



Main Investigation Report

at

Plot Adjacent to 35 Balcorne Street, Hackney, London E9 7JW

for

Hackney London Borough Council

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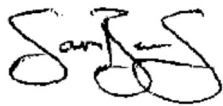
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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

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

Soils Limited was commissioned by Hackney London Borough Council to undertake an intrusive ground investigation and prepare a Main Investigation Report on land adjacent to 35 Balcorne Street, Hackney, London E9 7JW. The scope of the investigation was outlined in the Soils Limited quotation reference Q23106 dated, 25th June 2020.

No Preliminary Investigation Report has been undertaken on the site by Soils Limited, nor has been one made available by the client. This report includes an overview of the contamination onsite. However, this report does not make comment or assessment of the development of a Conceptual Site Model. This document comprises the Main Investigation Report and incorporates the results, discussion, and conclusions to this intrusive works.

Standards

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

- BS 5930:2015 and BS EN ISO 22476-2 2005+A1:2011
- BS EN 1997-1:2004+A1:2013 Eurocode 7.
- BS EN ISO 14688-1:2002+A1:2018
- BS EN ISO 14688-2:2004+A1:2018
- BRE DG240:1993
- NHBC Standards Chapter 4.2:2020
- BRE Special Digest 2005

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

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

The chemical analyses was 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.

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

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Section I Introduction

I.1 Objective of Investigation

Soils Limited was commissioned by Hackney London Borough Council 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.

No Preliminary Investigation Report has been undertaken on the site by Soils Limited, nor has been one made available by the client.

This report includes an overview of the contamination observed onsite without the benefit of historic maps, local authority enquires or the like. As such no Conceptual Site Model relating to the site, the impact of the site on its environs or the environs on the site, has or can be produced.

However, this report does not make comment or assessment of the development of a Conceptual Site Model. This document comprises the Main Investigation Report and incorporates the results, discussion, and conclusions to this intrusive works.

I.2 Location

The site was located adjacent to 35 Balcorne Street, Hackney, London E9 7JW and had an approximate O.S Land Ranger Grid Reference of TQ 35398 84161

The site location plan is given in Figure 1.

I.3 Site Description

The site is situated on the southern end of Balcorne Street. No buildings or structures were noted on the site. At the time of the site visit (July 2020) the site was covered in a geotextile membrane. The ground was noticeably raised above natural ground level across the site area, by up to 0.45m. Beneath the geotextile lay building rubble and materials, wood and noticeable Made Ground. Weeds and brambles were noted along all boundaries.

Mature trees were noted in the northeast corner and on the western boundary. Images from google earth, dated June 2018, show the site to be densely covered in mature bushes/shrubs. The site had a very slight downward slope to the entrance point in the west.

An aerial photograph of the site and its close surroundings has been included in Figure 2.

1.4 Proposed Development

At the time of reporting no proposed development drawings had been submitted to Soils Limited. Through correspondence with the client, it was believed that the proposal was to comprise a residential development, and as such is assumed to incorporate private gardens in line with the neighbouring properties.

Any change or deviation from the scheme outlined above could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

1.5 Anticipated Geology

The 1:50,000 BGS map showed the site to be located upon bedrock of the London Clay Formation with overlying superficial deposits of Hackney Gravel Member.

1.5.1 Hackney Gravel Member

The rivers of the south-east of England, including the River Thames and its tributaries, have been subject to at least three changes of level since Pleistocene times. One result has been the formation of a complex series of River Terrace Deposits.

The most recent editions of the Geological sheet of the area has further subdivided the River Terrace Deposits, now relating them to depositional elevation. The Hackney Gravels are shown on the most recent geological sheet to be part of the Post-diversionary Thames River Deposits and are indicated to comprise gravel, sandy and clayey in parts and are found on higher ground than the existing flood plains.

1.5.2 London Clay Formation

The London Clay Formation comprises stiff grey fissured clay, weathering to brown near surface. Concretions of argillaceous limestone in nodular form (Claystones) occur throughout the formation. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.

The upper boundary member of the London Clay Formation is known as the Claygate Member and marks the transition between the deep water, predominantly clay environment and succeeding shallow-water, sand environment of the Bagshot Formation.

