eastleigh Borough Council
Site Name	30-32 Queens View, Netley, Southampton, Hampshire SO3I 5EA
Grid Reference	SU 458 088
Soils Limited Quotation Ref	Q27498revI02, dated 16 th March 2023
Clients Purchase Order	000337277, dated 6 th April 2023

The record of revision to this document is presented below:

Record Of Revisions		
Revision	Date	Reason
20870/MIR RevI.0I	April 2024	Section 8.8 updated.

Note(s): The latest revised document supersedes all previous revisions of the MIR produced by Soils Limited.

Documents associated with this development that must be referred to are given below.

Record Of Associated Documents			
Reference	Type	Date	Creator
LP3177/DS/I	Phase I Desk Study and Site Reconnaissance	4 th January 2023	Leap Environmental Ltd

Limitations and Disclaimers

The report was prepared solely for the brief described in Section 1.1 of this report.

The contents, recommendations and advice given in the report are subject to the Terms and Conditions given in Soils Limited's Quotation

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.

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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.

If the term "competent person" is used in this report or any Soils Limited document, it means an engineering geologist or civil engineer with a minimum of three years post graduate experience in the understanding and application of the appropriate codes of practice.

Unless the site investigation works have been designed and specified in accordance with EC7, this report is a Geotechnical Investigation Report and is not necessarily a Ground Investigation Report as defined by EC7 (Eurocode 7 Part 1, §3.4, Part 2, §6.1) or a Geotechnical Design Report (Eurocode 7 Part 1, §2.8) as defined by Eurocode 7 and as such may not characterise the ground conditions and additional works may be required to comply with the requirements of EC7.

Within the report reference to ground level relates to the site level at the time of the investigation, unless otherwise stated.

Exploratory hole is a generic term used to describe a method of direct investigation. The term exploratory pit, borehole or window sample borehole implies the specific technique used to produce an exploratory hole.

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).

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 were 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 Derwentside Environmental Testing Services (DETS) 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.

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 updated 2021) 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".

It must be noted that a detailed survey of the possible presence or absence of invasive species, such as Japanese Knotweed, is outside of the scope of investigation.

Deleterious materials may be present in any Made Ground that pose a potential risk to site workers, end users and adjacent vulnerable receptors. These could include a range of contaminants, including asbestos, especially if the material includes large fractions of demolition derived materials.

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.

All environmental works are undertaken in the context of, and in compliance with, BS10175+A2 2017 and LCRM (EA 2021) and all other pertinent planning, standards, documentation and guidance appropriate to the site at the time of production which may include, but are not necessarily limited to, documents provided by BS/CEN/ISO, NHBC, AGS, CIEH, CIRIA, SoBRA and CLAIRE.

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Section I Introduction

I.1 Objective of Investigation

The Client commissioned Soils Limited to undertake an intrusive ground investigation and to prepare a Main Investigation Report to supply the Client and their designers with information regarding ground conditions, to assist in preparing a foundation scheme for development that was appropriate to the settings present on the site.

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

No Preliminary Investigation Report was undertaken by Soils Limited for the site that would allow a Conceptual Site Model (CSM) to be produced and potential contamination risks to be identified and assessed. To assist in delineating the scope of works described above, reliance was also placed on the Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/1, dated January 2023, which was supplied to Soils Limited by the client.

Following liaison and agreement with the Client and as recommended in the above report:

- Two (2No.) standpipe monitoring wells were installed within the boreholes, to allow groundwater/ground-gas monitoring on three (3No.) occasions.
- Soil samples were to be 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.

I.2 Site Description

The site of the proposed development comprised two semi-detached, two storeyed, brick, mixed use buildings with commercial use on ground floor and flats on the first floor, including garages adjacent to their northern and eastern edge.

The site surfacing included a tarmacadam covered car park and turning circle to the west and south-west, along with concrete flooring present in front of the structures and to the rear of the northern site building. Domestic gardens relating to the flats, mainly grass covered, and a conservatory were noted to the rear of the eastern building. Grassed areas with tarmacadam and gravel paths crossing were noted in the north-west and in the eastern part of the site and a grass patch was spotted in the middle of the turning circle.

Semi mature and mature trees were lining the eastern and north-eastern fringe of the study area, forming the domestic gardens of the properties. A mature tree was noted in the northern side of the site, next to the lock up garages and few scattered mature trees

were in the south-eastern side of the site within the grass covered area together with some shrubbery along the south-western boundary.

The subject area was sloping down gently to the south-west with a slope of $\sim 2^\circ$, towards 'The Solent' located $\sim 800\text{m}$ from the site.

The site surroundings included residential properties and recreational ground to the south and east, housing across 'Queens View Road' to the north and west and commercial developments with associated grounds to the south-west.

The location plan is given in Figure 1. An aerial photograph of the site and its close environs has been included in Figure 2.

1.3 Proposed Development

The proposals for the site comprised demolition of the existing structures to erect a three-storey building consisting of 20 No. residential flats. The proposed development was to include hard landscaping in the form of car park spaces and a parking court, footpaths and a bin storage area. Soft landscaping was to be included in the form of private gardens mainly to the rear of the flats along with low maintenance soft landscaped areas predominantly on the perimeter of the site and within the car park area to the front.

In compiling this report reliance was placed on drawing No.: 0019 Rev. P05, dated 8th August 2022 by MH Architects. The recommendations provided within this report are made exclusively in relation to the scheme outlined above and must not be applied to any other scheme without further consultation with Soils Limited. Soils Limited must be notified about any change or deviation from the scheme outlined.

Development plans provided by the Client are presented in Appendix F.

1.4 Anticipated Geology

The 1:50,000 BGS Geology map showed the site to be underlain by the Selsey Sand Formation bedrock, with overlying River Terrace Deposits.

1.4.1 River Terrace Deposits

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

I.4.2 Selsey Sand Formation

Silty sand, silty clay and sandy clayey silt, glauconitic, bioturbated, locally calcareous.

Rests on the Marsh Farm Formation at a sharp contact on a burrowed surface overlain by glauconitic sandy silt with a few pebbles. Overlain by Barton Clay Formation.

Boundary based a distinction of sand content from fine- to very fine-grained sandstone of the Tellina Bed (topmost Selsey Formation) to the olive grey glauconitic sandy clays of the Barton Clay Formation.

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 (Q27498rev102, dated 16th March 2023), was to comprise the following items:

- Service clearance of proposed test hole locations
- 4No. window sample boreholes and dynamic probes (DPSH) up to a depth of 4.00m bgl
- Installation of wells in two (2No.) of the boreholes, to allow groundwater/ground-gas monitoring on three (3No.) occasions, following liaison and agreement with the Client
- 2No. machine excavated trial pits to allow infiltration testing in accordance with BRE365
- Geotechnical laboratory testing
- Chemical laboratory analysis

2.1.1 Actual Project Works

The actual project works were undertaken on 9th, 10th and 15th May 2023, with subsequent sample logging, laboratory testing, monitoring, and reporting. The actual works comprised:

- Service clearance of proposed test hole locations
- 4No. window sample boreholes to a maximum depth of 3.00m bgl (WS1 to WS4)
- 4No. dynamic probes (DPSH) to a maximum depth of 6.00m bgl (DP1 to DP4), adjacent and prior to the drilling of the relevant window sample boreholes
- Installation of wells in two (2No.) of the boreholes (WS1 and WS4), to allow groundwater/ground-gas monitoring on three (3No.) occasions
- 3No. machine excavated trial pits (TPSK1, TPSK2 and TPSK2b) to 1.20m, 2.50m and 1.50m bgl respectively, to allow infiltration testing in accordance with BRE365
- Geotechnical laboratory testing
- Chemical laboratory analysis

Two window sample boreholes (WS1 and WS4) were backfilled with gravel and bentonite following the installation of monitoring wells; the remaining boreholes were backfilled with gravel; all trial pits (TPSK1, TPSK2 and TPSK2b) were backfilled with arisings and left slightly proud to accommodate future settlement.

The installation details are as follows:

- Ground level to 1.00m in WS1 and to 0.40m bgl in WS4 – plain 50mm pipework/bentonite backfill
- From 1.00m and 0.40m bgl to a depth of 2.70m and 1.40m bgl in WS1 and WS4 respectively, perforated 50mm pipework/gravel backfill with bentonite seal at depth.

The window samples WS2, WS3 and WS4 and dynamic probes DP2, DP3 and DP4, stopped at shallower depths than initially planned, due to the very competent material (dense soils) encountered, through which the equipment could not safely advance. The drilled depth in WS1 was limited to 3.00m bgl, due to the sides of the borehole continuously collapsing below that depth.

Trial pit TPSK1 stopped at a shallower depth than initially planned in order to reduce the risk of the excavator striking the overhead electrical cables running above the exploratory hole location. The depth of TPSK2 was also limited, due to the sides of the trial pit continuously collapsing. TPSK2b was subsequently undertaken at the same location of TPSK2, although at a shallower depth, to examine the infiltration potential of the ground within that depth.

All exploratory hole locations have been presented in Figure 3.

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

2.2 Ground Conditions

On 9th May 2023, service clearance of proposed test hole locations was undertaken using a cable avoidance tool (RD8000) to trace low and high voltage electricity cables, BT, security cabling and metal pipes. To detect non-metallic services such as fibre optic, clay drainage, plastic gas, and water services, Ground Penetration Radar (Leica DS2000) was used.

Two trial pits were machine excavated to depths of 1.20m and 2.50m below ground level (bgl) and infiltration testing was undertaken in each of them, in accordance with BRE365, the results of which are presented in Section 3.2.

On 10th May 2023, four (4No.) window sample boreholes were drilled, using a Premier Compact Series 110 rig, to depths ranging between 1.00m and 3.00m bgl.

Four super heavy dynamic probes were driven prior and adjacent to their corresponding window sample borehole to depths ranging between 1.50m and 6.00m bgl.

A standpipe was installed within each of the window sample borehole locations WS1 and WS4, to allow for continued monitoring of both groundwater and ground gas on three (3No.) occasions, following liaison and agreement with the client and as recommended in the Phase I Desk Study and Site Reconnaissance, undertaken for the site by Leap Environmental Ltd (Report ref.: LP3177/DS/1, dated January 2023).

On 12th May 2023, an additional trial pit (TPSK2b) was machine excavated to a depth of 1.20m bgl and infiltration testing was undertaken within it, in accordance with BRE365, the results of which are presented in Section 3.2.

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

Table 2.1 Final Depth of Exploratory Holes

Exploratory Hole	Depth (m bgl)	Exploratory Hole	Depth (m bgl)
WS1 ^w	3.00 ¹	DPI	6.00
WS2	1.00 ²	DP2	1.50 ²
WS3	1.50 ²	DP3	1.70 ²
WS4 ^w	1.50 ²	DP4	1.80 ²
TPSK1	1.20 ²		
TPSK2	2.50 ²		
TPSK2b	1.20		

Notes: ¹ Depth limited due to sides of the hole collapsing, ² Depth limited due to dense soils encountered, w - well installation The depths given in this table are taken from the ground level on-site at the time of investigation.

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

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

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

**Made Ground (MG)
River Terrace Deposits (RTD)
Selsey Sand Formation (SLSY)**

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

Table 2.2 Ground Conditions

Strata	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
	Top	Bottom		
MG	G.L.	0.40 – 0.45	0.40	Firm, dark brown, sandy, gravelly CLAY to sandy, gravelly SILT, with flint, tarmacadam, brick, concrete and clinker. Rare plastic found. Frequent rootlets noted.
RTD	0.40 – 0.45	2.70	2.30	Soft to firm, greyish brown, slightly sandy, very gravelly CLAY. Occasional rootlets noted. Becoming clayey, sandy, fine to coarse flint GRAVEL with depth. Becoming slightly sandy, very gravelly CLAY with depth.
SLSY	2.70	>3.00 ^{1 2}	Not proven ²	Yellowish brown, mottled orange, slightly clayey SILT.

Note(s): ¹ Final depth of exploratory hole. ² Base of strata not encountered. The depths given in this table are taken from the ground level on-site at the time of investigation. G.L. – Ground Level

It must be noted that the Selsey Sand Formation bedrock was only encountered within WS1, therefore the full depth of the River Terrace Deposits could not be established within the remaining three window sample borehole locations, which were terminated within the superficial stratum.

2.3 Ground Conditions Encountered in Exploratory Holes

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

2.3.1 Made Ground

Soils described as Made Ground were encountered in all four window samples and all three trial pits from ground level to depths ranging between 0.40m and 0.45m bgl.

The Made Ground typically comprised firm, dark brown, slightly sandy, gravelly CLAY to slightly sandy, slightly gravelly SILT, becoming gravelly with depth. Gravel was angular to rounded, fine to coarse flint, tarmacadam, brick, concrete and clinker. Rare plastic was found. Frequent rootlets were noted. Odour of manure was identified in WS1. Odour of chlorinated solvents was noted in WS2, and very faint soapy/floral odour was noted in WS3.

The established depth of Made Ground found at each exploratory hole location has been included in Table 2.3.

Table 2.3 Established Depth of Made Ground

Exploratory Hole	Depth (m bgl)	Exploratory Hole	Depth (m bgl)
WS1	0.40	TPSK1	0.40
WS2	0.40	TPSK2	0.40
WS3	0.40	TPSK2b	0.40
WS4	0.45		

2.3.2 River Terrace Deposits

The superficial River Terrace Deposits were encountered directly below the Made Ground in all window sample boreholes (WS1 to WS4) and inferred within their corresponding dynamic probes (DP1 to DP4) and within all exploratory pits (TPSK1, TPSK2, TPSK2b), to depths ranging from 1.00m bgl (WS2) and 2.70m bgl. However, all exploratory holes except from the location of WS/DP1 were terminated within the soils of the River Terrace Deposits, so the full depth of the stratum could not be established in these locations.

The soils typically comprised soft to firm, greyish brown, slightly sandy, very gravelly CLAY. Gravel was angular to sub angular, fine to coarse flint. Occasional rootlets were noted. Becoming yellowish to orangish brown, clayey, sandy, fine to coarse flint GRAVEL with depth. Becoming yellowish brown and orangish brown mottled, slightly sandy, very gravelly CLAY with depth. Distinct floral soapy/solvent odour was noted from 2.00m bgl in WS1.

The established depth of River Terrace Deposits found at each exploratory hole location has been included in Table 2.4.

Table 2.4 Established Depth of River Terrace Deposits

Exploratory Hole	Depth (m bgl)	Probe Hole	Depth (m bgl)
WS1	2.70	DP1	2.70 ²
WS2	1.00 ¹	DP2	1.50 ^{1 2}
WS3	1.50 ¹	DP3	1.70 ^{1 2}
WS4	1.50 ¹	DP4	1.80 ^{1 2}
TPSK1	1.20 ¹		
TPSK2	2.50 ¹		
TPSK2b	1.20 ¹		

Note: ¹ Final depth of exploratory hole. ² Inferred from dynamic probes.

2.3.3 Selsey Sand Formation

The Selsey Sand Formation bedrock was only encountered in the location of WS1 and inferred within its corresponding dynamic probe (DP1), directly below the River Terrace Deposits to the final investigatory depth of 6.00m bgl.

The stratum comprised yellowish brown, mottled orange, slightly clayey SILT. Rare clay laminations were encountered at base.

The established depth of the Selsey Sand Formation found at each exploratory hole location has been included in Table 2.5.

Table 2.5 Established Depth of Selsey Sand Formation

Exploratory Hole	Depth (m bgl)	Probe Hole	Depth (m bgl)
WS1	3.00 ¹	DPI	6.00 ^{1 2}
WS2	N/E	DP2	N/E
WS3	N/E	DP3	N/E
WS4	N/E	DP4	N/E
TPSK1	N/E		
TPSK2	N/E		
TPSK2b	N/E		

Note: ¹ Final depth of exploratory hole. ² Inferred from dynamic probes. N/E = Not encountered

2.4 Roots

Roots were encountered in all window sample boreholes and trial pits to depths ranging between 0.40m and 0.90m bgl. The established depth of root penetration found at the exploratory hole locations has been included in Table 2.6.

Table 2.6 Established Depth of Root Penetration

Exploratory Hole	Depth (m bgl)
WS1	0.65
WS2	0.65
WS3	0.80
WS4	0.90
TPSK1	0.40
TPSK2	0.50
TPSK2b	0.50

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.

Semi mature and mature trees were lining the eastern and north-eastern fringe of the study area, forming the domestic gardens of the properties. A mature tree was noted in the northern side of the site, next to the lock up garages and few scattered mature trees were in the south-eastern side of the site within the grass covered area together with some shrubbery along the south-western boundary. A search on Google Earth of an aerial photograph of the site and its environs dated 1999 (earliest available aerial photograph), showed the south-eastern site boundary as being covered by mature trees.

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 an exploratory pit is necessary to gain a better indication of the maximum root depth.

2.5 Groundwater

Groundwater was not encountered in any of the exploratory hole locations at the time of the investigation. This could potentially be attributed to the depth of all exploratory holes being limited.

Wells were installed in two (2No.) window sample boreholes (WS1 and WS4) to allow for combined groundwater/soil-gas monitoring on three (3No.) occasions, following instructions from the Client.

Groundwater records taken during the intrusive investigation and during the groundwater/soil-gas monitoring to date, are shown in Table 2.7.

Table 2.7 Groundwater Records and Monitoring Data

Exploratory Hole	Well Depth (m bgl)	Depth to Water (m bgl)			
		10.05.23 ¹	16.05.23 ²	26.05.23 ²	14.06.23 ²
WS1	2.70	N/E	N/E	N/E	N/E
WS4	1.40	N/E	N/E	N/E	N/E

Note: ¹ Reading taken during drilling, ² Reading taken during monitoring N/E = Not encountered

Changes in groundwater level occur for reasons including seasonal effects, rainfall events and variations in drainage.

The investigation and groundwater monitoring were conducted in May 2023, when groundwater levels should be falling from their annual maximum (highest) elevation, which typically occurs around March to the annual minimum (lowest) which typically occurs around September.

Section 3 Geotechnical In-Situ and Laboratory Testing

3.1 Dynamic Probe Tests

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 C.1, Table C.1.1 and C.1.2.

Table 3.1 SPT Hammer Efficiency

Rig Reference	Energy Ratio Er (%)
Premier 4	89.93

Table 3.2 Inferred SPT Interpretation

Strata	Depth Range (m bgl)	Inferred N₆₀ Range	Cohesive Soils	
			Cohesive Strength	Inferred Cohesion
River Terrace Deposits	0.40 – 2.70	4 - 59	Very low to Very high	Cu=20 – 295kPa
Selsey Sand Formation	2.70 – >6.00 ¹	12 - 30	Medium to Very High	Cu=60 – 150kPa
Strata	Depth Range (m bgl)	Inferred N₆₀ Range	Granular Soils	
			Relative Density	
River Terrace Deposits	0.40 – 1.50	8 - >50	Loose to Very dense	

Note(s): SPT “N₆₀” values presented have been corrected in accordance with BS EN 22476 Part 3 ¹ Base of strata not encountered.

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

3.2 Infiltration Tests

Infiltration tests were performed in trial pits TPSK1, TPSK2 and TPSK2b in order to audit the infiltration potential of the ground for development that was appropriate to the settings present on the site.

The tests were undertaken within the granular soils of River Terrace Deposits within all the locations. The test within trial pit TPSK2 was abandoned due to minimal infiltration recorded over the course of the day.

The tests comprised piping water via a water tanker in TPSK1 and TPSK2 and via a water bowser in TPSK2b. The fall in water level over time was then recorded to give an indication of soakage potential.

BRE DG365:2023 states that for an accurate infiltration rate to be obtained a soakage pit needs to be filled three times in quick succession. Each test is completed once 75% of the water present has drained away, in order to determine whether or not the underlying ground conditions may be suitable for surface water drainage.

Table 3.3 presents the infiltration test results performed within all three exploratory pits.

Table 3.3 Infiltration Test Results

Exploratory Hole	Test Cycle	Test Stratum	Test Depth (m bgl)	Infiltration Rate (m/sec)	Notes
TPSK1	1	RTD	1.16	6.70×10^{-5}	Gravel - natural soils
	2	RTD	1.08	6.80×10^{-5}	
	3	RTD	1.06	5.94×10^{-5}	
TPSK2	1	RTD	2.42	-	No infiltration rate was calculated due to the lack of infiltration recorded.
TPSK2b	1	RTD	1.20	2.80×10^{-5}	Gravel - natural soils
	2	RTD	1.20	3.05×10^{-5}	
	3	RTD	1.20	1.78×10^{-5}	Gravel – natural soils. Data extrapolated after 130min to calculate an infiltration rate.

Notes: RTD = River Terrace Deposits

Infiltration rates of between 1.78×10^{-5} m/sec and 6.80×10^{-5} m/sec were calculated within the soils of the River Terrace Deposits.

For a soakaway to be viable it is required to empty by 50% in a 24-hour period in saturated ground conditions.

3.3 Atterberg Limit Tests

Atterberg Limit tests were performed on two samples, one obtained from the cohesive beds of River Terrace Deposits and one from the cohesive soils of Selsey Sand Formation bedrock. The results were classified in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

Table 3.4 Atterberg Limit Results Classification

Strata	Depth (m bgl)	Volume Change Potential	
		NHBC	BRE 240
River Terrace Deposits (cohesive)	2.40	Low	Low
Selsey Sand Formation (cohesive)	2.80	None	Low

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

3.4 Particle Size Distribution Tests

Particle Size Distribution (PSD) tests were performed on four samples from the granular beds of River Terrace Deposits and on one sample from the Selsey Sand Formation bedrock.

Table 3.5 Particle Size Distribution Classification

Strata	Depth (m bgl)	Volume Change Potential	
		NHBC	BRE 240
River Terrace Deposits (granular)	1.10, 1.0-1.50, 1.0-2.0, 2.80	No	No
Selsey Sand Formation (cohesive)	2.80	Yes	Yes

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 C.2.3, Appendix C.2 and the laboratory report in Appendix C.3.

3.5 Sulphate and pH Tests

Water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment Special Digest 1, 2005, 'Concrete in Aggressive Ground'.

Table 3.6 Sulphate and pH Test Results

Strata	Depth (m bgl)	Sulphate Concentration (mg/l)	pH
River Terrace Deposits (cohesive)	0.60	23	7.2
River Terrace Deposits (granular)	0.90	<10	7.4

The significance of the sulphate and pH Test results is discussed in Section 5.2 and the laboratory report in Appendix C.3.

Section 4 Engineering Appraisal

4.1 Established Ground Conditions

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 exploratory holes.

4.1.1 Made Ground

Foundations must not be placed on non-engineered fill unless such use can be justified on the basis of a thorough ground investigation and detailed design. Foundations must be taken through any Topsoil and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Soils described as Made Ground were encountered in all four window samples and all three exploratory pits from ground level to depths ranging between 0.40m and 0.45m bgl. The Made Ground typically comprised firm, dark brown, slightly sandy, gravelly CLAY to slightly sandy, slightly gravelly SILT, becoming gravelly with depth. Gravel was angular to rounded, fine to coarse flint, tarmacadam, brick, concrete and clinker. Rare plastic was found. Frequent rootlets were noted. Odour of manure was identified in WS1. Odour of chlorinated solvents was noted in WS2, and very faint soapy/floral odour was noted in WS3.

4.1.2 River Terrace Deposits

The superficial River Terrace Deposits were encountered directly below the Made Ground in all window sample boreholes (WS1 to WS4) and inferred within their corresponding dynamic probes (DP1 to DP4) and within all exploratory pits (TPSK1, TPSK2, TPSK2b), to depths ranging from 1.00m bgl (WS2) and 2.70m bgl. However, all exploratory holes except from the location of WS/DP1 were terminated within the soils of the River Terrace Deposits, so the full depth of the stratum could not be established in these locations.

The soils of the River Terrace Deposits are normally consolidated, predominantly granular soils, although in the subject site were locally cohesive as well. As such are expected to display low to moderate bearing capacities with moderate to high settlement characteristics. The granular beds of the River Terrace Deposits were considered suitable for the proposed development.