The lower boundary is generally marked by a thin bed of well-rounded flint gravel and/or a glauconitic horizon. The formation overlies the Harwich Formation or where the Harwich Formation is absent the Lambeth Group.

In the north London area the upper part of the London Clay Formation has been disturbed by periglacial action and may contain pockets of sand and gravel.

1.6 Bomb damage and the potential for Unexploded Ordnance

A review has been undertaken of historic maps along with an online search which has indicated that the site is in an area that is likely to have been subject to bombing.

The London County Council Bomb Damage Maps along with online resource bombsight.org, indicates that areas to the north, east and south were heavily bombed including along Well Street, Holcroft Road and Moulins Street. It is noted that terraced housing was present across the full length of Balcorne Street and that a dwelling was once situated onsite. However there is no indication that the dwelling on site was demolished due to bomb a strike or residual damage.

1.7 Limitations and Disclaimers

This Main Investigation Report relates to the site located at Plot Adjacent to 35 Balcorne Street, Hackney, London E9 7JW and was prepared for the sole benefit of Hackney London Borough Council (The “Client”). The report was prepared solely for the brief described in Section 1.1 of this report.

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

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

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

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

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

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

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given

remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

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

It should 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.

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

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

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

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

Section 2 Site Works

2.1 Proposed Project Works

The proposed intrusive investigation was designed to provide information on the ground conditions and to aid the design of foundations for the proposed residential development. The intended investigation, as outlined within the Soils Limited quotation (Q23106, dated 25th June 2020), was to comprise the following items:

- 2No windowless sampler boreholes;
- 2No dynamic probes DPSH;
- Geotechnical laboratory testing;
- Chemical laboratory testing.

2.1.1 Actual Project Works

The actual project works were undertaken on 24th July 2020 and comprised:

- 2No windowless sampler boreholes (WS01 and WS02);
- 2No dynamic probes DPSH (DP01 and DP02);
- Geotechnical laboratory testing;
- Chemical laboratory testing;
- Topographical survey.

Two windowless sampler boreholes were backfilled with gravel and bentonite following the installation of monitoring wells.

All trial 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.

A topographical survey of the site and its immediate environs, including neighbouring building heights, was requested by the client as an addition to the original quotation.

The topographical survey drawing is included within Appendix D.

2.2 Ground Conditions

On 24th July 2020 two windowless sampler boreholes (WS01 to WS02) were drilled, using an Premier 110 windowless sampler and dynamic probe drilling rig. The windowless sampler boreholes terminated at depths of 2.60 and 2.80m bgl, respectively.

Two super heavy dynamic probes, (DP01 to DP02) were driven prior and adjacent to their corresponding windowless sampler borehole to depths ranging between 3.00 and 3.70m bgl.

All trial holes refused due to high blow counts encountered in the granular Hackney Gravel Member.

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

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

Table 2.1 Final Depth of Trial Holes

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
WS01	2.60	DP01	3.00
WS02	2.80	DP02	3.70

The approximate trial hole locations are shown on Figure 3.

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

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

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

Made Ground (MG)
Hackney Gravel Member (HAGR)
London Clay Formation (LC) – Not Encountered

The ground conditions encountered in the trial holes are summarised in Table 2.2. The ground was noticeably raised above natural ground level across the site area, up to 0.45m above surrounding areas. All depths are taken from existing site level.

Table 2.2 Ground Conditions

Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
MG	Anthropocene	0.0	2.00 – 2.40	2.20	Dark brown slightly silty very gravelly SAND, with limestone, concrete, and brick. Occasional fine to coarse plasterboard and burnt wood.
HAGR	Wolstonian	2.00 – 2.40	2.60 – 2.80 ¹ (3.00 – 3.70) ³	Not Proven ²	Yellowish brown, slightly clayey silty gravelly SAND.

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

2.3 Ground Conditions Encountered in Trial Holes

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

2.3.1 Made Ground

Soils described as Made Ground were encountered in both trial holes from ground level to depths of 2.00 and 2.40m bgl. It should be noted that the site was noted to raised up above the natural level across the site, up to 0.45m in places.

The Made Ground typically comprised dark brown slightly silty very gravelly SAND. Gravel was angular fine to coarse flint. Abundance of angular to rounded fine to coarse limestone scalping's, concrete and brick. Occasional fine to coarse plasterboard and burnt wood. The base of the Made Ground (>1.60m bgl) was noted to become increasing cohesive with less anthropogenic material evident.