4.1.3 Selsey Sand Formation

The Selsey Sand Formation bedrock was only encountered in the location of WS1 and inferred within its corresponding dynamic probe (DP1), directly below the River Terrace Deposits to the final investigatory depth of 6.00m bgl.

Soils of the Selsey Sand Formation are overconsolidated cohesive soils in the present investigation and are expected to display moderate bearing capacities with moderate settlement characteristics. The soils of the Selsey Sand Formation were considered a suitable bearing stratum for the proposed development; however, their upper horizon

was encountered beyond the depth of traditional shallow foundations.

4.1.4 Guidance on Shrinkable Soils

The ground conditions were established as River Terrace Deposits with a thickness of 2.70m, overlying the bedrock of Selsey Sand Formation encountered only in the location of WS/DP1.

The volume change potential for each stratum was established and presented in Table 4.1.

Table 4.1 Established Volume Change Potential by Strata

Strata	Volume Change Potential		Established Lower Boundary (m bgl)
	BRE	NHBC	
RTD (cohesive)	Low ¹	Low ¹	0.80
RTD (granular)	No ²	No ²	2.70
SLSY (cohesive)	Low ¹	No ¹	Not determined

Notes: ¹ Atterberg Limit Testing ² PSD Testing

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 classified the cohesive beds of River Terrace Deposits as **low volume change potential** in accordance with NHBC Standards Chapter 4.2.

The PSD tests indicated that all four samples tested from the granular beds of River Terrace Deposits had no volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Atterberg Testing indicated that the Selsey Sand Formation bedrock had **no volume change potential** in accordance with NHBC Standards Chapter 4.2.

Low volume change potential should therefore be adopted where foundations pass through the superficial cohesive soils of the River Terrace Deposits.

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 to establish an appropriate founding depth prior to the construction of foundations. This must take account of trees, substantial bushes and hedgerows that are to remain, those that have already been removed or are to be removed or those that are to be planted as part of the site landscaping. When trees are felled, it can take up to twenty years for desiccation caused by roots to recover. Site surveys may not include substantial shrubs or bushes and is also unlikely to have data on any trees, bushes or shrubs removed prior to or following the site survey and the foundation designer must investigate all sources, including local knowledge, aerial photographs and the like.

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”.

4.1.5 Groundwater

Groundwater was not encountered in any of the exploratory hole locations at the time of the investigation and post site works monitoring. This could potentially be attributed to the depth of all exploratory holes being limited.

Groundwater monitoring was ongoing at the time of reporting and will be updated upon completion.

Section 5 Foundation Scheme

5.1 Foundation Recommendations

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

Roots were encountered in all window sample boreholes and exploratory pits to depths ranging between 0.40m and 0.90m bgl. 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.

Considering the type of development, a shallow foundation solution, in the granular River Terrace Deposits was considered the most suitable.

The proposed development is likely to be both light and brittle. It is therefore considered that foundation design is undertaken using NHBC Standards Chapter 4.2.

5.1.1 Shallow Foundations into the River Terrace Deposits (granular beds)

Based on a 5.00 by 0.75m strip foundation, using commercial software Table 5.1 shows the calculated bearing values and anticipated settlement characteristics. The maximum encountered depth of Made Ground and unsuitable soils was 0.80m bgl, bearing capacities were calculated below this depth.

Given the limitations of only a single test location with adequate depth, an allowable bearing capacity of no more than 180kPa should be adopted for foundations formed within the granular soils of River Terrace Deposits underlying the site. Foundations formed onto soils in greater depths, is possible to be placed within the cohesive beds of River Terrace Deposits found underlying the granular beds in the location of WS1, which would result in significantly lower bearing capacity values.

Table 5.1 Allowable Bearing Capacities in the River Terrace Deposits

Depth (m bgl)	Size (m)	Bearing Capacity (kPa)	Anticipated Settlement (mm)
1.00	5.00 x 0.75	180	25

All foundation formations must be examined, recorded, and signed off by a competent person.

The use of reinforced trench fill foundations reduces the potential for differential settlement affecting the foundations.

For the allowable bearing value given above, settlements should not exceed the

presented values, provided that excavation bases are carefully bottomed out and blinded or concreted as soon after excavation as possible and kept dry.

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

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

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

It has been assumed that the foundations to any existing structures have been grubbed out. Where foundations have been grubbed out the new foundation must be taken through any backfill material into suitable natural ground as outlined in this report.

5.1.2 Ground Floor Slab

NHBC Standards 2023 states ground floors should be constructed as suspended floors where:

- *“the foundation depth dictated by the NHBC Standards 2023, Chapter 4.2.10 would exceed 1.5m bgl;”*
- *“ground floor construction is undertaken when the surface soils are seasonally desiccated;”*
- *“the depth of fill exceeds 600mm;”*
- *“there is shrinkable soil that could be subject to movement, expansive material or other unstable soils;”*
- *“the ground has been subject to vibratory improvement;” or*
- *“ground or fill is not suitable to support ground-bearing slabs.”*

It is considered that a ground bearing floor slab construction could be suitable for the development providing that any near surface cohesive soils are removed and replaced with suitably rolled and compacted granular fill.

5.2 Subsurface Concrete

The sulphate and pH tests carried out in accordance with BRE Special Digest 1, 2005, ‘Concrete in Aggressive Ground’, established the site concrete classifications for each stratum as presented in Table 5.2. The classification given was determined using the mobile groundwater case, in the view of groundwater being encountered within the underlying granular beds.

Table 5.2 Concrete Classification

Stratum	Design Sulphate Class	ACEC Class
RTD (granular)	DS-I	AC-I
RTD (cohesive)		

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.

5.3 Excavations

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

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

Section 6 Site Drainage

6.1 Soakaways

Given the observed infiltration over the test period, it is considered that the site would be suitable for the adoption of a surface water soakaway system located within the granular beds of River Terrace Deposits. In accordance with BRE DG365:2023 a rate of 1.78×10^{-5} m/sec should be used in the design of the soakaway system (i.e. the slowest rate recorded during all infiltration tests). Note that the above infiltration rate was calculated after extrapolation of the available data.

It is recommended that the results of the in-situ permeability testing are passed to a drainage engineer for commentary and design.

Section 7 Determination of Chemical Analysis

7.1 Site Characterisation and Revised Conceptual Site Model

No Preliminary Investigation Report was undertaken by Soils Limited for the site that would allow a Conceptual Site Model (CSM) to be produced and potential contamination risks to be identified and assessed.

Reliance was therefore, placed in the Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/1, dated January 2023 by Leap Environmental Ltd, which was supplied to Soils Limited by the client and according to which potential on-site and off-site sources of soil and groundwater contamination comprised the following:

- Made Ground on-site (i.e. fill material associated with current site structures) potentially including asbestos, metals, polycyclic aromatic hydrocarbons (PAHs), and being a plausible source of ground-gas
- Historic allotment gardens on-site (potentially being a source of pesticides, heavy metals and polycyclic aromatic hydrocarbons (PAHs))
- Allotment gardens and historic farmland – off site sources (potentially being a source of pesticides, heavy metals and polycyclic aromatic hydrocarbons (PAHs))
- Electrical substation – off site sources (potentially being a source of polychlorinated biphenyl, heavy metals and petroleum hydrocarbons)

As discussed in the above report:

- The site is underlain by Secondary A aquifers of High Vulnerability relating to the superficial River Terrace Deposits and Selsey Sand Formation bedrock underlying the site.
- Shallow groundwater is anticipated on-site. Perched water may be present in any Made Ground deposits underlying the site.
- There are no surface water features within the site or adjoining the site boundary. There are also no surface water features within 500m of the site. The closest is Southampton Water which is located ~570m southwest of the site. The site is situated within the Itchen coastal catchment.
- There are no active abstraction licences within 1000m of the subject site.
- The site does not lie within a currently designated groundwater Source Protection Zone (SPZ).

This Main Investigation Report established:

- The presence of Made Ground in each of the exploratory holes to depths ranging between 0.40m and 0.45m bgl. The Made Ground typically comprised firm, dark brown, slightly sandy, gravelly CLAY to slightly sandy, slightly gravelly SILT, becoming gravelly with depth. Gravel was angular to rounded, fine to coarse flint, tarmacadam, brick, concrete and clinker. Rare plastic was found. Frequent

rootlets were noted. Odour of manure was identified in WS1. Odour of chlorinated solvents was noted in WS2, and very faint solvent odour was noted in WS3.

- No significant visual or olfactory indicators of hydrocarbon contamination was present within the Made Ground.
- The presence of River Terrace Deposits in each of the exploratory holes directly beneath the Made Ground to a maximum depth of 2.70m bgl in the location of WS/DP1. The soils generally comprised soft to firm, greyish brown, slightly sandy, very gravelly CLAY. Gravel was angular to sub angular, fine to coarse flint. Occasional rootlets were noted. Becoming yellowish to orangish brown, clayey, sandy, fine to coarse flint GRAVEL with depth. Becoming yellowish brown and orangish brown mottled, slightly sandy, very gravelly CLAY with depth. Distinct floral soapy/solvent odour was noted from 2.00m bgl in WS1. Note that all exploratory holes except from the location of WS/DP1 were terminated within the soils of the River Terrace Deposits, so the full depth of the stratum could not be established in these locations.
- Shallow groundwater was not encountered in any of the exploratory hole locations within the Made Ground and/or River Terrace Deposits during the investigation and the 1st groundwater monitoring visit. However, this can be attributed to the limited depth of all exploratory holes undertaken on site.

Therefore, the Preliminary Qualitative Risk Assessment of the Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/1, by Leap Environmental Ltd, did not require significant revision and is presented in Appendix D.1.

7.2 Soil Sampling

Exploratory hole locations were established to provide an overview of ground conditions across the site in relation to the proposed construction, together with enabling the collection of samples to enable chemical characterisation of the underlying strata.

Representative samples for potential environmental testing were obtained from the exploratory holes at depths of between 0.10m and 0.50m to allow appropriate representation of the materials encountered, with additional samples to be obtained, if necessary, where there was visual or olfactory evidence of contamination.

Unless otherwise stated, analytical testing was based initially on a screening suite of commonly identified inorganic and organic contaminants, taking into account the prevailing site conditions and the findings of the initial conceptual site model.

7.3 Determination of Chemical Analysis

The driver for determination of the analysis suite was the information obtained from the Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/1, by Leap Environmental Ltd and the current intrusive investigation.

The chemical analyses were carried out on 4No. samples of Made Ground and 1No. sample of the granular River Terrace Deposits. The nature of the analyses is detailed in Table 7.1.

Table 7.1 Chemical Analyses Suites - Soil

No. of Tests	Determinants	Soil Tested	
		MG	RTD
5	Metal suites: Arsenic, Boron (Water Soluble), Cadmium, Chromium (total & hexavalent), Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc	✓	✓
5	Organic Matter	✓	✓
5	pH	✓	✓
5	Sulphate contents – water soluble	✓	✓
5	Asbestos screening	✓	✓
5	Phenols – total monohydric	✓	✓
1	Organochlorine Pesticides	✓	
1	Organophosphorus Pesticides	✓	
5	Polycyclic aromatic hydrocarbons (PAH) – (EPA 16)	✓	✓
5	Extractable Petroleum Hydrocarbons – (EPH) Texas Banded	✓	✓

The soil testing was carried out in compliance with the MCERTS performance standard, and the results are shown in Appendix D.2, test reports 23-06330 and 23-06541.

Section 8 Qualitative Risk Assessment

8.1 Assessment Criteria

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

8.2 Representative Contamination Criteria - Soil

In compiling this report reliance was placed on drawing No.: 0019 Rev. P05, dated 8th August 2022 by MH Architects. The recommendations provided within this report are made exclusively in relation to the scheme outlined above and must not be applied to any other scheme without further consultation with Soils Limited. Soils Limited must be notified about any change or deviation from the scheme outlined.

Based on the proposed development, the results of the chemical analysis have been compared against generic assessment criteria (GAC) for a '**Residential with Home Grown Produce**' end use, as presented in SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination December 2014 (C4SL), derived for the protection of human health. Where this document has not published screening values for determinants, GACs derived for the same end use have been adopted from the following published guidance; DEFRA Soil Guideline Values (SGV) and LQM/CIEH/Suitable 4 Use Level (S4UL).

To assess the potential toxicity of organic determinants (Petroleum Hydrocarbons and Polyaromatic Hydrocarbons) to the human health, soils samples were analysed for Soil Organic Matter (SOM). The selected samples analysed recorded, SOM values of between **0.5%** and **4.2%**. For each soil sample tested, the resultant SOM allowed for the correct comparison to be made with the appropriate guideline value for each organic determinant analysed.

8.3 Risk Assessment – Made Ground

Table 8.1 outlines the samples that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix D.2.

Table 8.1 Summary of GAC Exceedances – Made Ground

Location	Depth (m bgl)	Contaminant	Concentration	Guidance Level (S4UL)	SOM (%)
WS2	0.10	Dibenz(a,h)anthracene	0.40	0.28	4.2

Note(s): Units mg/kg, SOM – Organic Matter

The risk assessment has established a potential pollutant linkage in relation to human health from a single elevated Polyaromatic Hydrocarbons (PAHs) concentration within the Made Ground, in WS2 at 0.10m bgl.

8.4 Risk Assessment – River Terrace Deposits

Table 8.2 outlines the samples that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix D.2.

Table 8.2 Summary of GAC Exceedances – River Terrace Deposits

Location	Depth (m bgl)	Contaminant	Concentration	Guidance Level
None				

The risk assessment has established no potential chemical pollutant linkage in relation to human health receptors within the sample tested from the River Terrace Deposits.

8.5 Asbestos

The test certificate for each sample submitted for contamination analysis during this investigation includes the results of an Asbestos Screen.

In each case 'Not detected' was reported.

This finding does not obviate the risk of asbestos being present on the site and the Client must seek advice from qualified and competent asbestos specialist during and prior to undertaking works to ensure compliance with appropriate legislation and guidance.

8.6 Risk to Groundwater

From information provided by the Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/1, dated January 2023 by Leap Environmental Ltd, the Groundsure Maps stated, that the superficial River Terrace Deposits and the Selsey Sand Formation bedrock had a Secondary A Aquifer designation, indicating that the units maintain the potential to sustain large volumes of water. The overall groundwater vulnerability was soils of Medium Vulnerability, soils with moderate ability to attenuate diffuse source pollutants or in which it is possible that some non-adsorbed diffuse source pollutants and liquid discharges could penetrate the soils layer.

The soils of River Terrace Deposits underlying the Made Ground reaching to a proven depth of 2.70m bgl, were assessed by the intrusive investigation as predominantly granular, permeable soils, and therefore could be considered a sensitive receptor; however, shallow groundwater was not encountered within the superficial soils during the intrusive investigation. The predominantly cohesive soils of the Selsey Sand Formation underlying the River Terrace Deposits are impermeable subject to soil composition (presence of clayey lenses), therefore, are not considered a sensitive receptor.

A quantitative or/and qualitative Groundwater Risk Assessment was not commissioned as part of the site investigation report. However, it is considered that the marginally elevated PAHs recorded in WS2 at a depth of 0.10m bgl, presumably resulted from a tarmacadam inclusion present in the Made Ground, which is going to be removed as part of the development works and therefore, represent a very low to negligible risk to

groundwater. It must be noted that soils tested from a greater depth at the above location were not impacted, implying that such materials are likely to be only marginally leachable and therefore bioavailable. Given the largely insoluble nature of PAHs in Made Ground (anything soluble has usually already been leached away over time), any potential risk to groundwater can be considered **negligible**.

8.7 Risk from Ground Gas Ingression

The Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/1, dated January 2023 by Leap Environmental Ltd, suggested that there was a moderate risk of ground gas generation associated with the Made Ground underlying the site.

The intrusive investigation recorded Made Ground at a thickness of up to 0.45m bgl; no putrescible material was observed within the Made Ground. PAHs were recorded in concentrations in excess of the relevant S4UL for a '*Residential with Home Grown Produce*' land-use scenario in one location within the site boundaries but are not significant contributors to the creation of ground gases or vapours.

Therefore, as the ground investigation recorded Made Ground at a thickness less than 0.50m and no putrescible material was encountered, the overall risk from ground gas to the proposed development is considered to be very low. Taking into consideration the likely potential source of ground gases, limited to the presence of Made Ground, three monitoring visits have been undertaken over a period of a month, the results of which are presented in Table 8.3 and provided in Appendix E.

Table 8.3 Ground Gas Results

Date (Baro Trend)	TH	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	H ₂ S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	Dp	H ₂ O (m bgl)	Hole (m)	VOC (ppm)
16/05/23 (Steady)	ATM	<0.1	<0.1	20.6	<1.0	<1.0	<0.1	1023	0.0	<1.0	-	-	<1.0
	WS1	<0.1	0.5	20.1	<1.0	<1.0	<0.1	1023	0.0	<1.0	Dry	2.64	10.0
	WS4	<0.1	1.8	18.6	<1.0	<1.0	<0.1	1023	0.0	<1.0	Dry	1.37	2.0
26/05/23 (Rising)	ATM	<0.1	<0.1	20.8	<1.0	<1.0	<0.1	1030	0.3	1.0	-	-	<1.0
	WS1	<0.1	0.6	19.9	<1.0	<1.0	<0.1	1030	0.3	1.0	Dry	2.40	<1.0
	WS4	<0.1	2.2	19.0	<1.0	2.0	<0.1	1030	0.1	1.0	Dry	1.35	<1.0
14/06/23 (Rising)	ATM	<0.1	<0.1	20.9	<1.0	<1.0	<0.1	1015	0.0	<1.0	-	-	<1.0
	WS1	<0.1	0.5	20.5	<1.0	1.0	<0.1	1016	0.0	<1.0	Dry	2.62	<1.0
	WS4	<1.0	2.0	19.2	<1.0	1.0	<0.1	1015	0.0	<1.0	Dry	1.35	<1.0
Maximum		<0.1	2.2	20.5	<1.0	2.0	<0.1	1030	0.3	1.0	-	-	10.0
Minimum		<0.1	0.5	18.6	<1.0	<1.0	<0.1	1015	<0.1	<1.0	Dry	-	<1.0

Based on the documentation presented in the "BS 8485:2015+A1:2019", Code of practice for the design of protective measures for Methane and Carbon Dioxide ground gases for new buildings" the hazardous gas flow rate (Q_{hg}) was calculated using Equation 1:

$$Q_{hg} = \left(\frac{C_{hg}}{100} \right) \times q \quad \text{Equation 1}$$

Where:

C_{hg} is the measured hazardous gas concentration in percentage volume-by-volume

q is the flow rate in litres per hour of combined gases found by direct measurement – where the flow rate is zero or below the detection level of the instrument, this must default to the detection limit, in this case 0.1 ltr/hr.

The highest concentration of carbon dioxide (CO₂) was recorded at 2.2% by volume, in WS4 on 26th May 2023. Consequently, the values used in Equation 1 were 2.2 and 0.3l/hr for the hazardous ground gas concentration and flow rate respectively, and therefore Equation 1 gives the below results:

$$Q_{hg} = \left(\frac{2.2}{100} \right) \times 0.3 = 0.0066 \text{ l/hr}$$

The results derive a Gas Screening Value of 0.0066, which is significantly below the CS1/CS2 threshold of 0.07.

VOC (Volatile Organic Compounds) screening undertaken during the monitoring has recorded a maximum of 10.0ppm in WS1 on 16th May 2023; this is potentially linked to the elevated Polyaromatic Hydrocarbons (PAHs) concentration found within the Made Ground in WS2 at 0.10m bgl. However, the maximum VOCs being significantly above the average for the dataset (average of 2.6ppm vs maximum of 10.0ppm), is not considered significant in context and was recorded on only one date at a single location, so this peak value may be an outlier or artefact. In addition, the remainder of the results do not indicate VOCs in excess of a worst case of 2.0ppm and an average of 1.2ppm. As such, it is considered that this potentially is an anomaly and is not considered representative of the gas conditions prevalent onsite.

CIRIA C665 and BS8485:2015+A1:2019 both state that where concentrations of carbon dioxide are consistently recorded over 5% v/v and/or methane in excess of 1%, consideration should be given to increasing the Characteristic Situation to 2 on a precautionary basis.

Reviewing the dataset, site model and quality of data, no methane was recorded above instrument detection limit (0.1%), and carbon dioxide concentration was not recorded above 2.2% on all monitoring occasions. As such no precautionary rise to CS2 is indicated from the dataset.

The technical results of the initial characterisation of the ground gas regime, classifies the site as Characteristic Situation 1 (CS1), where no ground gas protection is necessary within new properties. Therefore, the results of the precautionary monitoring showed that the moderate risk initially identified in the Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/1, dated January 2023 by Leap Environmental Ltd was not appropriate for the site.

The precautionary monitoring identified no unexpected results or indications of active gas generation and/or significant flow. As such, no protection measures are either indicated or considered necessary.

8.7.1 Radon

The site **was not situated** within an area where protection or risk assessment against the ingress of radon was required. Radon protection measures **will not be required** within the proposed new development.

8.8 Generic Quantitative Risk Assessment

Quantitative risk assessments are undertaken for soil and ground gas. The full laboratory chemical report is presented in Appendix D.2.

8.8.1 Soils

One of the samples tested showed concentrations in marginal excess of the relevant S4UL for a '*Residential with Plant Uptake*' land-use scenario. In WS2 at 0.10m bgl, Dibenz(a,h)anthracene was recorded at a concentration of 0.40mg/kg against the residential end-use S4UL of 0.28mg/kg.

WS2 was situated beneath an area of proposed soft landscaping.

The Tier 1 risk assessment therefore, established that there was a potential **very low risk** to construction workers and other vulnerable receptors on exposure which will have to be considered in relation to the site works by the H&S advisors and is beyond the scope of this report.

However, based on the current and future use of the site and considering that the elevated PAHs recorded in WS2 at a depth of 0.10m bgl, presumably resulted from a tarmacadam inclusion present in the Made Ground as mentioned in Section 8.6, it is considered that any potential risk to the future site occupants will be mitigated upon removal of the impacted soils as part of the development works.

8.8.2 Groundwater

The Groundwater Risk Assessment established that there is a **negligible** residual risk to the groundwater receptor as discussed in Section 8.6.

8.8.3 Ground Gas

Monitoring of the wells installed within WS1 and WS4 has been undertaken on three occasions, including targeting periods of steady and rising pressure. In accordance with BS8485:2015, a **very low risk** was identified, which does not require gas protection measures.

8.9 Conclusions

Soil chemical analysis recorded one sample (WS2:0.10m bgl) with substance levels over their representative guideline values. WS2 was located beneath proposed residential gardens. It was considered that the elevated PAHs recorded in WS2 at a depth of 0.10m bgl, resulted from a tarmacadam inclusion present in the Made Ground, which is going to be removed as part of the development works. Consequently, the elevated polyaromatic hydrocarbons in WS2 represent a negligible risk to the groundwater receptor and future site occupants.

Therefore, a remediation strategy is not required for the site.

8.10 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.

8.11 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 must always be sought.

8.12 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.

8.13 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.

8.14 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.

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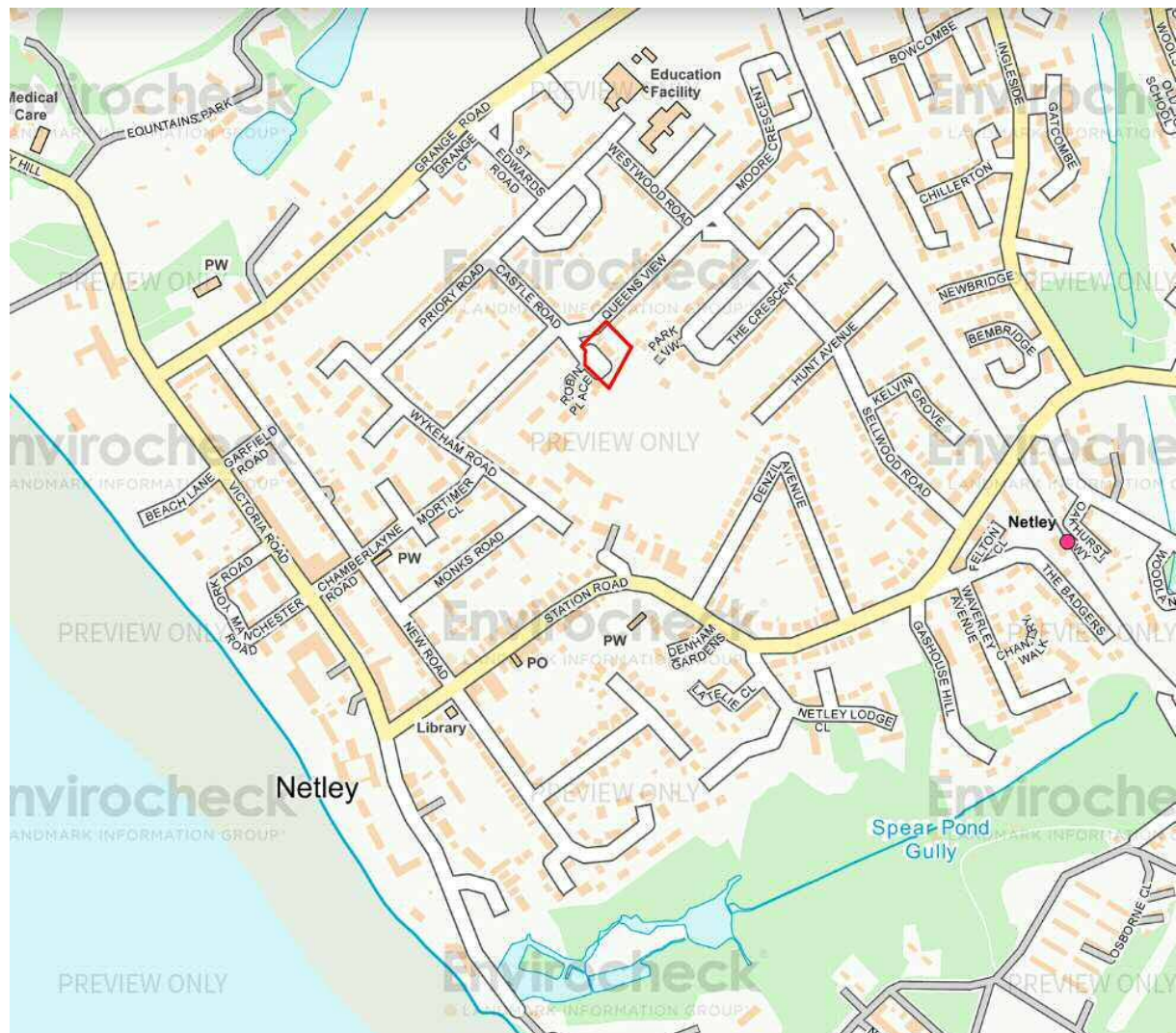


Figure 1 – Site Location Map

Job Number
20870

Project
30-32 Queens View, Netley, Southampton,
Hampshire SO31 5EA

Client
Eastleigh Borough Council

Date
April 2024



Figure 2 – Aerial Photograph



Project

30-32 Queens View, Netley,
Southampton, Hampshire
SO31 5EA

Client

Eastleigh Borough Council

Date

April 2024

Job Number

20870



Figure 3 – Exploratory Hole Plan

Project

30-32 Queens View, Netley,
Southampton, Hampshire
SO31 5EA

Client

Eastleigh Borough Council

Date

April 2024

Job Number

20870



Appendix A Standards and Resources

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

- BS 5930:2015 and BS EN ISO 22476-2 2005+A1:2011
- BS EN 1997-1:2004+A1:2013
- BS EN ISO 14688-1:2018
- BS EN ISO 14688-2:2018
- BS 10175:2011+A2:2017
- LCRM 2021 Environment Agency
- BS 8004:2015 – Code of practice for foundations
- BS 1377:1990 Parts 1 to 8
- BRE Digest 241 “Low-rise buildings on shrinkable clay soils: Part 2
- BRE Special Digest 1, 2005, ‘Concrete in Aggressive Ground’
- 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.
- N.E. Simons, B.K. Menzies, “A Short Course in Foundation Engineering”
- NHBC Standards Chapter 4.2, January 2023.
- SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination December 2014
- CIRIA C733, Asbestos in soil and made ground: a guide to understanding and managing risks and CAR2012 regulations.
- Google Earth (accessed May 2023)
- British Geological Survey Website & iGeology App (accessed May 2023)

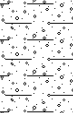
Appendix B Field Work

Appendix B.1 Engineers Logs

	Contract Name: 30-32 Queens View				Client: Eastleigh Borough Council				Hole ID: WS1						
	Contract Number: 20870		Start and End Date: 10/05/23		Logged By: DW		Checked By:		Status:		Hole Type: WS				
	Easting:		Northing:		Ground Level:		Plant Used: Premier 4		Print Date: 02/06/2023		Scale: 1:50				
Weather:			Termination:									Sheet 1 of 1			
Samples & In Situ Testing					Strata Details								Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation		
0.20	D			(0.40)		Firm, dark brown, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse flint, rare brick and clinker. Frequent rootlets. Odour of manure. MADE GROUND						1			
0.50	D			0.40		Soft to firm, greyish brown, slightly sandy, very gravelly CLAY. Gravel is angular to sub angular, fine to coarse flint. Occasional rootlets. RIVER TERRACE DEPOSITS									
0.80	D			0.65		Brown, yellowish brown and orangish brown mottled, sandy, clayey GRAVEL. Gravel is angular to well rounded, fine to coarse flint. Distinct floral soapy/solvent odour from 2.00m bgl. Occasional sand and gravel lenses. RIVER TERRACE DEPOSITS									
1.10	D			(1.20)		SAND AND GRAVEL band.									
1.40	ES					Occasional black organic-like staining. Same odour of floral solvents.									
1.90	D					1.85		Stiff brown, yellowish brown and orangish brown mottled, slightly sandy, very gravelly CLAY. Gravel is angular to well rounded, fine to coarse flint. Distinct floral soapy/solvent odour. RIVER TERRACE DEPOSITS						2	
2.10	ES			(0.40)		Orangish brown, slightly sandy, very gravelly CLAY. Gravel is angular to well rounded, fine to coarse flint. RIVER TERRACE DEPOSITS									
2.40	D			2.25		(0.45)	Orangish brown, slightly sandy, very gravelly CLAY. Gravel is angular to well rounded, fine to coarse flint. RIVER TERRACE DEPOSITS								
2.60	D			2.70		(0.30)	Yellowish brown, mottled orange, slightly clayey SILT. Rare clay laminations at base. SELSEY SAND FORMATION								3
2.80	D			3.00	End of Borehole at 3.00m										
											4				
											5				
											6				
											7				
											8				
											9				
											10				
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:						
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 0.65m bgl.						
									Water Strikes						
Chiselling					Installation		Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks			
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)							
					0.00	1.00	PLAIN	30				No groundwater encountered.			
					1.00	2.70	SLOTTED	30							
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.															

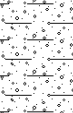
	Contract Name: 30-32 Queens View				Client: Eastleigh Borough Council				Hole ID: WS2					
	Contract Number: 20870		Start and End Date: 10/05/23		Logged By: DW		Checked By:		Status:		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 4		Print Date: 02/06/2023		Scale: 1:50			
Weather:			Termination:					Sheet 1 of 1						
Samples & In Situ Testing				Strata Details								Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation	
0.10	D ES			(0.40)		Firm, dark brown, slightly sandy, slightly gravelly CLAY. Becomes gravelly with depth. Gravel is angular to rounded, fine to coarse flint, brick, and unbound black stained potential tarmac gravel. Frequent rootlets. Odour of chlorinated solvents. MADE GROUND <i>Band with gravel with black staining and strong chlorinated solvents odour.</i> Greyish brown, sandy, clayey GRAVEL. Gravel is angular to sub-angular, fine to coarse flint. Frequent rootlets. Fines reducing with depth. Very faint soapy odour. RIVER TERRACE DEPOSITS Orangish brown, yellowish brown and dark brown mottled, silty becoming clayey sandy, slightly GRAVEL. Gravel is angular to well rounded, fine to coarse flint. RIVER TERRACE DEPOSITS <i>Dark brown clayey band.</i> End of Borehole at 1.00m						1		
0.50	D ES		0.40											
0.80	D ES		0.65											
	D ES		(0.35) 1.00											
												2		
												3		
												4		
												5		
												6		
												7		
												8		
												9		
												10		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 0.65m bgl.					
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
												0	0.00	No groundwater encountered.
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

	Contract Name: 30-32 Queens View				Client: Eastleigh Borough Council				Hole ID: WS3					
	Contract Number: 20870		Start and End Date: 10/05/23		Logged By: DW		Checked By:		Status:		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 4		Print Date: 02/06/2023		Scale: 1:50			
Weather:			Termination:					Sheet 1 of 1						
Samples & In Situ Testing				Strata Details								Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation	
0.10	D ES			(0.40)		Firm, dark brown, slightly sandy, slightly gravelly SILT. Becomes gravelly with depth. Gravel is angular to rounded, fine to coarse flint and rare fine concrete and brick. Rare fine plastic. Frequent rootlets. Very faint soapy/floral odour. MADE GROUND Low recovery - anticipated compressed liner of low density material.						1		
0.60	D ES			0.40										
0.90	D ES			0.80										
1.00 - 1.40	B ES			(0.70)		Brown, yellowish brown and orangish brown mottled, clayey very sandy GRAVEL. Gravel is angular to well rounded, fine to coarse flint. Occasional sandy gravelly clay lenses. Rusty nail at 0.9m bgl. RIVER TERRACE DEPOSITS Possibly Made Ground to 1.00m bgl.								
1.20	ES			1.50		End of Borehole at 1.50m								
Start & End of Shift Observations				Borehole Diameter		Casing Diameter		Remarks:						
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 0.80m bgl.					
Chiselling				Installation				Water Strikes						
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
												0	0.00	No groundwater encountered.
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

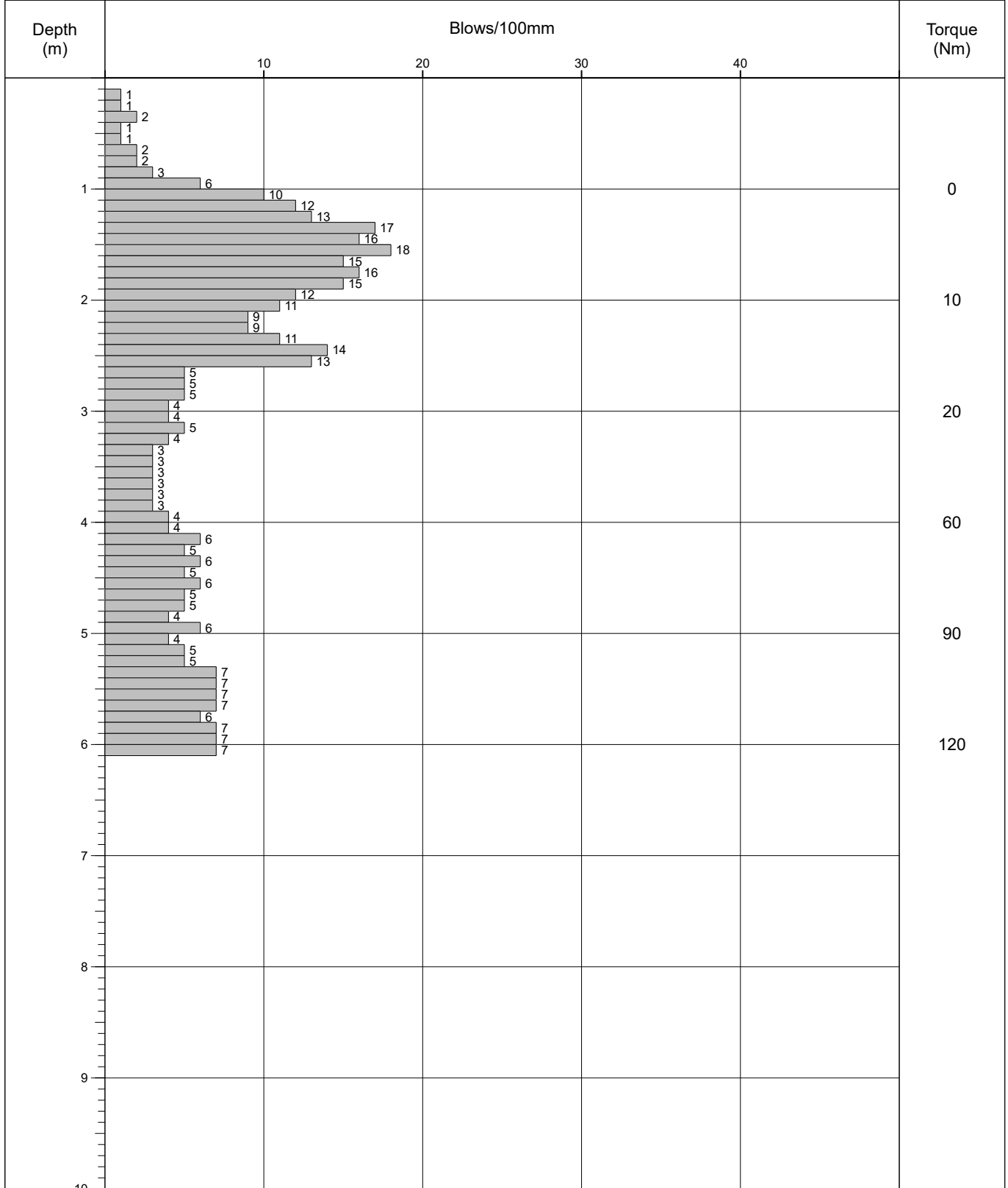
	Contract Name: 30-32 Queens View				Client: Eastleigh Borough Council				Hole ID: WS4				
	Contract Number: 20870		Start and End Date: 10/05/23		Logged By: DW		Checked By:		Status:		Hole Type: WS		
	Easting:		Northing:		Ground Level:		Plant Used: Premier 4		Print Date: 02/06/2023		Scale: 1:50		
Weather:			Termination:									Sheet 1 of 1	
Samples & In Situ Testing				Strata Details								Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation
0.20 0.30 0.50 0.90 1.00 - 1.50	ES D D ES D ES B			(0.45) 0.45 (1.05) 1.50	   	Firm, dark brown, slightly sandy, slightly gravelly SILT. Becomes gravelly with depth. Gravel is angular to rounded, fine to coarse flint, concrete and clinker. Rare fine plastic. Frequent rootlets. MADE GROUND Yellow medium sand lens. Brown and orangish brown mottled, clayey, very sandy GRAVEL. Gravel is angular to well rounded, fine to coarse flint. Rare sandy gravelly clay lenses. Rare rootlets. RIVER TERRACE DEPOSITS							
						End of Borehole at 1.50m							
											1		
											2		
											3		
											4		
											5		
											6		
											7		
											8		
											9		
											10		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 0.90m bgl.				
									Water Strikes				
Chiselling					Installation		Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)					
					0.00 0.40	0.40 1.40	PLAIN SLOTTED	30 30		0	0.00	No groundwater encountered.	
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.													

	Contract Name: 30-32 Queens View				Client: Eastleigh Borough Council				Hole ID: WS2					
	Contract Number: 20870		Start and End Date: 10/05/23		Logged By: DW		Checked By:		Status:		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 4		Print Date: 02/06/2023		Scale: 1:50			
Weather:			Termination:					Sheet 1 of 1						
Samples & In Situ Testing				Strata Details								Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation	
0.10	D			(0.40)		Firm, dark brown, slightly sandy, slightly gravelly CLAY. Becomes gravelly with depth. Gravel is angular to rounded, fine to coarse flint, brick, and unbound black stained potential tarmac gravel. Frequent rootlets. Odour of chlorinated solvents. MADE GROUND Band with gravel with black staining and strong chlorinated solvents odour. Greyish brown, sandy, clayey GRAVEL. Gravel is angular to sub-angular, fine to coarse flint. Frequent rootlets. Fines reducing with depth. Very faint soapy odour. RIVER TERRACE DEPOSITS Orangish brown, yellowish brown and dark brown mottled, silty becoming clayey sandy, slightly GRAVEL. Gravel is angular to well rounded, fine to coarse flint. RIVER TERRACE DEPOSITS Dark brown clayey band. End of Borehole at 1.00m						1		
0.50	D			0.40										
0.80	ES			0.65										
	D			(0.35)										
	ES			1.00										
												2		
												3		
												4		
												5		
												6		
												7		
												8		
												9		
												10		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 0.65m bgl.					
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
												0	0.00	No groundwater encountered.
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

	Contract Name: 30-32 Queens View				Client: Eastleigh Borough Council				Hole ID: WS3					
	Contract Number: 20870		Start and End Date: 10/05/23		Logged By: DW		Checked By:		Status:		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 4		Print Date: 02/06/2023		Scale: 1:50			
Weather:			Termination:					Sheet 1 of 1						
Samples & In Situ Testing				Strata Details								Groundwater		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation	
0.10	D ES			(0.40)		Firm, dark brown, slightly sandy, slightly gravelly SILT. Becomes gravelly with depth. Gravel is angular to rounded, fine to coarse flint and rare fine concrete and brick. Rare fine plastic. Frequent rootlets. Very faint soapy/floral odour. MADE GROUND Low recovery - anticipated compressed liner of low density material.						1		
0.60	D ES			0.40										
0.90	D ES			0.80										
1.00 - 1.40	B ES			(0.70)		Brown, yellowish brown and orangish brown mottled, clayey very sandy GRAVEL. Gravel is angular to well rounded, fine to coarse flint. Occasional sandy gravelly clay lenses. Rusty nail at 0.9m bgl. RIVER TERRACE DEPOSITS Possibly Made Ground to 1.00m bgl.								
1.20	ES			1.50		End of Borehole at 1.50m								
Start & End of Shift Observations				Borehole Diameter		Casing Diameter		Remarks:						
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 0.80m bgl.					
Chiselling				Installation				Water Strikes						
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
												0	0.00	No groundwater encountered.
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.														

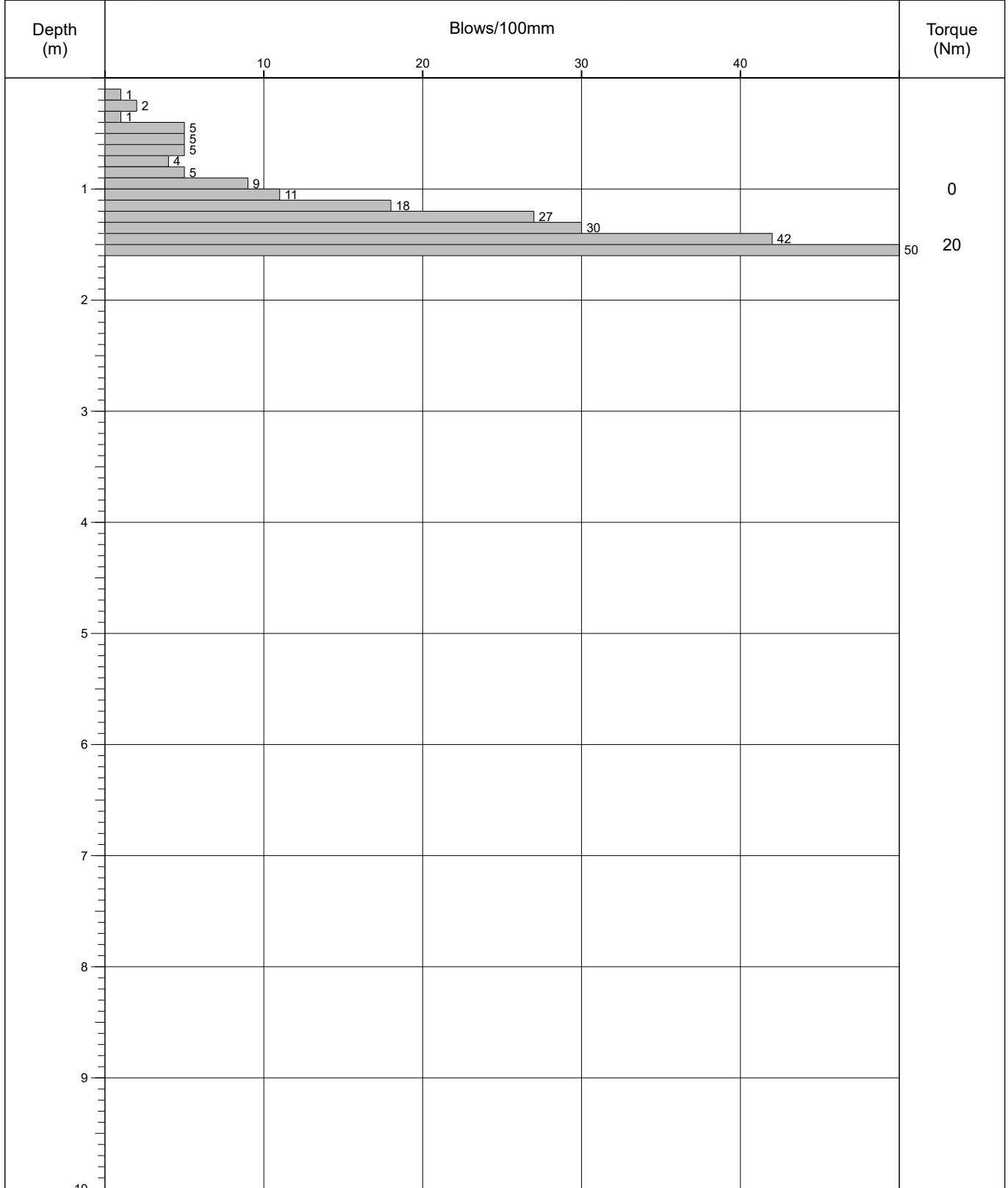
	Contract Name: 30-32 Queens View				Client: Eastleigh Borough Council				Hole ID: WS4				
	Contract Number: 20870		Start and End Date: 10/05/23		Logged By: DW		Checked By:		Status:		Hole Type: WS		
	Easting:		Northing:		Ground Level:		Plant Used: Premier 4		Print Date: 02/06/2023		Scale: 1:50		
Weather:			Termination:									Sheet 1 of 1	
Samples & In Situ Testing				Strata Details								Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description						Water Strike	Backfill/Installation
0.20 0.30 0.50 0.90 1.00 - 1.50	ES D D ES D ES B			(0.45) 0.45 (1.05) 1.50	   	Firm, dark brown, slightly sandy, slightly gravelly SILT. Becomes gravelly with depth. Gravel is angular to rounded, fine to coarse flint, concrete and clinker. Rare fine plastic. Frequent rootlets. MADE GROUND Yellow medium sand lens. Brown and orangish brown mottled, clayey, very sandy GRAVEL. Gravel is angular to well rounded, fine to coarse flint. Rare sandy gravelly clay lenses. Rare rootlets. RIVER TERRACE DEPOSITS							
						End of Borehole at 1.50m							
											1		
											2		
											3		
											4		
											5		
											6		
											7		
											8		
											9		
											10		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:				
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Rootlets observed to 0.90m bgl.				
									Water Strikes				
Chiselling					Installation		Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks	
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)					
					0.00 0.40	0.40 1.40	PLAIN SLOTTED	30 30		0	0.00	No groundwater encountered.	
Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.													

Project Name:	30-32 Queens View	Project No.	20870	Co-ords:		Hole Type	DP
Location:	30-32 Queens View, Netley, Southampton Hampshire SO31 5EA	Level:	m AOD	Scale	1:50	Logged By	CF
Client:	Eastleigh Borough Council	Dates:	10/05/2023				



Remarks	Fall Height	760mm	Cone Base Diameter	52mm	
	Hammer Weight	63.5kg	Final Depth	6m	
	Probe Type	DPSHA	Energy Ratio (Er)	89.93%	

Project Name:	30-32 Queens View	Project No.	20870	Co-ords:		Hole Type	DP
Location:	30-32 Queens View, Netley, Southampton Hampshire SO31 5EA	Level:	m AOD			Scale	1:50
Client:	Eastleigh Borough Council	Dates:	10/05/2023			Logged By	CF



Remarks Stopped due to very hard grounds encounteterd.	Fall Height	760mm	Cone Base Diameter	52mm
	Hammer Weight	63.5kg	Final Depth	1.5m
	Probe Type	DPSHA	Energy Ratio (Er)	89.93%

**Soils Limited**

Newton House, Cross Road, Tadworth KT20 5SR
Tel: 01737 814221 Email: admin@soilslimited.co.uk

Probe Log

Probe No.

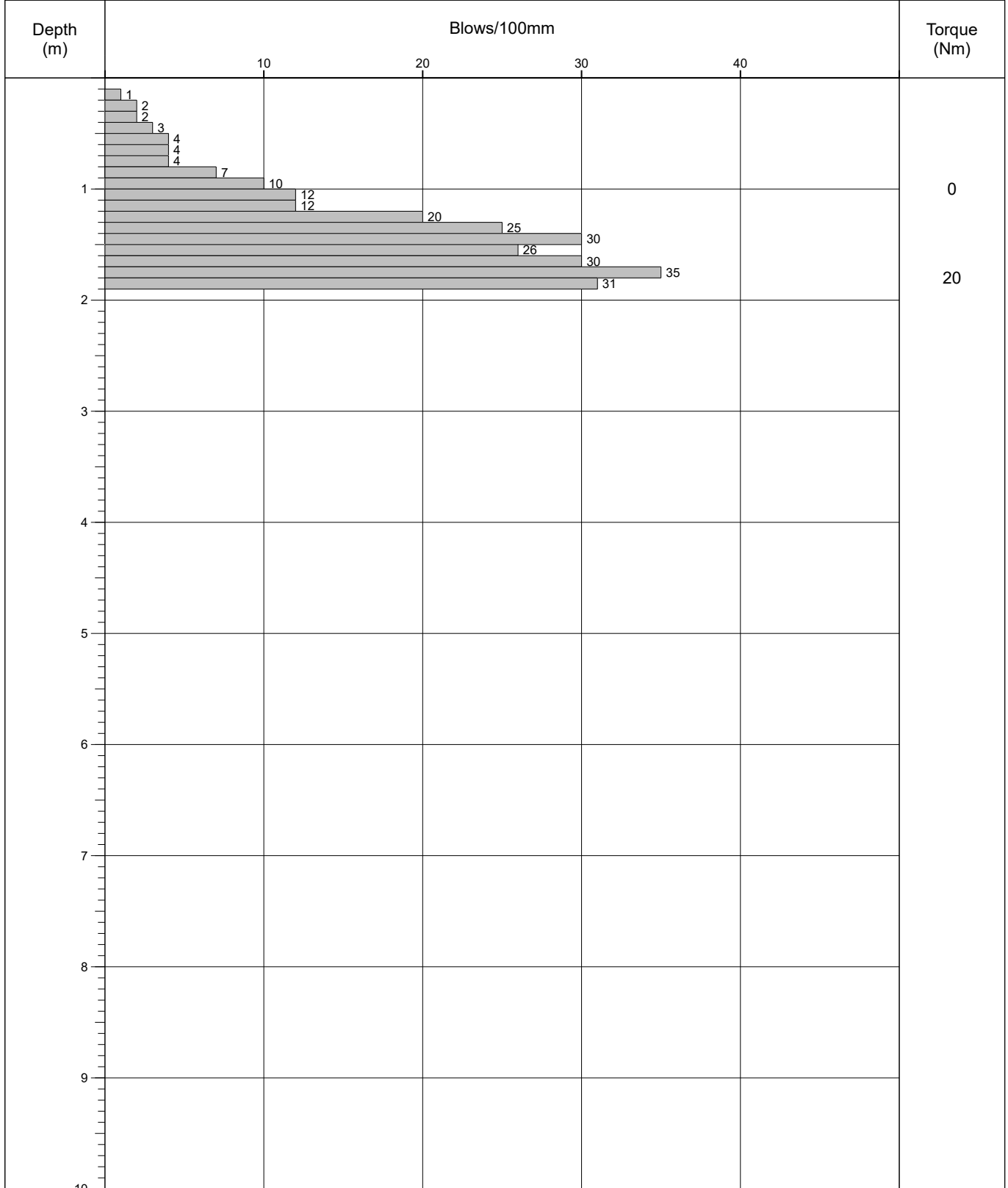
DP3

Sheet 1 of 1

Project Name:	30-32 Queens View	Project No.	20870	Co-ords:		Hole Type	DP
Location:	30-32 Queens View, Netley, Southampton Hampshire SO31 5EA			Level:	m AOD	Scale	1:50
Client:	Eastleigh Borough Council			Dates:	10/05/2023	Logged By	CF

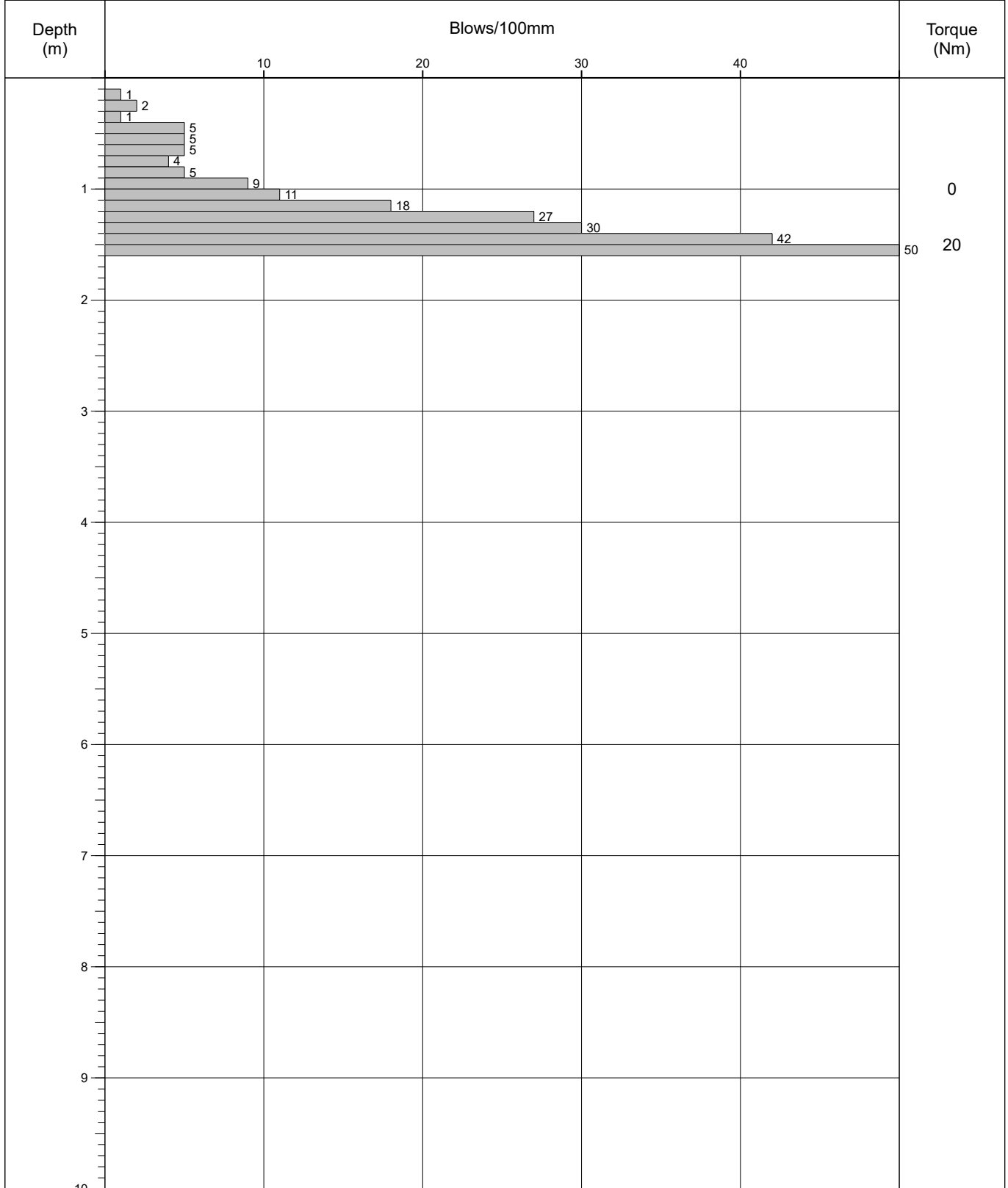
Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
1	1				0
	1				
	2				
	1				
	1				
	2				
	1				
	2				
	3				
	5				
	11				
	17				
	21				
	30				
	31				
	30				20
2					
3					
4					
5					
6					
7					
8					
9					
10					
Remarks	Fall Height	760mm	Cone Base Diameter	52mm	
Stopped due to very hard grounds encountered.	Hammer Weight	63.5kg	Final Depth	1.7m	
	Probe Type	DPSHA	Energy Ratio (Er)	89.93%	

Project Name:	30-32 Queens View	Project No.	20870	Co-ords:		Hole Type	DP
Location:	30-32 Queens View, Netley, Southampton Hampshire SO31 5EA	Level:	m AOD			Scale	1:50
Client:	Eastleigh Borough Council	Dates:	10/05/2023			Logged By	CF



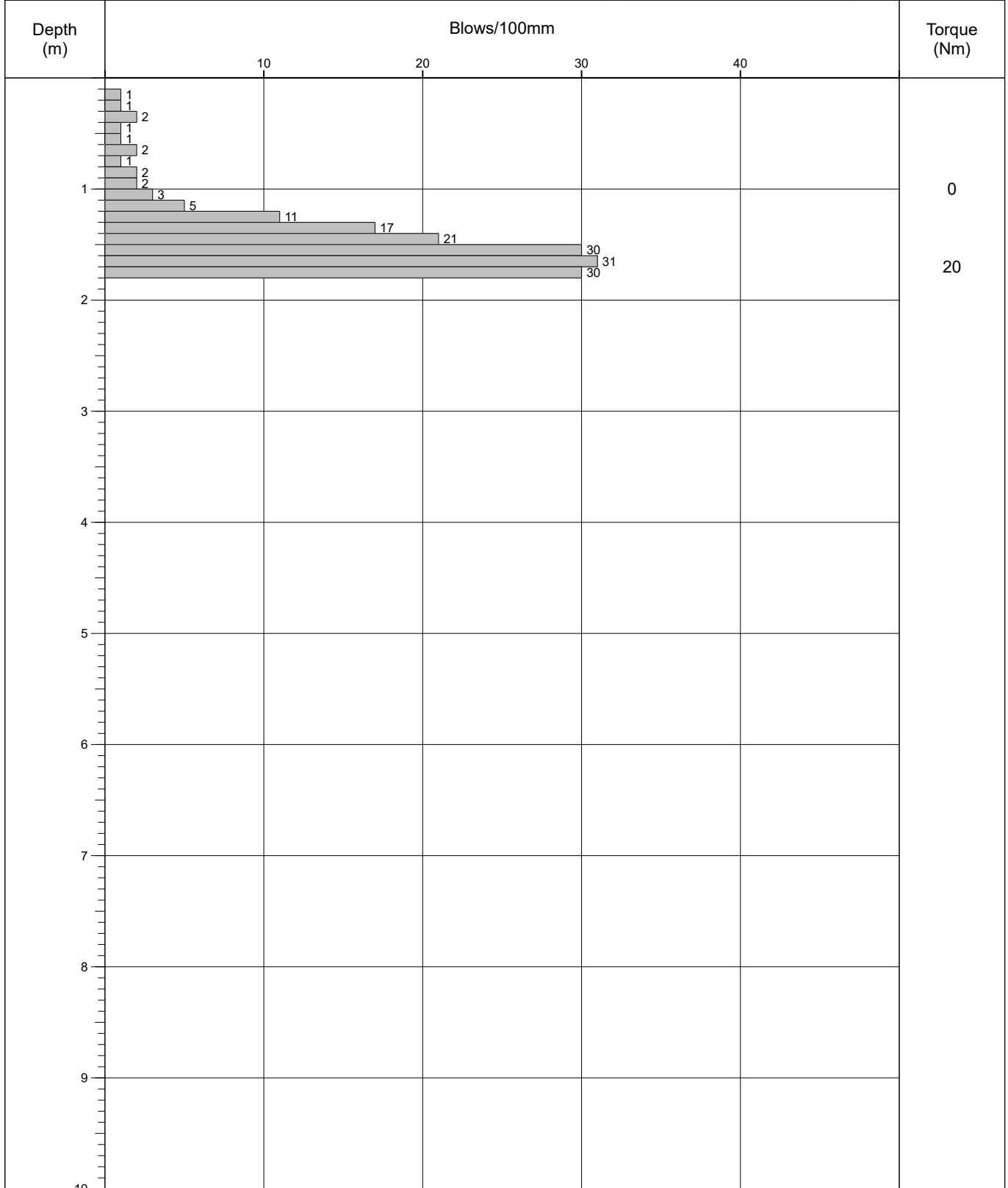
Remarks Stopped due to very hard grounds encountered.	Fall Height	760mm	Cone Base Diameter	52mm
	Hammer Weight	63.5kg	Final Depth	1.8m
	Probe Type	DPSHA	Energy Ratio (Er)	89.93%

Project Name:	30-32 Queens View	Project No.	20870	Co-ords:		Hole Type	DP
Location:	30-32 Queens View, Netley, Southampton Hampshire SO31 5EA	Level:	m AOD			Scale	1:50
Client:	Eastleigh Borough Council	Dates:	10/05/2023			Logged By	CF

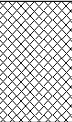
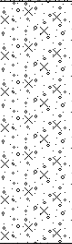


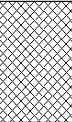
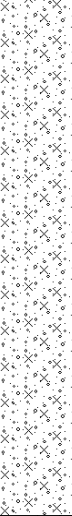
Remarks Stopped due to very hard grounds encounteterd.	Fall Height	760mm	Cone Base Diameter	52mm
	Hammer Weight	63.5kg	Final Depth	1.5m
	Probe Type	DPSHA	Energy Ratio (Er)	89.93%

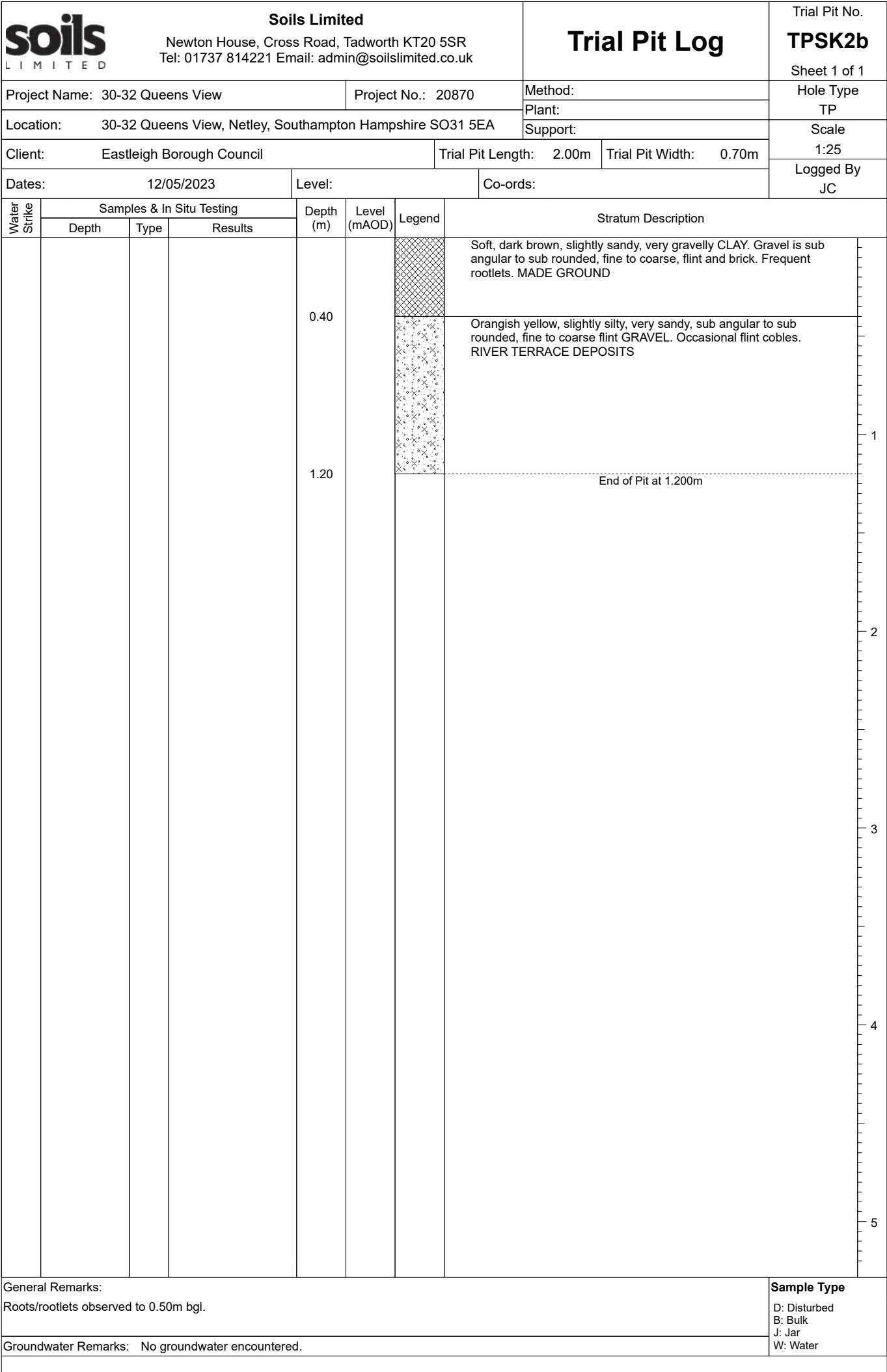
Project Name:	30-32 Queens View	Project No.	20870	Co-ords:		Hole Type	DP
Location:	30-32 Queens View, Netley, Southampton Hampshire SO31 5EA			Level:	m AOD	Scale	1:50
Client:	Eastleigh Borough Council			Dates:	10/05/2023	Logged By	CF



Remarks Stopped due to very hard grounds encounteterd.	Fall Height	760mm	Cone Base Diameter	52mm
	Hammer Weight	63.5kg	Final Depth	1.7m
	Probe Type	DPSHA	Energy Ratio (Er)	89.93%

		Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk			Trial Pit Log			Trial Pit No. TPSK1 Sheet 1 of 1	
Project Name: 30-32 Queens View				Project No.: 20870		Method:			Hole Type TP
Location: 30-32 Queens View, Netley, Southampton Hampshire SO31 5EA						Plant:			
Client: Eastleigh Borough Council				Trial Pit Length: 1.70m		Trial Pit Width: 0.65m		Scale 1:25	
Dates: 09/05/2023		Level:		Co-ords:			Logged By CF		
Water Strike	Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.30	J+D +B		0.40			Soft, dark brown, slightly sandy, very gravelly CLAY. Gravel is sub angular to sub rounded, fine to coarse, flint and brick. Frequent rootlets. MADE GROUND		
	0.60	J+D +B					Orangish yellow, slightly silty, very sandy, sub angular to sub rounded, fine to coarse flint GRAVEL. RIVER TERRACE DEPOSITS		
	0.90	J+D +B							
		1.20	B		1.20			End of Pit at 1.200m	
									1
									2
									3
									4
									5
General Remarks: Roots/rootlets observed to 0.40m bgl.								Sample Type D: Disturbed B: Bulk J: Jar W: Water	
Groundwater Remarks: No groundwater encountered.									

		Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk			Trial Pit Log		Trial Pit No. TPSK2 Sheet 1 of 1	
Project Name: 30-32 Queens View				Project No.: 20870		Method:		Hole Type TP
Location: 30-32 Queens View, Netley, Southampton Hampshire SO31 5EA						Plant:		
Client: Eastleigh Borough Council				Trial Pit Length: 1.70m		Trial Pit Width: 0.65m		Scale 1:25
Dates: 09/05/2023				Level:		Co-ords:		Logged By CF
Water Strike	Samples & In Situ Testing			Depth (m)	Level (mAOD)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30	J+D +B		0.40			Soft, dark brown, slightly sandy, very gravelly CLAY. Gravel is sub angular to sub rounded, fine to coarse, flint and brick. Frequent rootlets. MADE GROUND	
	0.60	J+D +B					Orangish yellow, slightly silty, very sandy, sub angular to sub rounded, fine to coarse flint GRAVEL. Occasional flint cobbles. RIVER TERRACE DEPOSITS	
	0.90	J+D +B						
	1.50	D+B						
	2.00	D+B						
	2.50	D+B		2.50			End of Pit at 2.500m	
General Remarks: Roots/rootlets observed to 0.50m bgl.								Sample Type D: Disturbed B: Bulk J: Jar W: Water
Groundwater Remarks: No groundwater encountered.								



Appendix C Geotechnical In-Situ and Laboratory Testing

Appendix C.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 C.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 C.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(s): (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 C.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 C.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(s): (Ref: The Standard Penetration Test (SPT): Methods and Use, CIRIA Report 143, 1995)

Appendix C.2 Interpretation

Table C.2.1 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density
DPI	RTD (cohesive) 0.40 – 0.65 & 1.85 – 2.70 CLAY	4 - 59	Very low to Very high Cu=20 – 295kPa
	RTD (granular) 0.65 – 1.85 GRAVEL	8 - >50	Loose to Very dense
	SLSY ¹ 2.70 – 6.00 SILT	12 - 30	Medium to Very high Cu=60 – 150kPa
DP2	RTD ¹ (granular) 0.40 – 1.50 GRAVEL	12 - >50	Medium to Very dense
DP3	RTD (cohesive) 0.40 – 0.80 CLAY	6 - 8	Low to Medium Cu=30 – 40kPa
	RTD ¹ (granular) 0.80 – 1.70 GRAVEL	8 - >50	Loose to Very dense
DP4	RTD ¹ 0.45 – 1.80 GRAVEL	17 - >50	Medium to Very dense

Note(s): ¹ Ground conditions inferred past the base of window sample boreholes.

Table C.2.2 Interpretation of Atterberg Limit Tests

Stratum	Moisture Content (%)	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Soil Classification	Volume Change Potential	
						BRE	NHBC
RTD (cohesive)	11	27	52	14	CI	Low	Low
SLSY	20	9	97	9	ML	Low	None

Note(s): BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)

NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2

Soils Classification based on British Soil Classification System

The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240. The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 µm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 µm and some particles, 'rock flour' for example, can be finer than 2 µm but are not clay minerals.

(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Clauses 3.2, 4.3 and 5)

Table C.2.3 Interpretation of PSD Tests

Location	Depth (m bgl)	Soil Description	Volume Change Potential		Passing 63µm Sieve (%)
			BRE	NHBC	
WS1	1.10	Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL	No	No	6
WS1	2.80	Brown fine to coarse sandy SILT/ CLAY	Yes	Yes	88
WS2	0.80	Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL	No	No	3
WS3	1.0-1.50	Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL	No	No	5
WS4	1.0-2.0	Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL	No	No	3

Note(s): BRE 240 states that a soil has a volume change potential when the clay fraction **exceeds 15%**. Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve. NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63µm sieve is greater than 35% and the Plasticity Index is greater than 10%.

(The Particle Size Distribution Tests were undertaken in accordance with BS 1377: Part 2: 1990 Clause 9)

Appendix C.3 Geotechnical In-Situ and Laboratory Results

Soakaway Calculations

Soakaway Test No.	TPSK1 Test 1
Contract:	30-32 Queens View
Contract No.	20870

Field Test

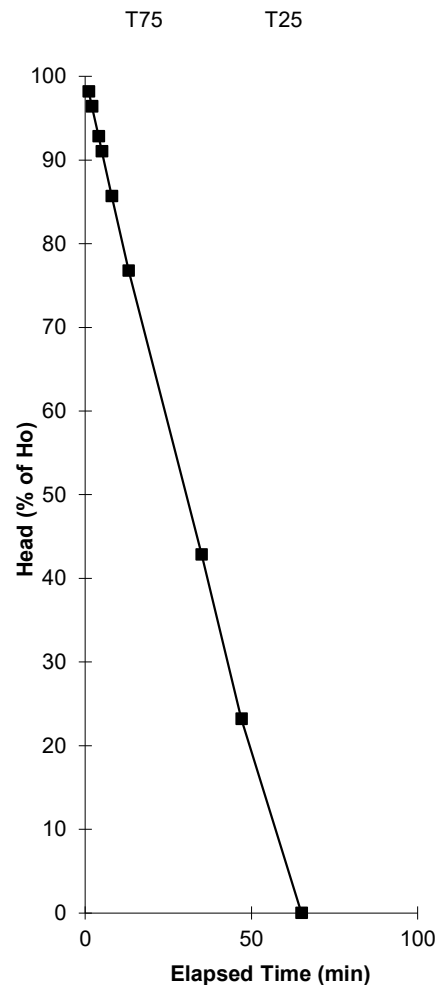
Trial Pit Log (include details of groundwater):

See trial Pit record

Depth of Pit	1.16 m
Width of Pit	0.65 m
Length of Pit	1.70 m
Depth of Pit Soaked	0.56 m
ap50	2.421 m2
Vp75-25	0.3094 m3
t75-25	31.8 min
water used	0.6188 m3
f	6.708E-05 m/sec.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.60	0	100	0.56
0.61	1	98	0.55
0.62	2	96	0.54
0.64	4	93	0.52
0.65	5	91	0.51
0.68	8	86	0.48
0.73	13	77	0.43
0.92	35	43	0.24
1.03	47	23	0.13
1.16	65	0	0.00



Comments

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Soakaway Calculations

Soakaway Test No.	TPSK1 Test 2
Contract:	30-32 Queens View
Contract No.	20870

Field Test

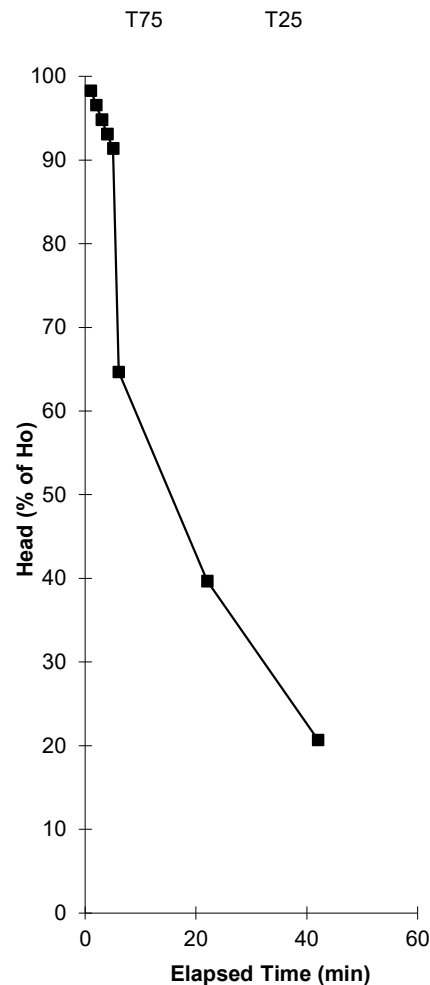
Trial Pit Log (include details of groundwater):

See trial Pit record

Depth of Pit	1.08 m
Width of Pit	0.65 m
Length of Pit	1.70 m
Depth of Pit Soaked	0.58 m
ap50	2.468 m2
Vp75-25	0.32045 m3
t75-25	31.8 min
water used	0.6409 m3
f	6.796E-05 m/sec.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.50	0	100	0.58
0.51	1	98	0.57
0.52	2	97	0.56
0.53	3	95	0.55
0.54	4	93	0.54
0.55	5	91	0.53
0.71	6	65	0.38
0.85	22	40	0.23
0.96	42	21	0.12



T75	5.613	75
T25	37.455	25
T75-25	31.842	Derived from Best Fit

Comments

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Soakaway Calculations

Soakaway Test No.	TPSK1 Test 3
Contract:	30-32 Queens View
Contract No.	20870

Field Test

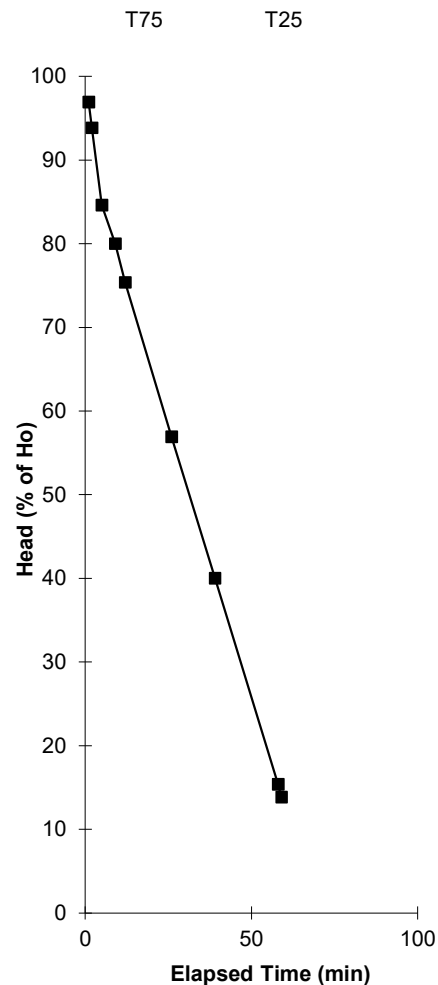
Trial Pit Log (include details of groundwater):

See trial Pit record

Depth of Pit	1.06 m
Width of Pit	0.65 m
Length of Pit	1.70 m
Depth of Pit Soaked	0.65 m
ap50	2.6325 m2
Vp75-25	0.359125 m3
t75-25	38.3 min
water used	0.7183 m3
f	5.939E-05 m/sec.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.41	0	100	0.65
0.43	1	97	0.63
0.45	2	94	0.61
0.51	5	85	0.55
0.54	9	80	0.52
0.57	12	75	0.49
0.69	26	57	0.37
0.80	39	40	0.26
0.96	58	15	0.10
0.97	59	14	0.09



T75	12.292	75
T25	50.578	25
T75-25	38.286	Derived from Best Fit

Comments

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Soakaway Calculations

Soakaway Test No.	TPSK2 Test 1
Contract:	30-32 Queens View
Contract No.	20870

Field Test

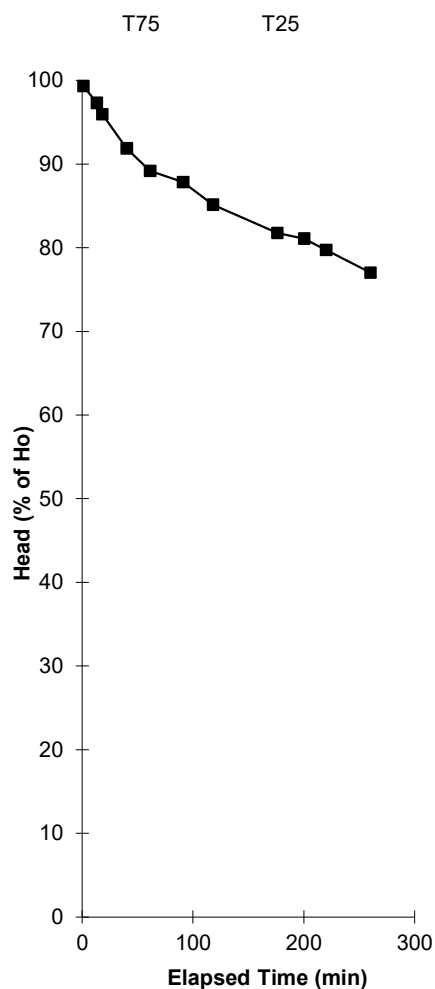
Trial Pit Log (include details of groundwater):

See trial Pit record

Depth of Pit	2.42 m
Width of Pit	0.65 m
Length of Pit	2.10 m
Depth of Pit Soaked	0.74 m
ap50	3.4 m2
Vp75-25	0.50505 m3
t75-25	0.0 min
water used	1.0101 m3
f	N/A m/sec.

Field Data

Depth to	Elapsed	Head of	Head of
Water	Time	Water	Water
(m)	(min)	(% of Ho)	(m)
1.68	0	100	0.74
1.69	1	99	0.74
1.70	13	97	0.72
1.71	18	96	0.71
1.74	40	92	0.68
1.76	61	89	0.66
1.77	91	88	0.65
1.79	118	85	0.63
1.82	176	82	0.61
1.82	200	81	0.60
1.83	220	80	0.59
1.85	260	77	0.57
T75	0.000	75	
T25	0.000	25	
T75-25	0.000	Derived from Best Fit	



Comments

Infiltration stopped - unable to calculate infiltration rate

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Soakaway Calculations

Soakaway Test No.	TPSK2b Test 1
Contract:	30-32 Queens View
Contract No.	20870

Field Test

Trial Pit Log (include details of groundwater):

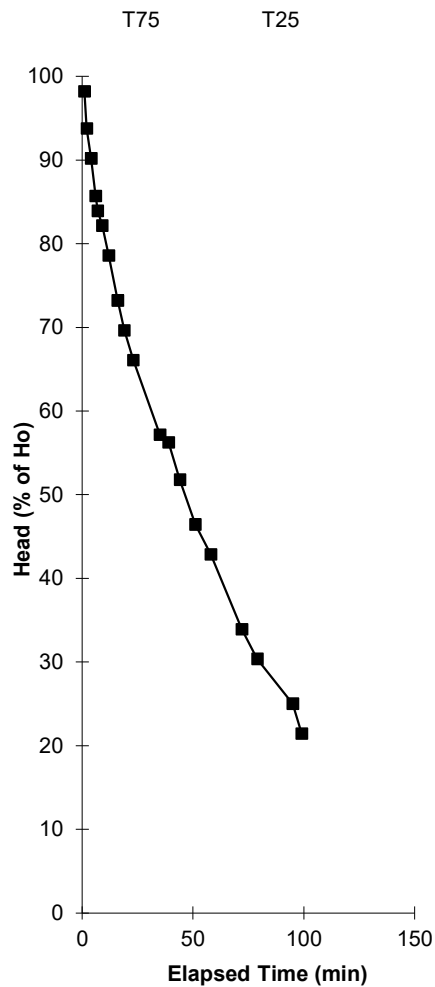
See trial Pit record

Depth of Pit	1.20 m
Width of Pit	0.70 m
Length of Pit	2.00 m
Depth of Pit Soaked	0.56 m
ap50	2.912 m2
Vp75-25	0.392 m3
t75-25	80.3 min
water used	0.7840 m3
f	2.793E-05 m/sec.

Field Data

Depth to	Elapsed	Head of	Head of
Water	Time	Water	Water
(m)	(min)	(% of Ho)	(m)
0.64	0	100	0.56
0.65	1	98	0.55
0.675	2	94	0.53
0.695	4	90	0.51
0.72	6	86	0.48
0.73	7	84	0.47
0.74	9	82	0.46
0.76	12	79	0.44
0.79	16	73	0.41
0.81	19	70	0.39
0.83	23	66	0.37
0.88	35	57	0.32
0.885	39	56	0.32
0.91	44	52	0.29
0.94	51	46	0.26
0.96	58	43	0.24
1.01	72	34	0.19
1.03	79	30	0.17
1.06	95	25	0.14
1.08	99	21	0.12

T75	14.667	75
T25	95.000	25
T75-25	80.333	Derived from Best Fit



Comments

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Soakaway Calculations

Soakaway Test No.	TPSK2b Test 2
Contract:	30-32 Queens View
Contract No.	20870

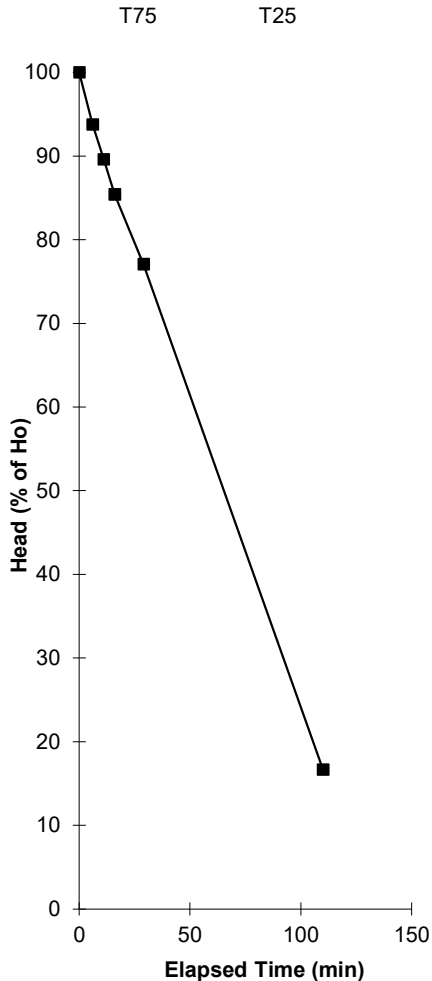
Field Test

Trial Pit Log (include details of groundwater):

See trial Pit record

Depth of Pit	1.20 m
Width of Pit	0.70 m
Length of Pit	2.00 m
Depth of Pit Soaked	0.48 m
ap50	2.696 m ²
Vp75-25	0.336 m ³
t75-25	68.2 min
water used	0.6720 m ³
f	3.045E-05 m/sec.

Field Data

[illegible]

Comments

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Soakaway Calculations

Soakaway Test No.	TPSK2b Test 3
Contract:	30-32 Queens View
Contract No.	20870

Field Test

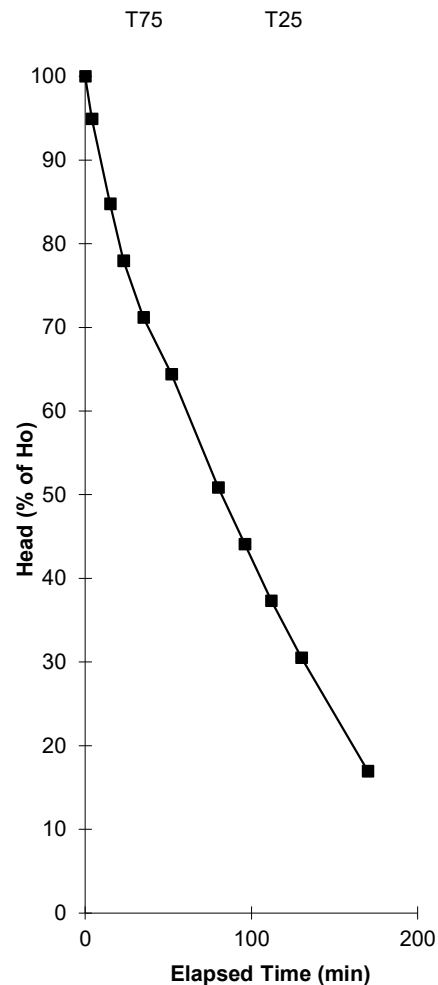
Trial Pit Log (include details of groundwater):

See trial Pit record

Depth of Pit	1.20 m
Width of Pit	0.70 m
Length of Pit	2.00 m
Depth of Pit Soaked	0.59 m
ap50	2.993 m2
Vp75-25	0.413 m3
t75-25	121.8 min
water used	0.8260 m3
f	1.889E-05 m/sec.

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)	Head of Water (m)
0.61	0	100	0.59
0.64	4	95	0.56
0.7	15	85	0.50
0.74	23	78	0.46
0.78	35	71	0.42
0.82	52	64	0.38
0.9	80	51	0.30
0.94	96	44	0.26
0.98	112	37	0.22
1.02	130	31	0.18
1.1	170	17	0.10



T75	28.250	75
T25	150.000	25
T75-25	121.750	Derived from Best Fit

Comments

Data extrapolated to calculate an infiltration rate.

SOILS LIMITED

Newton House, Cross Road, Tadworth
Surrey, KT20 5SR

Telephone: 01737 814 221
Facsimile: 01737 812 557



Laboratory Report



Contract Number: 66637

Client Ref: **20870**

Client PO: **20870**

Date Received: **19-05-2023**

Date Completed: **02-06-2023**

Report Date: **02-06-2023**

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

This report has been checked and approved by:

Brendan Evans
Office Administrator

Contract Title: **30-32 Queens View**

For the attention of: **Olia Kontogianni**

Test Description	Qty
Moisture Content of Soil BS1377 : Part 2 : Clause 3.2 : 1990 - * UKAS	2
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	2
PSD Wet & Dry Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	5
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

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Approved Signatories:

Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (Human Resources/ Health and Safety Manager)



**NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND
PLASTICITY INDEX
(BS 1377:1990 - Part 2 : 4.4 & 5.3)**

Contract Number	66637	
Project Name	30-32 Queens View	
Date Tested	24/05/2023	
	DESCRIPTIONS	

[illegible]

Operator

Aaron Hodge

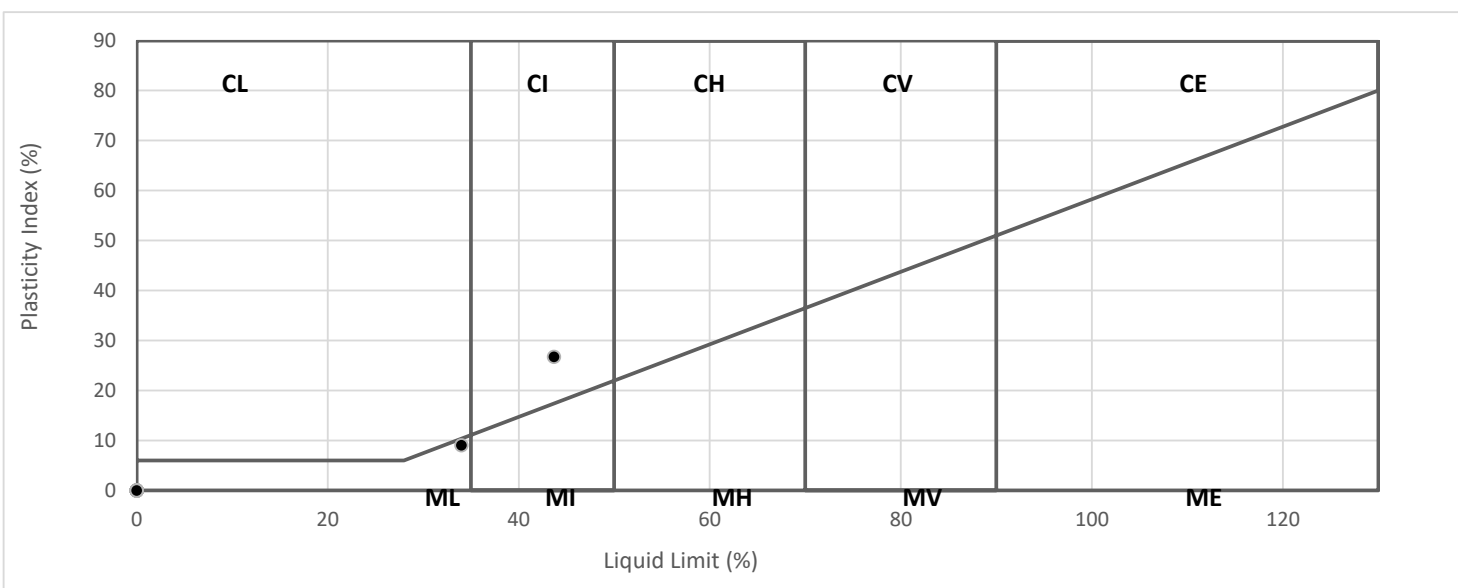
**NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND
PLASTICITY INDEX
(BS 1377:1990 - Part 2 : 4.4 & 5.3)**

Contract Number	66637	
Project Name	30-32 Queens View	
Date Tested	24/05/2023	

[illegible]

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION BS 5930:2015+A1:2020



Operator

Aaron Hodge

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

Contract Number 66637

Borehole/Pit No. WS1

Project Name 30-32 Queens View

Sample No. 1

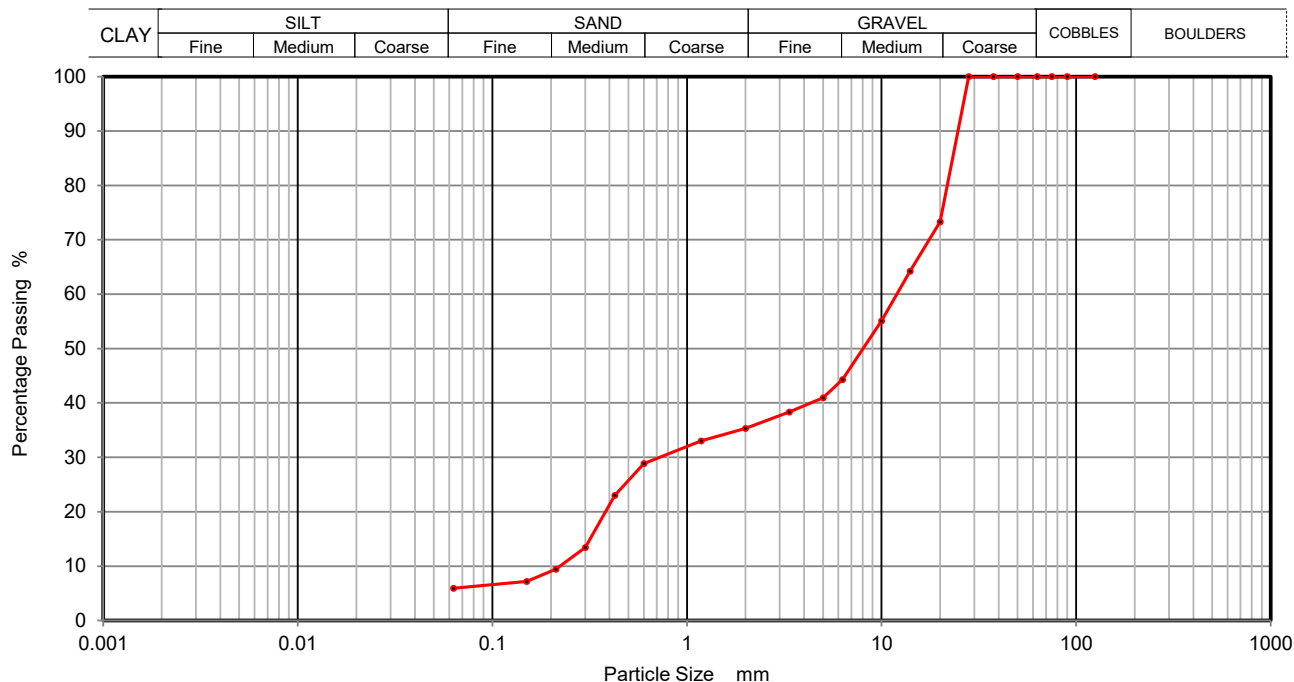
Soil Description Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL

Depth Top 1.10

Depth Base

Date Tested 31/05/2023

Sample Type D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	73		
14	64		
10	55		
6.3	44		
5	41		
3.35	38		
2	35		
1.18	33		
0.6	29		
0.425	23		
0.3	13		
0.212	9		
0.15	7		
0.063	6		

Sample Proportions	% dry mass
Cobbles	0
Gravel	65
Sand	29
Silt and Clay	6

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Operator

David Edwards

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

Contract Number 66637

Borehole/Pit No. WS1

Project Name 30-32 Queens View

Sample No. 1

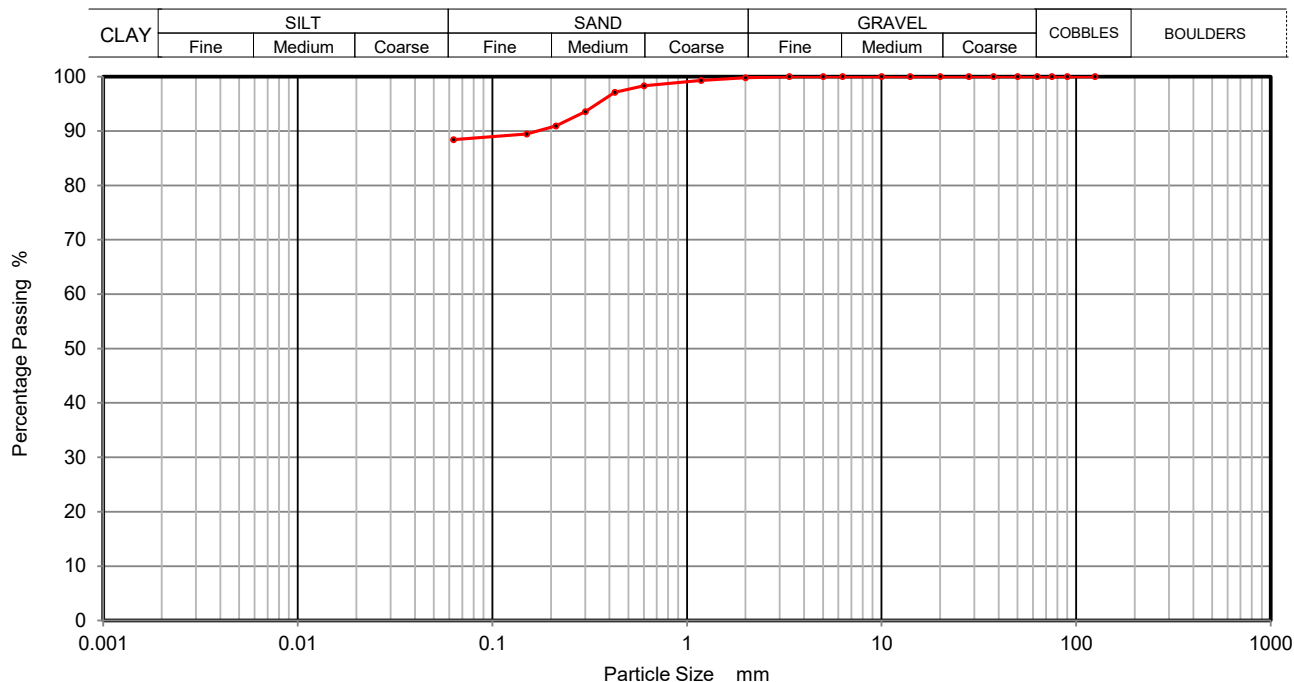
Soil Description Brown fine to coarse sandy SILT/ CLAY

Depth Top 2.80

Depth Base

Date Tested 31/05/2023

Sample Type D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	98		
0.425	97		
0.3	94		
0.212	91		
0.15	89		
0.063	88		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	12
Silt and Clay	88

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator

David Edwards

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

Contract Number 66637

Borehole/Pit No. WS2

Project Name 30-32 Queens View

Sample No. 1

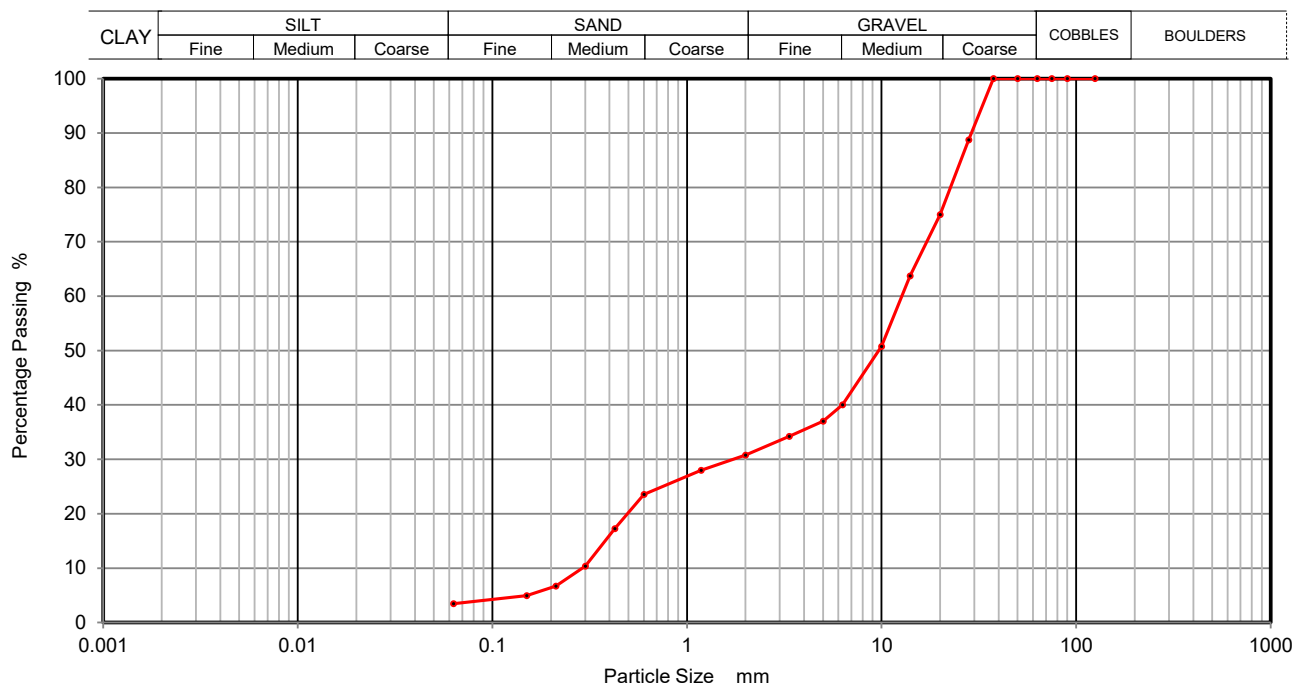
Soil Description Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL

Depth Top 0.80

Depth Base

Date Tested 31/05/2023

Sample Type D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	89		
20	75		
14	64		
10	51		
6.3	40		
5	37		
3.35	34		
2	31		
1.18	28		
0.6	24		
0.425	17		
0.3	10		
0.212	7		
0.15	5		
0.063	3		

Sample Proportions	% dry mass
Cobbles	0
Gravel	69
Sand	28
Silt and Clay	3

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator

David Edwards

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

Contract Number 66637

Borehole/Pit No. WS3

Project Name 30-32 Queens View

Sample No. 1

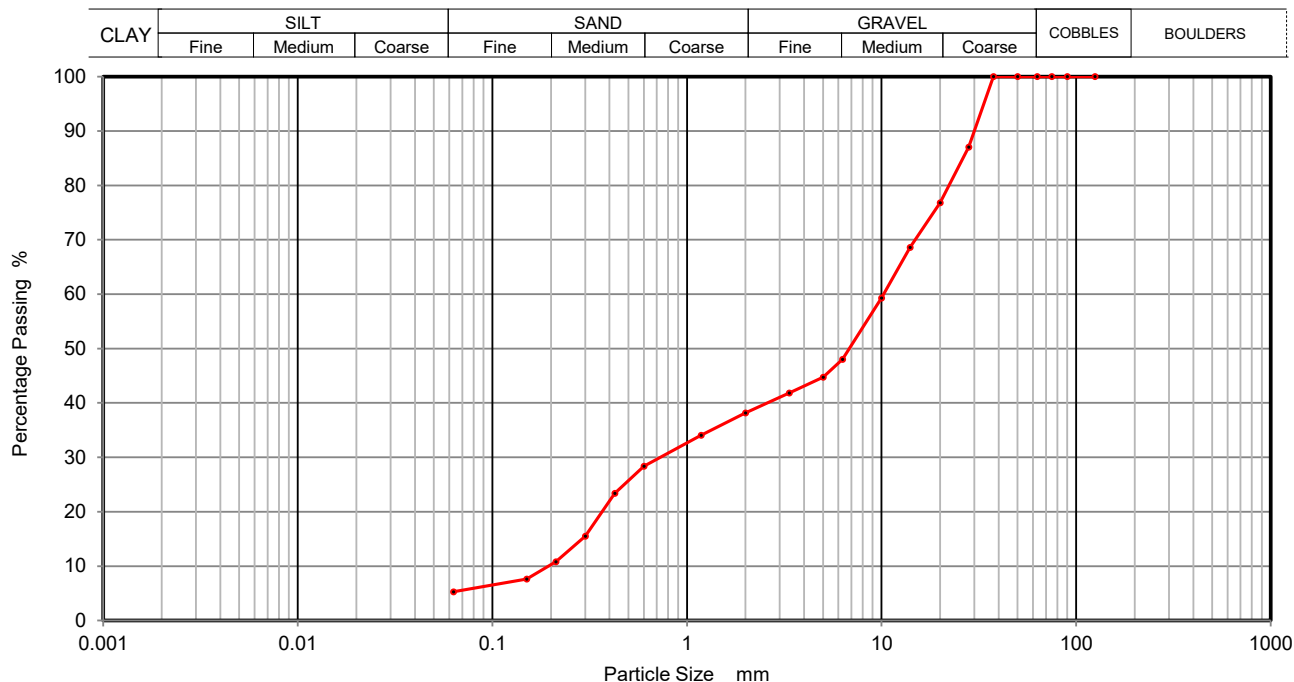
Soil Description Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL

Depth Top 1.00

Depth Base 1.50

Date Tested 31/05/2023

Sample Type D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	87		
20	77		
14	69		
10	59		
6.3	48		
5	45		
3.35	42		
2	38		
1.18	34		
0.6	28		
0.425	23		
0.3	15		
0.212	11		
0.15	8		
0.063	5		

Sample Proportions	% dry mass
Cobbles	0
Gravel	62
Sand	33
Silt and Clay	5

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Operator

David Edwards

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

Contract Number 66637

Borehole/Pit No. WS4

Project Name 30-32 Queens View

Sample No. 1

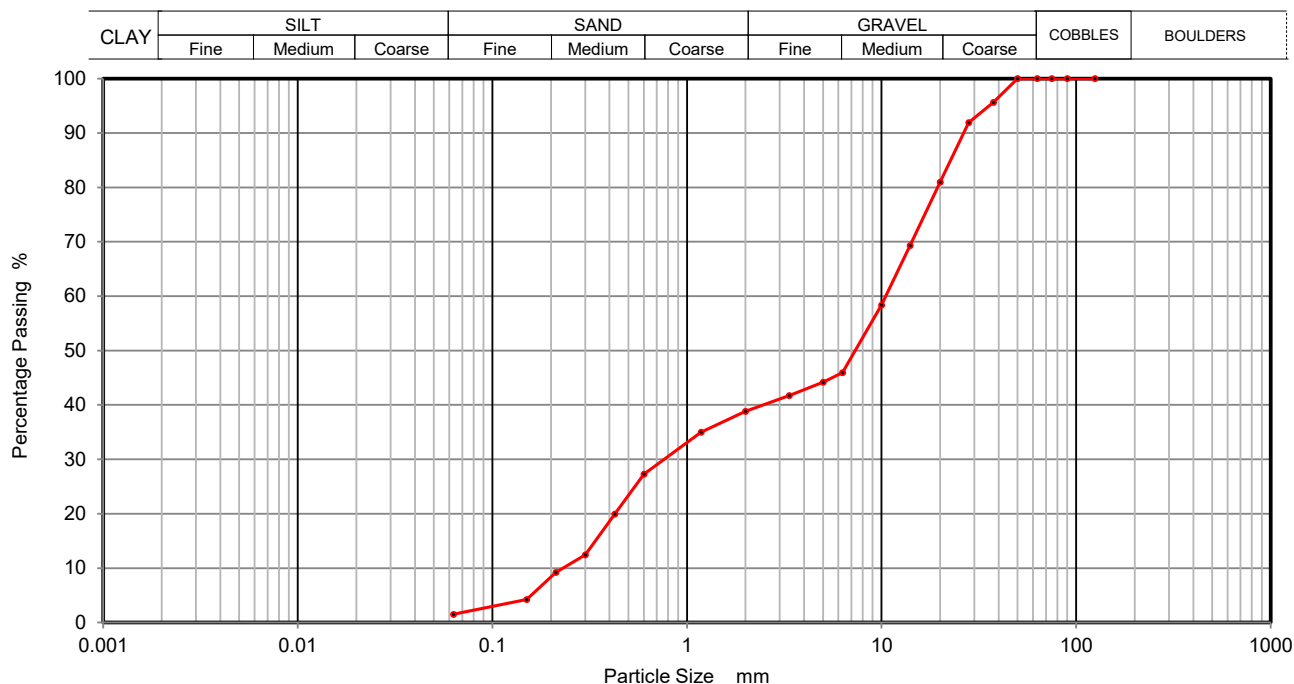
Soil Description Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL

Depth Top 1.00

Depth Base 2.00

Date Tested 31/05/2023

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	96		
28	92		
20	81		
14	69		
10	58		
6.3	46		
5	44		
3.35	42		
2	39		
1.18	35		
0.6	27		
0.425	20		
0.3	12		
0.212	9		
0.15	4		
0.063	2		

Sample Proportions	% dry mass
Cobbles	0
Gravel	61
Sand	37
Silt and Clay	2

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator

David Edwards

Appendix D Chemical Laboratory Analyses

Appendix D.1 Conceptual Site Model

Table D.I.1 Preliminary Qualitative Risk Assessment (Phase I Desk Study and Site Reconnaissance, ref.: LP3177/DS/I, January 2023)

Contaminant	Receptor	Pathway ¹	Likelihood of Exposure	Severity of Exposure	Risk Classification	Notes
All contaminants in soils	Future Residents	Dermal contact, ingestion and inhalation of soil particles	Likely	Medium	Moderate risk	There is a low risk of contamination from the made ground on site. Private residential gardens are planned for the future development, therefore dermal contact and consumption from soils is likely.
		Consumption of contaminated home grown produce	Likely	Medium	Moderate risk	
	Construction workers	Dermal contact, ingestion and inhalation of soil particles	Unlikely	Medium	Low risk	Construction workers are expected to have limited contact with soils provided normal standards of hygiene are adopted and appropriate PPE/RPE is provided.
		Groundwater (Secondary A River Terrace Deposits aquifer and Secondary A Selsey Sand Formation aquifer)	Unlikely	Medium	Low risk	
	Groundwater	Vertical infiltration and leaching from impacted on-site soils	Unlikely	Medium	Low risk	The site is underlain by secondary A aquifers which are of high vulnerability, however the site is not within a SPZ and there are no potable abstractions within 1km. Whilst limited potential soil sources have been identified, levels of soluble contaminants in soil are likely to be relatively low.
All contaminants in groundwater	Construction workers	Dermal contact and ingestion	Unlikely	Mild	Very low risk	Construction workers are expected to wear appropriate PPE and RPE. Groundwater levels are unknown. Heavy metals from the allotments on site are a low risk of contamination. The electrical substation located 80m south of the site is an unlikely risk due to the anticipated groundwater flow direction and low solubility of PCB.
Contaminant	Receptor	Pathway ¹	Likelihood of Exposure	Severity of Exposure	Risk Classification	Notes
Asbestos fibres in soils	Future Residents	Inhalation of asbestos fibres	Low likelihood	Severe	Moderate risk	The buildings on site may contain asbestos as they were built during the late 60s/ early 70s, however given that the buildings are going to be demolished the overall risk of exposure is reduced. There is a high likelihood of made ground similarly containing asbestos. Risk to groundworkers should be mitigated by the use of appropriate control measures.
	Construction workers	Inhalation of asbestos fibres	Likely	Medium	Moderate risk	
Soil gases generated from fill materials	Future site users	Vertical and lateral migration through unsaturated pore space.	Low likelihood	Severe	Moderate risk	Any made ground on site has the potential for ground gases, although deep made ground is not anticipated. Possible ingress into confined spaces in buildings during severe low/falling pressure events.
	Structures on or adjacent to the site	Ingress into buildings via service penetrations, floor construction and cracks, wall cavities, etc. resulting in accumulation in enclosed spaces within buildings. Migration via preferential pathways such as below ground service trenches.				

Table D.I.2 CSM Revised Post-Chemical Analyses

Source	Potential Contaminant	Exposure Pathway	Receptor	Initial Assessment from Preliminary Investigation Report Information			Comments	Proposed Investigation		
				Severity	Probability	Risk				
Made Ground	Dibenz(a,h)anthracene	Inhalation of dust	Site Workers/Site Maintenance	Minor	Low	Very Low	Soil chemical analysis recorded one sample (WS2:0.10m bgl) with substance levels over their representative guideline values. WS2 was located beneath proposed residential gardens.	As presented in Section 8.9, the elevated polyaromatic hydrocarbons in WS2 represent a negligible risk to the groundwater receptor and future site occupants.		
			End Users			Very low				
			Off-site Users	Minor	Unlikely	Very low				
	Dibenz(a,h)anthracene	Inhalation of vapour/gases	Site Workers/Site Maintenance	Minor	Low	Very Low				
			End Users							
			Off-site Users							
		Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Minor	Low	Very Low				
		End Users								
		Migration via surface runoff	Surface Water	Minor	Unlikely	Very low				
		Migration in solution via groundwater	Shallow Aquifer	Minor	Unlikely	Very low				
		Deep Aquifer	Minor	Unlikely	Very low					
	Direct contact with construction material	Buried Structures								
	Buried Services									
Migration of gases via permeable soils	Site Workers/Site Maintenance									
	End Users									
	Off-site Users									
	Building and Confined Spaces									

Appendix D.2 Chemical Laboratory Results



Olia Kontogianni
Soils Ltd
Thomas Telford House - Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-06541

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Sample Receipt Date: 19/05/2023

Sample Scheduled Date: 19/05/2023

Report Issue Number: 1

Reporting Date: 30/05/2023

Authorised by:

Kevin Old
Operations Director

Dates of laboratory activities for each tested analyte are available upon request.

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DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 23-06541	Date Sampled	15/05/23	15/05/23	15/05/23	15/05/23	15/05/23
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 30 - 32 Queens View	TP / BH No	WS1	WS2	WS2	WS3	WS4
Project / Job Ref: 20870	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 20870	Depth (m)	0.20	0.10	0.50	0.10	0.20
Reporting Date: 30/05/2023	DETS Sample No	652684	652685	652686	652687	652688

Determinand	Unit	RL	Accreditation	(n)				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	6.3	7.4	7.6	6.6	7.5
Organic Matter (SOM)	%	< 0.1	MCERTS	4.1	4.2	0.5	3.9	1.5
Arsenic (As)	mg/kg	< 2	MCERTS	6	4	3	9	< 2
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	11	7	5	17	4
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	14	7	< 4	19	6
Lead (Pb)	mg/kg	< 3	MCERTS	34	24	4	82	14
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	4	< 3	< 3	5	< 3
Selenium (Se)	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Vanadium (V)	mg/kg	< 1	MCERTS	23	12	8	20	6
Zinc (Zn)	mg/kg	< 3	MCERTS	30	30	9	77	32
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 23-06541	Date Sampled	15/05/23	15/05/23	15/05/23	15/05/23	15/05/23
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 30 - 32 Queens View	TP / BH No	WS1	WS2	WS2	WS3	WS4
Project / Job Ref: 20870	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 20870	Depth (m)	0.20	0.10	0.50	0.10	0.20
Reporting Date: 30/05/2023	DETS Sample No	652684	652685	652686	652687	652688

Determinand	Unit	RL	Accreditation	(n)				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	0.45	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	0.37	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	6.61	0.12	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	1.67	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	8.21	0.11	0.14	0.18
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	6.99	< 0.1	0.12	0.17
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	3.57	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	2.92	< 0.1	< 0.1	0.13
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	3.37	< 0.1	0.15	0.19
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	1.31	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	3.30	< 0.1	< 0.1	0.14
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	1.82	< 0.1	< 0.1	0.11
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.40	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	1.56	< 0.1	< 0.1	0.12
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	42.5	< 1.6	< 1.6	< 1.6

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - EPH Texas Banded					
DETS Report No: 23-06541	Date Sampled	15/05/23	15/05/23	15/05/23	15/05/23
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 30 - 32 Queens View	TP / BH No	WS1	WS2	WS2	WS3
Project / Job Ref: 20870	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 20870	Depth (m)	0.20	0.10	0.50	0.10
Reporting Date: 30/05/2023	DETS Sample No	652684	652685	652686	652687

Determinand	Unit	RL	Accreditation	(n)				
EPH Texas (C6 - C8) :	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
HS 1D MS Total								
EPH Texas (>C8 - C10) :	mg/kg	< 1	MCERTS	< 1	3	< 1	4	2
EH 1D Total								
EPH Texas (>C10 - C12) :	mg/kg	< 1	MCERTS	< 1	< 1	< 1	7	4
EH 1D Total								
EPH Texas (>C12 - C16) :	mg/kg	< 1	MCERTS	< 1	14	< 1	< 1	< 1
EH 1D Total								
EPH Texas (>C16 - C21) :	mg/kg	< 1	MCERTS	< 1	83	< 1	4	3
EH 1D Total								
EPH Texas (>C21 - C40) :	mg/kg	< 6	MCERTS	< 6	228	< 6	13	16
EH 1D Total								
EPH Texas (C6 - C40) :	mg/kg	< 6	NONE	< 6	328	< 6	27	25
HS 1D MS+EH 1D Total								

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions

DETS Report No: 23-06541	
Soils Ltd	
Site Reference: 30 - 32 Queens View	
Project / Job Ref: 20870	
Order No: 20870	
Reporting Date: 30/05/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
652684	WS1	None Supplied	0.20	14.5	Brown sandy clay with stones and vegetation
652685	WS2	None Supplied	0.10	11.4	Brown sandy clay with stones and vegetation
652686	WS2	None Supplied	0.50	7.1	Light brown sandy gravel with stones and chalk
652687	WS3	None Supplied	0.10	13.8	Brown sandy clay with stones and vegetation
652688	WS4	None Supplied	0.20	10.3	Brown sandy clay with stones and vegetation

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{U/S}

Unsuitable Sample ^{U/S}



DETS Ltd
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Rose Lane
Lenham Heath
Maidstone
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Tel : 01622 850410



Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-06541

Soils Ltd

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Reporting Date: 30/05/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphénylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



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List of HWOL Acronyms and Operators

DETS Report No: 23-06541

Soils Ltd

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Reporting Date: 30/05/2023

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym

EPH Texas (C10 - C12) - EH_1D_Total
EPH Texas (C12 - C16) - EH_1D_Total
EPH Texas (C16 - C21) - EH_1D_Total
EPH Texas (C21 - C40) - EH_1D_Total
EPH Texas (C6 - C40) - HS_1D_MS+EH_1D_Total
EPH Texas (C6 - C8) - HS_1D_MS_Total
EPH Texas (C8 - C10) - EH_1D_Total



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Sun Valley Business Park
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SO23 0LB

Derwentside Environmental Testing Services Ltd
Unit 1
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Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-06330

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Sample Receipt Date: 16/05/2023

Sample Scheduled Date: 16/05/2023

Report Issue Number: 1

Reporting Date: 22/05/2023

Authorised by:

A handwritten signature in black ink, appearing to read "Kevin Old", written over a horizontal line.

Kevin Old
Operations Director

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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.



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Soil Analysis Certificate - Organochlorine Pesticides						
DETS Report No: 23-06330		Date Sampled	09/05/23			
Soils Ltd		Time Sampled	None Supplied			
Site Reference: 30 - 32 Queens View		TP / BH No	TPSK2			
Project / Job Ref: 20870		Additional Refs	None Supplied			
Order No: 20870		Depth (m)	0.30			
Reporting Date: 22/05/2023		DETS Sample No	651915			

Determinand	Unit	RL	Accreditation				
Aldrin	mg/kg	< 0.02	NONE	< 0.02			
alpha-HCH	mg/kg	< 0.02	NONE	< 0.02			
beta-HCH	mg/kg	< 0.02	NONE	< 0.02			
cis-chlordane	mg/kg	< 0.02	NONE	< 0.02			
delta-HCH	mg/kg	< 0.02	NONE	< 0.02			
Dieldrin	mg/kg	< 0.02	NONE	< 0.02			
Endosulfan A	mg/kg	< 0.02	NONE	< 0.02			
Endosulfan B	mg/kg	< 0.02	NONE	< 0.02			
Endrin	mg/kg	< 0.02	NONE	< 0.02			
gamma-HCH (Lindane)	mg/kg	< 0.02	NONE	< 0.02			
Heptachlor	mg/kg	< 0.02	NONE	< 0.02			
Heptachlor epoxide	mg/kg	< 0.02	NONE	< 0.02			
Hexachlorobenzene (HCB)	mg/kg	< 0.02	NONE	< 0.02			
Isodrin	mg/kg	< 0.02	NONE	< 0.02			
Methoxychlor	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDD	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDE	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDT	mg/kg	< 0.02	NONE	< 0.02			
p,p' - DDD	mg/kg	< 0.02	NONE	< 0.02			
p,p' - DDE	mg/kg	< 0.02	NONE	< 0.02			
p,p' - DDT	mg/kg	< 0.02	NONE	< 0.02			
trans-chlordane	mg/kg	< 0.02	NONE	< 0.02			
Trifluralin	mg/kg	< 0.02	NONE	< 0.02			



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Soil Analysis Certificate - Organophosphorus Pesticides						
DETS Report No: 23-06330	Date Sampled	09/05/23				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: 30 - 32 Queens View	TP / BH No	TPSK2				
Project / Job Ref: 20870	Additional Refs	None Supplied				
Order No: 20870	Depth (m)	0.30				
Reporting Date: 22/05/2023	DETS Sample No	651915				

Determinand	Unit	RL	Accreditation				
Azinphos-methyl	mg/kg	< 0.1	NONE	< 0.1			
Chlorfenvinphos, alpha	mg/kg	< 0.1	NONE	< 0.1			
Chlorfenvinphos, beta	mg/kg	< 0.1	NONE	< 0.1			
Chlorpyrifos-methyl	mg/kg	< 0.1	NONE	< 0.1			
Diazinon	mg/kg	< 0.1	NONE	< 0.1			
Dichlorvos	mg/kg	< 0.1	NONE	< 0.1			
Dimethoate	mg/kg	< 0.1	NONE	< 0.1			
Fenitrothion	mg/kg	< 0.1	NONE	< 0.1			
Fenthion	mg/kg	< 0.1	NONE	< 0.1			
Malathion	mg/kg	< 0.1	NONE	< 0.1			
Mevinphos, (E)	mg/kg	< 0.1	NONE	< 0.1			
Mevinphos, (Z)	mg/kg	< 0.1	NONE	< 0.1			
Parathion-ethyl	mg/kg	< 0.1	NONE	< 0.1			
Parathion-methyl	mg/kg	< 0.1	NONE	< 0.1			
Phorate	mg/kg	< 0.1	NONE	< 0.1			



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Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 23-06330	
Soils Ltd	
Site Reference: 30 - 32 Queens View	
Project / Job Ref: 20870	
Order No: 20870	
Reporting Date: 22/05/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
651915	TPSK2	None Supplied	0.30	11.4	Brown sandy clay with stones and vegetation

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/5}

Unsuitable Sample ^{u/s}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-06330

Soils Ltd

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Reporting Date: 22/05/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



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List of HWOL Acronyms and Operators
DETS Report No: 23-06330
Soils Ltd
Site Reference: 30 - 32 Queens View
Project / Job Ref: 20870
Order No: 20870
Reporting Date: 22/05/2023

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym



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Soil Analysis Certificate - Organochlorine Pesticides						
DETS Report No: 23-06330		Date Sampled	09/05/23			
Soils Ltd		Time Sampled	None Supplied			
Site Reference: 30 - 32 Queens View		TP / BH No	TPSK2			
Project / Job Ref: 20870		Additional Refs	None Supplied			
Order No: 20870		Depth (m)	0.30			
Reporting Date: 22/05/2023		DETS Sample No	651915			

Determinand	Unit	RL	Accreditation				
Aldrin	mg/kg	< 0.02	NONE	< 0.02			
alpha-HCH	mg/kg	< 0.02	NONE	< 0.02			
beta-HCH	mg/kg	< 0.02	NONE	< 0.02			
cis-chlordane	mg/kg	< 0.02	NONE	< 0.02			
delta-HCH	mg/kg	< 0.02	NONE	< 0.02			
Dieldrin	mg/kg	< 0.02	NONE	< 0.02			
Endosulfan A	mg/kg	< 0.02	NONE	< 0.02			
Endosulfan B	mg/kg	< 0.02	NONE	< 0.02			
Endrin	mg/kg	< 0.02	NONE	< 0.02			
gamma-HCH (Lindane)	mg/kg	< 0.02	NONE	< 0.02			
Heptachlor	mg/kg	< 0.02	NONE	< 0.02			
Heptachlor epoxide	mg/kg	< 0.02	NONE	< 0.02			
Hexachlorobenzene (HCB)	mg/kg	< 0.02	NONE	< 0.02			
Isodrin	mg/kg	< 0.02	NONE	< 0.02			
Methoxychlor	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDD	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDE	mg/kg	< 0.02	NONE	< 0.02			
o,p' - DDT	mg/kg	< 0.02	NONE	< 0.02			
p,p' - DDD	mg/kg	< 0.02	NONE	< 0.02			
p,p' - DDE	mg/kg	< 0.02	NONE	< 0.02			
p,p' - DDT	mg/kg	< 0.02	NONE	< 0.02			
trans-chlordane	mg/kg	< 0.02	NONE	< 0.02			
Trifluralin	mg/kg	< 0.02	NONE	< 0.02			



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Soil Analysis Certificate - Organophosphorus Pesticides						
DETS Report No: 23-06330	Date Sampled	09/05/23				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: 30 - 32 Queens View	TP / BH No	TPSK2				
Project / Job Ref: 20870	Additional Refs	None Supplied				
Order No: 20870	Depth (m)	0.30				
Reporting Date: 22/05/2023	DETS Sample No	651915				

Determinand	Unit	RL	Accreditation				
Azinphos-methyl	mg/kg	< 0.1	NONE	< 0.1			
Chlorfenvinphos, alpha	mg/kg	< 0.1	NONE	< 0.1			
Chlorfenvinphos, beta	mg/kg	< 0.1	NONE	< 0.1			
Chlorpyrifos-methyl	mg/kg	< 0.1	NONE	< 0.1			
Diazinon	mg/kg	< 0.1	NONE	< 0.1			
Dichlorvos	mg/kg	< 0.1	NONE	< 0.1			
Dimethoate	mg/kg	< 0.1	NONE	< 0.1			
Fenitrothion	mg/kg	< 0.1	NONE	< 0.1			
Fenthion	mg/kg	< 0.1	NONE	< 0.1			
Malathion	mg/kg	< 0.1	NONE	< 0.1			
Mevinphos, (E)	mg/kg	< 0.1	NONE	< 0.1			
Mevinphos, (Z)	mg/kg	< 0.1	NONE	< 0.1			
Parathion-ethyl	mg/kg	< 0.1	NONE	< 0.1			
Parathion-methyl	mg/kg	< 0.1	NONE	< 0.1			
Phorate	mg/kg	< 0.1	NONE	< 0.1			



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Tel : 01622 850410

Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 23-06330	
Soils Ltd	
Site Reference: 30 - 32 Queens View	
Project / Job Ref: 20870	
Order No: 20870	
Reporting Date: 22/05/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
651915	TPSK2	None Supplied	0.30	11.4	Brown sandy clay with stones and vegetation

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/5}

Unsuitable Sample ^{u/s}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-06330

Soils Ltd

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Reporting Date: 22/05/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



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List of HWOL Acronyms and Operators
DETS Report No: 23-06330
Soils Ltd
Site Reference: 30 - 32 Queens View
Project / Job Ref: 20870
Order No: 20870
Reporting Date: 22/05/2023

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym



Olia Kontogianni
Soils Ltd
Thomas Telford House - Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-06543

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Sample Receipt Date: 19/05/2023

Sample Scheduled Date: 19/05/2023

Report Issue Number: 1

Reporting Date: 25/05/2023

Authorised by:

Kevin Old
Operations Director

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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.



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Soil Analysis Certificate						
DETS Report No: 23-06543	Date Sampled	15/05/23	15/05/23			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 30 - 32 Queens View	TP / BH No	WS3	WS4			
Project / Job Ref: 20870	Additional Refs	None Supplied	None Supplied			
Order No: 20870	Depth (m)	0.60	0.90			
Reporting Date: 25/05/2023	DETS Sample No	652695	652696			

Determinand	Unit	RL	Accreditation	(n)		
pH	pH Units	N/a	MCERTS	7.2	7.4	
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	202	< 200	
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.02	< 0.02	
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	23	< 10	
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02	< 0.01	
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	
Ammonium as NH ₄	mg/kg	< 0.5	MCERTS	5	2.9	
Ammonium as NH ₄	mg/l	< 0.05	MCERTS	0.50	0.29	
W/S Chloride (2:1)	mg/kg	< 1	MCERTS	8	2	
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS	4.1	0.9	
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS	< 3	< 3	
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS	< 1.5	< 1.5	
W/S Magnesium	mg/l	< 0.1	NONE	2.3	0.3	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 23-06543	
Soils Ltd	
Site Reference: 30 - 32 Queens View	
Project / Job Ref: 20870	
Order No: 20870	
Reporting Date: 25/05/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
652695	WS3	None Supplied	0.60	10.1	Brown sandy clay with stones
652696	WS4	None Supplied	0.90	4.4	Light brown sandy gravel with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/5}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-06543

Soils Ltd

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Reporting Date: 25/05/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



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List of HWOL Acronyms and Operators
DETS Report No: 23-06543
Soils Ltd
Site Reference: 30 - 32 Queens View
Project / Job Ref: 20870
Order No: 20870
Reporting Date: 25/05/2023

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym



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Soil Analysis Certificate						
DETS Report No: 23-06543	Date Sampled	15/05/23	15/05/23			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: 30 - 32 Queens View	TP / BH No	WS3	WS4			
Project / Job Ref: 20870	Additional Refs	None Supplied	None Supplied			
Order No: 20870	Depth (m)	0.60	0.90			
Reporting Date: 25/05/2023	DETS Sample No	652695	652696			

Determinand	Unit	RL	Accreditation	(n)		
pH	pH Units	N/a	MCERTS	7.2	7.4	
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	202	< 200	
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.02	< 0.02	
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	23	< 10	
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02	< 0.01	
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02	
Ammonium as NH ₄	mg/kg	< 0.5	MCERTS	5	2.9	
Ammonium as NH ₄	mg/l	< 0.05	MCERTS	0.50	0.29	
W/S Chloride (2:1)	mg/kg	< 1	MCERTS	8	2	
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS	4.1	0.9	
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS	< 3	< 3	
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS	< 1.5	< 1.5	
W/S Magnesium	mg/l	< 0.1	NONE	2.3	0.3	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation



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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 23-06543	
Soils Ltd	
Site Reference: 30 - 32 Queens View	
Project / Job Ref: 20870	
Order No: 20870	
Reporting Date: 25/05/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
652695	WS3	None Supplied	0.60	10.1	Brown sandy clay with stones
652696	WS4	None Supplied	0.90	4.4	Light brown sandy gravel with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{1/5}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-06543

Soils Ltd

Site Reference: 30 - 32 Queens View

Project / Job Ref: 20870

Order No: 20870

Reporting Date: 25/05/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



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List of HWOL Acronyms and Operators	
DETS Report No: 23-06543	
Soils Ltd	
Site Reference: 30 - 32 Queens View	
Project / Job Ref: 20870	
Order No: 20870	
Reporting Date: 25/05/2023	

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym

Appendix D.3 General Assessment Criteria

HUMAN HEALTH RISK ASSESSMENT

Introduction

The statutory definition of contaminated land was initially defined in the Environmental Protection Act 1990, ref. 1.1, which was introduced by the Environment Act 1995, ref. 1.2, and retained in the Environment Act 2021, ref 1.3, as;

‘Land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that –

- (a) significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) pollution of controlled waters is being, or is likely to be, caused.’

The UK guidance on the assessment of contaminated land has developed as a direct result of the introduction of these Acts. The technical guidance supporting the original legislation was summarised in a number of key documents collectively known as the Contaminated Land Reports (CLRs). These have since been replaced or superseded by Land Contamination Risk Management (LCRM) 2021, ref 1.4 produced and administrated by the Environment Agency online through the .GOV.uk website <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm> .

However, the basic definitions, methodology and guidance remain essentially the same utilizing the UK Contaminated Land Exposure Assessment Models (CLEA) as within the original CLR and planning guidance it replaces or supersedes.

In establishing whether a site fulfils the statutory definition of ‘contaminated land’ it remains necessary to identify, whether a pollutant linkage exists in respect of the land in question and whether the pollutant linkage:

- is resulting in significant harm being caused to the identified receptor in the pollutant linkage,
- presents a significant possibility of significant harm being caused to that receptor,
- is resulting in the pollution of the controlled waters which constitute the receptor, or
- is likely to result in such pollution.

A ‘pollutant linkage’ may therefore be defined as the confirmation of a link between a contaminant ‘source’ and a vulnerable at risk ‘receptor’ by means of a ‘pathway’ and that the risk is potentially significant. If there is no complete linkage, risk defaults to low to negligible and can never be potentially significant.

Assessment Methodology

A four-stage assessment process is followed for identifying potential pollutant linkages on a site. These stages are summarised in the table below:

No.	Process	Description
1	Hazard Identification	Establishing contaminant sources, pathways and receptors (the conceptual model).
2	Hazard Assessment	Analysing the potential for unacceptable risks (what linkages could be present, what could be the effects).
3	Risk Estimation	Trying to establish the magnitude and probability of the possible consequences (what degree of harm might result and to what receptors, and how likely is it).
4	Risk Evaluation	Deciding whether the risk is unacceptable in the context of existing and future proposals.

Stages 1 and 2 develop an initial '*conceptual model*' based upon information collated from desk-based available and existing site information and a walkover of the site as recommended in BS10175 and LCRM. The formation of any conceptual model is an iterative process and as such it should be updated and refined throughout each phase of the project to reflect any additional information obtained and unknowns being resolved and identify the potential contaminants of concern at the site, i.e. those with the potential to cause significant harm to identified receptors.

The extent of the desk studies and enquiries to be conducted should be in general accordance with BS10175 and other UK guidance to produce an initial conceptual model highlighting the known potential risks, remaining unknowns and contaminants of concern. The information from these enquiries is presented in a desk study or preliminary report with recommendations, if necessary, for further work based upon the conceptual model findings and any identified or unresolved unknowns.

If potential pollutant linkages or potentially significant unknowns are identified within the initial conceptual model, further site investigation and report will be recommended and usually required under planning. Such investigation should be based on and driven by the findings of the initial conceptual model and planned in general accordance with BS10175, LCRM and other current UK guidance where relevant. The number of exploratory holes and samples collected for analysis should be consistent with the size, extent and nature of the site, the identified contaminants of concern and the level of initial risk identified in the initial conceptual model. This will enable a contamination risk assessment to be conducted in accordance with current UK requirements, at which point the conceptual model can be updated and any relevant pollutant linkages can be further quantified and any remaining unknowns resolved. As previously this is an iterative process that may highlight or require additional investigation to resolve to the satisfaction of the regulator.

A two-stage investigation process may therefore be more appropriate where time constraints are less of an issue with the first intrusive investigation being conducted as an initial or screening assessment to confirm or validate the presence of potential sources on site identified in the initial conceptual model and to investigate if additional unknown sources not previously identified are present. This helps to define the scope, extent and requirements of a second more refined and targeted investigation to delineate wherever possible the extent of the identified contamination, contaminants of concern and/or remaining unknowns.

All site works should be undertaken in general accordance with the British Standards BS 10175, ref. 5, for environmental only investigations and BS 5930:2015, ref. 1.6, in the case of combined Geoenvironmental and/or Geotechnical investigations.

The results of analysis are compared initially against generic guidance values which are dependent on the proposed end-use of the development and which must ultimately be based on traceable, scientifically valid and justified exposure and chemical data using the UKCLEA methodology.

The end-use and therefore potential exposure pathways may be defined as one of the following under current UK guidance;

- Residential with homegrown produce i.e. typical low rise and low-density housing with gardens where vegetables and fruits may be grown for home consumption.
- Residential without homegrown produce i.e. low-density housing where no gardens are present where vegetables and fruits could be grown for home consumption.
- Allotments – i.e. areas where vegetables and fruits are grown for home consumption but are not specifically associated with a residential property.
- Public open space residential – i.e. grassed areas adjacent and/or directly related to high density housing and other common or communal open areas on which underlying soils could be exposed but on which vegetables and fruits are not grown for consumption.
- Public open space – i.e. areas such as parks, playing fields and other recreational areas to which public access is possible but otherwise to which there is no direct residential linkage.
- Commercial – i.e. industrial premises where there is limited exposure to soil and residents are not present on site.

Standard Land-use Scenarios

The standard land-use scenarios used to develop exposure models are further detailed in the following sections:

Residential with homegrown produce

Generic scenario assumes a house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

-
- Critical receptor is assumed to be a young female child (zero to six years old)
 - Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
-

A sub-set of the Residential land-use is **Residential without Homegrown produce**. The generic scenario assumes low density housing with communal landscaped gardens where the consumption of homegrown vegetables will not occur and the pathways of direct ingestion and produce inputs are suitably moderated.

Allotments

Areas of open space commonly made available to local users but remote from residential properties, but on which tenants may grow fruit and vegetables for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make only occasional accompanied visits.

Although some allotment holders may choose to keep animals on allotments, potential exposure to animal products is not currently considered within the CLEA model.

-
- Critical receptor is a young female child (zero to six years old)
 - Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours but at reduced exposure levels reflecting non-residential status.
-

Commercial

This generic scenario assumes a typical commercial or light industrial property at which employees spend most time indoors and are involved in office-based or relatively light physical work.

-
- Critical receptor is a working female adult (aged 16 to 65 years old).
 - Exposure duration is over working lifetime
 - Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours but exposure reduced to reflect non-residential nature and general lack of open spaces.
-

Public Open Space within Residential Area

This generic scenario refers to any grassed area up to 0.05 ha that is associated with residential properties but is not for their exclusive use and on which no fruit or vegetables are grown for home consumption.

-
- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil which can be interacted with directly
 - Predominantly used by children for play and/or access
 - Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
-

-
- older children chosen as the critical receptor on basis that they will use site most frequently (age class 4-9 years)
-
- ingestion rate assumed to be 75 mg.day⁻¹
-

Public Open Space Park

This generic scenario refers to any public park or grassed space that is more than 0.5ha in area:

-
- Public park (>0.5 ha), predominantly grassed and may also contain children's play equipment and border areas of soil containing flowers or shrubs (75% assumed cover)
-
- Female child age classes 1-6
-
- Soil ingestion rate of 50 mg.day⁻¹
-
- Occupancy period outdoors = 2 hours.day⁻¹
-
- Exposure frequency of 170 days.year⁻¹ for age classes 2-18 and 85 days.year⁻¹ for age class 1
-
- Outdoor exposure pathways only (no tracking back of soils).
-

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC) generated using the CLEA model based on the exposure and land use scenario assumptions noted above.

GAC's are deliberately conservative values adopted to ensure that they are applicable to the majority of possible contaminated sites and below which there is considered a low to negligible risk to identified human health receptors, i.e. there can be no harm. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC's derived by a competent third party or the Environment Agency / DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC's to ensure that they are used appropriately.

Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses or the contaminant is susceptible to wide variation depending on factors such as form and bioavailability, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific or remediation values for relevant soil contaminants based on site and contaminant specific conditions.

In 2014, the publication of Category 4 Screening Levels (C4SL), refs 1.8 and 1.9, as part of the Defra-funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3) ref 1.7 used in the generation of SGVs. C4SL were published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern. Where a C4SL has been published, Soils Limited has adopted them as GAC for these six substances.

For all other substances the soils will be compared to Suitable For Use Levels (S4ULs) published by LQM, ref. 1.10, which were developed for around 85 substances and are

intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants.

Where no S4UL or C4SL is available, assessment criteria may be generated using the Contaminated Land Exposure Assessment (CLEA) Software Version 1.07, ref. 1.11, Toxicological and physico-chemical/fate and transport data used to generate the criteria has been derived from a hierarchy of data sources as follows:

1. Environment Agency or Department of Environment Food and Rural Affairs (DEFRA) documents;
2. Other documents produced by UK Government or state organisations;
3. European institution documents;
4. International organisation documents;
5. Foreign government institutions.

In the case of the majority of contaminants considered, the toxicological data has been drawn originally from the relevant CLR 9 TOX report, or updated toxicological data published by the Environment Agency (2009), where available. Where no TOX report is available reference has been made to appropriately determined health criteria values, derived from the above-noted hierarchy, as this is considered to represent appropriate peer reviewed data sources. Similarly, fate and transport data should also be determined by reference to appropriate sources and the CLEA model assumptions.

Chemical laboratory test results are processed as follows. A statistical analysis of the results is conducted, as detailed in CIEH and CL:AIRE 'Guidance on Comparing Soil Contamination Data with a Critical Concentration', ref. 1.12. Individual concentrations are then compared to the selected guideline values to identify and isolate concentrations of contaminants that are in excess of the selected screening low or no risk criteria.

Where the risk estimation identifies significant concentrations of one or more contaminants, further risk evaluation needs to be undertaken often as a site specific DQRA in line with current guidance to determine and confirm if the identified exceedances are significant in the context of the proposed development or activity.

References

- 1.1 The Environmental Protection Act, Part IIA, Section 78, DoE 1990.
- 1.2 Environment Act 1995, Section 57, DoE 1995.
- 1.3 Environment Act 2021 OEP 2021.
- 1.4 Land Contamination Risk Management Gov.UK (EA) 2021
- 1.5 BS 10175: 2011+A2:2017 '*Investigation of potentially contaminated sites. Code of practice*', British Standards Institute, 2017
- 1.6 BS 5930: 2015+A1:2020 '*Code of practice for ground investigations*', British Standards Institute, 2015
- 1.7 Science Report SC050021/SR3 '*Updated technical background to the CLEA model*', Environment Agency, 2008
- 1.8 DEFRA SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination, published March 2014.
- 1.9 Contaminated Land: Applications in Real Environment (CL:AIRE) (2014). '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*', Revision 2, DEFRA research project SP1010.
- 1.10 The LQM/S4ULs for Human Health Risk Assessment, Nathanail P, McCaffery C, Gillett A, Ogden R, and Nathanail J, Land Quality Press, Nottingham, published 2015.
- 1.11 CLEA '*Software Version 1.071*' (downloaded from the CL:AIRE website , <https://www.claire.co.uk/home/news/44-risk-assessment/178-soil-guideline-values>)
- 1.12 CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*', Chartered Institute of Environmental Health (CIEH) and Contaminated Land: Applications in Real Environments (CL:AIRE), May 2008.

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date		
			With			Without			Allotments			Commercial			Residential			Park							
			SOM	1.0	2.5	6	1	2.5							6	1	2.5	6	1	2.5				6	1
Type	Contaminants	Species	Year																						
Metals	Antimony		2010					550						7500							EIC/AGS/ CL:AIRE	EIC/AGS/ CL:AIRE	2010		
	Arsenic		2014			37		40			49		640		79		168			S4UL	LQM/CIEH	2015			
	Barium		2010					1300					22000							EIC/AGS/ CL:AIRE	EIC/AGS/ CL:AIRE	2010			
	Beryllium		2015			1.7		1.7			35		12		2.2		63		S4UL	LQM/CIEH	2015				
	Boron		2015			290		11000			45		240000		21000		46000		S4UL	LQM/CIEH	2015				
	Cadmium		2015			11		85			1.9		190		120		532		S4UL	LQM/CIEH	2015				
	Chromium	III	2014			26		149			4.9		410		220		880		C4SL	DEFRA	2014				
			2015			910		910		18000		8600		1500		33000		S4UL	LQM/CIEH	2015					
			2014			21		21		170		49		23		250		C4SL	DEFRA	2014					
		VI	2015			6		6			1.8		33		7.7		220		S4UL	LQM/CIEH	2015				
			2015			2400		7100		520		68000		12000		44000		S4UL	LQM/CIEH	2015					
			Lead			210		310		84		6000		760		1400		C4SL	DEFRA	2014					
	Mercury	Elemental	2012			1.0		1.0			26		26						SGV	DEFRA	2012				
			2015			1.2		1.2		21		58		16		30		S4UL	LQM/CIEH	2015					
			2012			170		170		80		36000						SGV	DEFRA	2012					
			2015			40		56		19		1100		120		240		S4UL	LQM/CIEH	2015					
			2012			11		11		8		410						SGV	DEFRA	2012					
	Molybdenum		2015			11		15			6		320		40		68		S4UL	LQM/CIEH	2015				
			2010					670				17000						EIC/AGS/ CL:AIRE	EIC/AGS/ CL:AIRE	2010					
			2012			130		130		230		1800						SGV	DEFRA	2012					
	Nickel		2015			130		180			53		980		230		800		S4UL	LQM/CIEH	2015				
			2012			350		350		120		13000						SGV	DEFRA	2012					
			2015			250		430		88		12000		1100		1800		S4UL	LQM/CIEH	2015					
	Vanadium		2015			410		1200			91		9000		2000		5000		S4UL	LQM/CIEH	2015				
	Zinc		2015			3700		40000			620		730000		81000		170000		S4UL	LQM/CIEH	2015				
	BTEX & MTBE	Benzene		2012			0.33		0.33			0.07		95						SGV	DEFRA	2012			
2014						0.87		3.3		0.18		98		140		230		C4SL	DEFRA	2014					
2015				0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	S4UL	LQM/CIEH	2015	
Toluene			2012			610		610			120		4400						SGV	DEFRA	2012				
			2015	130	290	660	880	1900	3900	22	51	120	65000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015	
Ethylbenzene			2012			350		350			90		2800						SGV	DEFRA	2012				
			2015	47	110	260	83	190	440	16	39	91	4700	13000	27000	24000	24000	25000	17000	22000	27000	S4UL	LQM/CIEH	2015	
Xylenes		o-xylene	2012			250		250			160		2600							SGV	DEFRA	2012			
			2015	60	140	330	88	210	480	28	67	160	6600	15000	33000	41000	42000	43000	17000	24000	33000	S4UL	LQM/CIEH	2015	
			2012			240		240			180		3500							SGV	DEFRA	2012			
			2015	59	140	320	82	190	450	31	74	170	6200	14000	31000	41000	42000	43000	17000	24000	32000	S4UL	LQM/CIEH	2015	
			2012			230		230			160		3200							SGV	DEFRA	2012			
Petroleum Hydrocarbons Fractions				2015	56	130	310	79	180	310	29	69	160	5900	14000	30000	41000	42000	43000	17000	23000	31000	S4UL	LQM/CIEH	2015
	Aliphatic >C5 - C6			2015	42	78	160	42	78	160	730	1700	3900	3200	5900	12000	570000	590000	600000	95000	130000	180000	S4UL	LQM/CIEH	2015
	Aliphatic >C6 - C8			2015	100	230	530	100	230	530	2300	5600	13000	7800	17000	40000	600000	610000	620000	150000	220000	320000	S4UL	LQM/CIEH	2015
	Aliphatic >C8 - C10			2015	27	65	150	27	65	150	320	770	1700	2000	4800	11000	13000	13000	13000	14000	18000	21000	S4UL	LQM/CIEH	2015
	Aliphatic >C10 - C12			2015	130	330	760	130	330	770	2200	4400	7300	9700	23000	47000	13000	13000	13000	21000	23000	24000	S4UL	LQM/CIEH	2015
	Aliphatic >C12 - C16			2015	1100	2400	4300	1100	2400	4400	11000	13000	13000	59000	82000	90000	13000	13000	13000	25000	25000	26000	S4UL	LQM/CIEH	2015
	Aliphatic >C16 - C35			2015	65000	92000	110000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aliphatic >C35 - C44			2015	65000	92000	140000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aromatic >C5 - C7			2015	70	140	300	370	690	1400	13	27	57	26000	46000	86000	56000	56000	56000	76000	84000	92000	S4UL	LQM/CIEH	2015
	Aromatic >C7 - C8			2015	130	290	660	860	1800	3900	22	51	120	56000	110000	180000	56000	56000	56000	87000	95000	100000	S4UL	LQM/CIEH	2015
Aromatic >C8 - C10	2015	34	83	190	47	110	270	8.6	21	51	3500	8100	17000	5000	5000	5000	7200	8500	9300	S4UL	LQM/CIEH	2015			

Land Use			Residential With or Without Plant Uptake						Public Open Space (POS)													Name	Authority	Date	
			With home-grown produce			Without home-grown produce			Allotments			Commercial			Residential			Park							
Type	Contaminants	Species	Year	SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
	Aromatic >C10 - C12		2015		74	180	380	250	590	1200	13	31	74	16000	28000	34000	5000	5000	5000	9200	9700	10000	S4UL	LQM/CIEH	2015
	Aromatic >C12 - C16		2015		140	330	660	1800	2300	2500	23	57	130	36000	37000	38000	5100	5100	5000	10000	10000	10000	S4UL	LQM/CIEH	2015
	Aromatic >C16 - C21		2015		260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	S4UL	LQM/CIEH	2015
	Aromatic >C21 - C35		2015		1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aromatic >C34 - C44		2015		1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aliphatic + Aromatic >C44 - C70				1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
Polycyclic Aromatic Hydrocarbons (PAH' s) (mg/kg)	Acenaphthene		2015		210	510	1100	3000	4700	6000	34	85	200	84000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Acenaphthylene		2015		170	420	920	2900	4600	6000	28	69	160	83000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Anthracene		2015		2400	5400	11000	31000	35000	37000	380	950	2200	520000	540000	540000	740000	740000	740000	150000	150000	150000	S4UL	LQM/CIEH	2015
	Benzo(a)anthracene		2015		7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	S4UL	LQM/CIEH	2015
	Benzo(a)pyrene		2014				5				5.3			5.7			76			10		21	C4SL	DEFRA	2014
			2015		2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	S4UL	LQM/CIEH	2015
	Benzo(b)fluoranthene		2015		2.6	3.3	3.7	3.9	4.0	4.0	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16	S4UL	LQM/CIEH	2015
	Benzo(ghi)perylene		2015		320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	S4UL	LQM/CIEH	2015
	Benzo(k)fluoranthene		2015		77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	S4UL	LQM/CIEH	2015
	Chrysene		2015		15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	S4UL	LQM/CIEH	2015
	Dibenz(a,h)anthracene		2015		0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	S4UL	LQM/CIEH	2015
	Fluoranthene		2015		280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400	S4UL	LQM/CIEH	2015
	Fluorene		2015		170	400	860	2800	3800	4500	27	67	160	63000	68000	71000	9900	9900	9900	20000	20000	20000	S4UL	LQM/CIEH	2015
	Indeno(1,2,3-cd)pyrene		2015		27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	S4UL	LQM/CIEH	2015
	Naphthalene		2015		2.3	5.6	13	2.3	5.6	13	4.1	10	24	190	460	1100	4900	4900	4900	1200	1900	3000	S4UL	LQM/CIEH	2015
	Phenanthrene		2015		95	220	440	1300	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	S4UL	LQM/CIEH	2015
	Pyrene		2015		620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	S4UL	LQM/CIEH	2015
	Coal Tar(Bap as surrogate matter)		2015		0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	S4UL	LQM/CIEH	2015
Chloroalkanes & alkenes	1,2 Dichloroethane		2015		0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	S4UL	LQM/CIEH	2015
	1,1,1 Trichloroethane		2015		8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000	76000	100000	S4UL	LQM/CIEH	2015
	1,1,2,2 Tetrachloroethane		2015		1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	S4UL	LQM/CIEH	2015
	1,1,1,2 Tetrachloroethane		2015		1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	110	250	560	1400	1400	1400	1500	1800	2100	S4UL	LQM/CIEH	2015
	Tetrachloroethene		2015		0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	42	95	1400	1400	1400	810	1100	1500	S4UL	LQM/CIEH	2015
			2021		0.31	0.7	1.6	0.32	0.71	1.6	2	4.8	11	24	55	130	3200	3300	3400	1400	1900	2500	C4SL	CLAIRE	2021
	Tetrachloromethane (Carbon Tetrachloride)		2015		0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	S4UL	LQM/CIEH	2015
	Trichloroethene (TCE)		2015		0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	S4UL	LQM/CIEH	2015
			2021		0.0093	0.02	0.043	0.0097	0.02	0.045	0.032	0.072	0.16	0.73	1.5	3.4	76	78	79	41	54	69	C4SL	CLAIRE	2021
	Trichloromethane		2015		0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	S4UL	LQM/CIEH	2015
Explosives	Vinyl Chloride (Chloroethene)		2015		0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	S4UL	LQM/CIEH	2015
			2021		0.0064	0.01	0.017	0.015	0.019	0.029	0.0017	0.0031	0.0058	1.1	1.4	2.2	7.8	7.8	7.8	18	19	19	C4SL	CLAIRE	2021
	2,4,6 Trinitrotoluene		2015		1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	S4UL	LQM/CIEH	2015
	RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)		2015		120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000	51000	53000	S4UL	LQM/CIEH	2015
	HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)		2015		5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000	23000	24000	S4UL	LQM/CIEH	2015
	Aldrin		2015		5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	S4UL	LQM/CIEH	2015
Pesticides	Dieldrin		2015		0.97	2	3.5	7	7.3	7.4	0.17</														

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date	
			With			Without			Allotments			Commercial			Residential			Park						
			SOM	1.0	2.5	6	1	2.5																6
Type	Contaminants	Species	Year																					
Phenols & Chlorophenols	1,3-Dichlorobenzene		2015	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	S4UL	LQM/CIEH	2015
	1,4-Dichlorobenzene		2015	61	150	350	61	150	350	15	37	88	4400	10000	25000	17000	17000	1700	36000	36000	36000	S4UL	LQM/CIEH	2015
	1,2,3,-Trichlorobenzene		2015	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770	1100	1600	S4UL	LQM/CIEH	2015
	1,2,4,-Trichlorobenzene		2015	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700	2600	4000	S4UL	LQM/CIEH	2015
	1,3,5,-Trichlorobenzene		2015	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380	580	860	S4UL	LQM/CIEH	2015
	1,2,3,4,-Tetrachlorobenzene		2015	15	36	78	24	56	120	4.4	11	26	1700	3080	4400	830	830	830	1500	1600	1600	S4UL	LQM/CIEH	2015
	1,2,3,5,- Tetrachlobenzene		2015	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49	120	240	78	79	79	110	120	130	S4UL	LQM/CIEH	2015
	1,2,4, 5,- Tetrachlobenzene		2015	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42	72	96	13	13	13	25	26	26	S4UL	LQM/CIEH	2015
	Pentachlorobenzene		2015	5.8	12	22	19	30	38	1.2	3.1	7	640	770	830	100	100	100	190	190	190	S4UL	LQM/CIEH	2015
	Hexachlorobenzene		2015	1.8	3.3	4.9	4.1	5.7	6.7	0.47	1.1	2.5	110	120	120	16	16	16	30	30	30	S4UL	LQM/CIEH	2015
Phenols & Chlorophenols	Phenols		2012			420			420			280			3200							SGV	DEFRA	2012
			2015	120	200	380	440	690	1200	23	42	83	440	690	1300	440	690	1300	440	690	1300	S4UL	LQM/CIEH	2015
	Chlorophenols (4 Congeners)		2015	0.87	2	4.5	94	150	210	0.13	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	S4UL	LQM/CIEH	2015
	Pentachlorophenols		2015	0.22	0.52	1.2	27	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	S4UL	LQM/CIEH	2015
Others	Carbon Disulphide		2015	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	S4UL	LQM/CIEH	2015
	Hexachloro-1,3-Butadiene		2015	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	S4UL	LQM/CIEH	2015
	Sum of PCDDs, PCDFs and dioxin-like PCB's.		2012			8			8			8			240							SGV	DEFRA	2012

NOTE	
Priority	Guideline (mg kg ⁻¹)
1	Site Specific Assessment Criteria (SSAC) (Soils Limited)
2	2014: Category 4 Screening Level (C4SL) (Contaminated Land: Application in Real Environment (CL:ARE), 2014 and 2021)
3	2012: Soil Guideline Value (SGV) (Environment Agency, 2009)
4	2015: Suitable 4 Use Level (S4UL) (Nathanail <i>et al</i> , 2015)
For Generic Risk Assessment, the values in Bold should have priority unless site specific, Client or regulatory requirements dictate otherwise – which must be justified	
Table reviewed January 2022	

Appendix E Gas Monitoring

Job Number:	20870
Site Name:	30-32 Queen's View
BH/WS ID:	WS1
Date:	16/05/2023
Start Time:	08:25:57

Weather	* Delete as appropriate			
Wind		Light		
Cloud Cover		Light		
Precipitation	Dry			
Ground Conditions		Slightly		

Gas Monitor:*		or	Gfm
PID:*		or	Watch gas
Dip meter:*		or	Single Phase

Step 3	
Depth to Water (m bgl)	Base of Hole (m bgl)
Dry	2.64

Step 1			
Monitoring interval	Flow L/hr	Dp Pa	SP mB
Borehole measurement	00:00:05	0.0	0
	00:00:30	0.0	0
	00:01:00	0.0	0
	00:02:00		
	00:03:00		
	00:04:00		
	00:05:00		
	00:06:00		
	00:07:00		
	00:08:00		
	00:09:00		
	00:10:00		
	00:11:00		

Step 2									
Monitoring interval	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	LEL CH ₄ %	H2S ppm	Co ppm	Ap mB	VOC (PPM)	Temp (°C)
Atmosphere	0.0	0	20.6	0.0	0	0	1023	0	12
Borehole measurement	00:00:05	0.0	0.0	20.4	0	0		10	
	00:00:30	0.0	0.3	20.5	0	0		9	
	00:01:00	0.0	0.5	20.1	0	0		9	
	00:02:00	0.0	0.5	20.1	0	0		8	
	00:03:00								
	00:04:00								
	00:05:00								
	00:06:00								
	00:07:00								
	00:08:00								
	00:09:00								
	00:10:00								

Samples		Notes;

Job Number:	20870
Site Name:	30-32 Queen's View
BH/WS ID:	WS4
Date:	16/05/2023
Start Time:	08:38:40

Gas Monitor:*		or	Gfm
PID:*		or	Watchgas
Dip meter:*		or	Single Phase

Weather	* Delete as appropriate			
Wind		Light		
Cloud Cover		Light		
Precipitation	Dry			
Ground Conditions		Slightly		

Step 3	
Depth to Water (m bgl)	Base of Hole (m bgl)
Dry	1.37

Step 1				
Monitoring interval		Flow L/hr	Dp Pa	SP mB
Borehole measurement	00:00:05	0.0	0	
	00:00:30	0.0	0	
	00:01:00	0.0	0	
	00:02:00			
	00:03:00			
	00:04:00			
	00:05:00			
	00:06:00			
	00:07:00			
	00:08:00			
	00:09:00			
	00:10:00			
	00:11:00			

Step 2										
Monitoring interval	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	LEL CH ₄ %	H ₂ S ppm	Co ppm	Ap mB	VOC (PPM)	Temp (°C)	
Atmosphere	0.0	0	20.0	0.0	0	0	1023	0	4	
Borehole measurement	00:00:05	0.0	1.7	18.8	0	0		2		
	00:00:30	0.0	1.8	18.6	0	0		2		
	00:01:00	0.0	1.8	18.6	0	0		2		
	00:02:00	0.0	1.8	18.6	0	0		2		
	00:03:00									
	00:04:00									
	00:05:00									
	00:06:00									
	00:07:00									
	00:08:00									
	00:09:00									
	00:10:00									

Samples		Notes;

Job Number:	20870
Site Name:	30-32 Queen's View
BH/WS ID:	WS1
Date:	26/05/2023
Start Time:	00:00:00

Gas Monitor:*	<i>gfm 435</i>	<i>or</i>	
PID:*	<i>poli mp400p</i>	<i>or</i>	
Dip meter:*	<i>single</i>	<i>or</i>	<i>Single Phase</i>

Weather	* Delete as appropriate			
Wind		<i>Light</i>		
Cloud Cover		<i>Light</i>		
Precipitation	<i>Dry</i>			
Ground Conditions		<i>Slightly</i>		

Step 3	
Depth to Water (m bgl)	Base of Hole (m bgl)
dry	2.40

Step 1			
Monitoring interval	Flow L/hr	Dp Pa	SP mB
Borehole measurement	00:00:05	0.3	1
	00:00:30	0.3	1
	00:01:00	0.3	1
	00:02:00	0.3	1
	00:03:00	0.3	1
	00:04:00	0.3	1
	00:05:00		
	00:06:00		
	00:07:00		
	00:08:00		
	00:09:00		
	00:10:00		
	00:11:00		

Step 2									
Monitoring interval	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	LEL CH ₄ %	H2S ppm	Co ppm	Ap mB	VOC (PPM)	Temp (°C)
Atmosphere	0.0	0	20.8	0.0	0	0	1030	0	4
Borehole measurement	00:00:05	0.0	0.0	20.7	0.0	0	1030	0	
	00:00:30	0.0	0.4	20.0	0.0	0	1030	0	
	00:01:00	0.0	0.6	19.9	0.0	0	1030	0	
	00:02:00	0.0	0.5	19.9	0.0	-1	1030	0	
	00:03:00	0.0	0.6	19.9	0.0	-1	1030	0	
	00:04:00	0.0	0.6	19.9	0.0	-1	1030	0	
	00:05:00								
	00:06:00								
	00:07:00								
	00:08:00								
	00:09:00								
	00:10:00								

Samples		Notes;
1 Litre Plastic		Frozen to g/l
1 Litre Glass		
40ml Vial		
Gas sample (Tedlar bag		

Job Number:	20870
Site Name:	30-32 Queen's View
BH/WS ID:	WS4
Date:	26/05/2023
Start Time:	00:00:00

Weather	* Delete as appropriate			
Wind		Light		
Cloud Cover		Light		
Precipitation	Dry			
Ground Conditions		Slightly		

Gas Monitor:*	gfm 435	or	
PID:*	poli mp400p	or	
Dip meter:*	single	or	Single Phase

Step 3	
Depth to Water (m bgl)	Base of Hole (m bgl)
dry	1.35

Step 1				
Monitoring interval		Flow L/hr	Dp Pa	SP mB
Borehole measurement	00:00:05	0.3	1	
	00:00:30	0.3	1	
	00:01:00	0.3	1	
	00:02:00	0.3	1	
	00:03:00	0.3	1	
	00:04:00	0.3	1	
	00:05:00			
	00:06:00			
	00:07:00			
	00:08:00			
	00:09:00			
	00:10:00			
	00:11:00			

Step 2										
Monitoring interval	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	LEL CH ₄ %	H2S ppm	Co ppm	Ap mB	VOC (PPM)	Temp (°C)	
Atmosphere	0.0	0	20.8	0.0	0	0	1030	0		4
Borehole measurement	00:00:05	0.0	0.7	20.2	0	1	1030	0		
	00:00:30	0.0	2.1	19.1	0	2	1030	0		
	00:01:00	0.0	2.2	19.0	0	1	1030	0		
	00:02:00	0.0	2.2	19.0	0	1	1030	0		
	00:03:00	0.0	2.1	19.2	0	0	1030	0		
	00:04:00	0.0	2.1	19.2	0	0	1030	0		
	00:05:00									
	00:06:00									
	00:07:00									
	00:08:00									
	00:09:00									
	00:10:00									

Samples		Notes;
1 Litre Plastic		Frozen to g/l
1 Litre Glass		
40ml Vial		
Gas sample (Tedlar bag		

Job Number:

20870

Site Name:

30-32 Queen's View

BH/WS ID:

WS1

Date:

14/06/2023

Start Time:

11:18:52 AM

Weather

* Delete as appropriate

Wind

Light

Cloud Cover

Light

Precipitation

Dry

Ground Conditions

Dry

Gas Monitor:*

or

Gfm

PID:*

or

Watch gas

Dip meter:*

or

Single Phase

Step 3

Depth to Water (m bgl)

Base of Hole (m bgl)

Dry

2.62

Step 1

Monitoring interval

Flow
L/hr

Dp
Pa

SP
mB

mea

00:00:05

0.0

0

00:00:30

0.0

0

00:01:00

0.0

0

00:02:00

00:03:00

00:04:00

00:05:00

00:06:00

00:07:00

00:08:00

00:09:00

00:10:00

00:11:00

Step 2

Monitoring interval

CH₄
% v/v

CO₂
% v/v

O₂
% v/v

LEL CH₄
%

H2S
ppm

Co
ppm

Ap
mB

VOC
(PPM)

Temp
(°C)

Atmosphere

0.0

0

20.9

0.0

0

0

1015

0

23

mea

00:00:05

0.0

0.0

20.8

0.0

0

0

1016

0

00:00:30

0.0

0.5

20.5

0.0

0

1

1015

0

00:01:00

0.0

0.5

20.5

0.0

0

1

1016

0

00:02:00

0.0

0.5

20.5

0.0

0

1

00:03:00

00:04:00

00:05:00

00:06:00

00:07:00

00:08:00

00:09:00

00:10:00

Samples

Notes;

1 Litre Plastic

1 Litre Glass

40ml Vial

Gas sample (Tedlar bag)

Job Number:	20870				Weather	* Delete as appropriate									
Site Name:	30-32 Queen's View				Wind		Light								
BH/WS ID:	WS4				Cloud Cover		Light								
Date:	14/06/2023				Precipitation	Dry									
Start Time:	11:29:54 AM				Ground Conditions	Dry									
Gas Monitor:*		or			Step 3										
PID:*		or			Depth to Water (m bgl)		Base of Hole (m bgl)								
Dip meter:*		or	Single Phase		Dry		1.35								
Step 1				Step 2											
mea	Monitoring interval	Flow L/hr	Dp Pa	SP mB	Monitoring interval	CH ₄ % v/v	CO ₂ % v/v	O ₂ % v/v	LEL CH ₄ %	H2S ppm	Co ppm	Ap mB	VOC (PPM)	Temp (°C)	
	00:00:05	0.0	0		Atmosphere	0.0	0	20.9	0.0	0	0	1015	0	23	
	00:00:30	0.0	0		mea	00:00:05	0.0	0.0	20.6	0.0	0	0	1015	0	
	00:01:00	0.0	0			00:00:30	0.0	2.0	19.4	0.0	0	1	1015	0	
	00:02:00					00:01:00	0.0	2.0	19.2	0.0	0	1	1015	0	
	00:03:00					00:02:00	0.0	1.9	19.4	0.0	0	1			
	00:04:00					00:03:00	0.0	1.8	19.5	0.0	0	0			
	00:05:00					00:04:00	0.0	1.7	19.6	0.0	0	0			
	00:06:00					00:05:00									
	00:07:00					00:06:00									
	00:08:00					00:07:00									
	00:09:00					00:08:00									
	00:10:00				00:09:00										
00:11:00				00:10:00											
Samples					Notes;										
1 Litre Plastic															
1 Litre Glass															
40ml Vial															
Gas sample (Tedlar bag															

Appendix F Information Provided by the Client



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L T

ROBIN PLACE

3 to 12

ESS

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