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

Table 2.3 Final Depth of Made Ground

Trial Hole	Depth (m bgl)
WS01	2.00
WS02	2.40

2.3.2 Hackney Gravel Member

Soils described as Hackney Gravel Member were encountered underlying the Made Ground and persisted to the full investigatory depth of 2.80m bgl in the windowless sampler boreholes, and inferred to the full investigatory depth of 3.70m bgl in the corresponding dynamic probes.

The Hackney Gravel Member typically comprised yellowish brown, slightly clayey silty gravelly SAND. Gravel was angular to sub-rounded, fine to coarse flint. Sand was fine to coarse.

The depth of Hackney Gravel Member has been included in Table 2.4.

Table 2.4 Final Depth of Hackney Gravel Member

Trial Hole	Depth (m bgl)	Trial Hole	Depth (m bgl)
WS01	2.60 ¹	DP01	3.00 ¹
WS02	2.80 ¹	DP02	3.70 ¹

Notes: ¹base of trial hole

2.4 Roots

Roots were encountered in both trial holes from just below surface, persisting to depths of 1.80m and 2.30m bgl. The depths of root penetration have been included in Table 2.5.

Table 2.5 Depth of Root Penetration

Trial Hole	Depth (m bgl)
WS01	1.80
WS02	2.30

During a site walkover mature trees were noted in the northeast corner and on the western boundary. Images from google earth, dated June 2018, show the site to be densely covered in mature bushes/shrubs. Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that may have been removed both within the site and its close environs. No stumps were observed whilst onsite, however these could have been located under the geotextile material or beneath the raised level.

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

2.5 Groundwater

No groundwater strikes or seepages were recorded during the construction of the windowless sampler boreholes onsite.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in July (2020), when groundwater levels should be falling from their annual maximum (highest) elevation, which typically occurs around March.

Groundwater equilibrium conditions may only be conclusively established, if a series of observations are made via groundwater monitoring wells, which was beyond the client's brief.

Section 3 Discussion of Geotechnical In-Situ and Laboratory Testing

3.1 Dynamic Probe Tests

Dynamic probing (DPSH) was undertaken at two locations (DP01 to DP02) adjacent and prior to the drilling of WS01 and WS02 to depths ranging between 3.00 and 3.70m bgl. The results were converted to equivalent SPT “N60” values based on dynamic energy using commercial computer software (Geostru). The results were then interpreted based on the classifications outlined in Appendix B.1.

The SPT “N60” values presented have been corrected in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the ‘N’ values should therefore not be necessary. The energy ratio of the drilling rig was 78.56%. The energy ratio for each location is presented on the individual logs within Appendix A.1.

The Hackney Gravel Member recorded equivalent SPT “N60” values between 20 and greater than 50, classifying the granular soils as medium dense to very dense relative density. Both dynamic probe profiles showed increasing strength with depth, with both probes terminating shallower than the proposed depth due to high blow counts in the very dense soils.

The London Clay Formation was not encountered or inferred in any of the trial holes undertaken.

A full interpretation of the DPSH tests are outlined in Appendix B.1, Table B.2.1.

3.2 Particle Size Distribution Tests

Particle Size Distribution (PSD) tests were performed on three samples from the Hackney Gravel Member.

The PSD tests classified the granular soils of the Hackney Gravel Member as having no volume change potential in accordance BRE Digest 240 and NHBC Standards Chapter 4.2.

A full interpretation of the PSD tests are outlined in Table B.2.2, and the laboratory report in Appendix B.3.

3.3 Sulphate and pH Tests

Two samples were taken from the Made Ground and one from the Hackney Gravel Member for water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment Special Digest 1, 2005, 'Concrete in Aggressive Ground'.

The tests recorded water soluble sulphate between 26mg/l and 145mg/l with pH values of 7.5 to 8.0.

The significance of the sulphate and pH Test results are discussed in Section 4.4 and the laboratory report in Appendix B.3.

Section 4 Foundation Design

4.1 General

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

4.1.1 Made Ground

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

The BSI Code of Practice for Foundations, BS 8004:2015, Clause 4.1.2.2 states, *'Spread foundations should not be placed on non-engineered fill unless such use can be justified on the basis of a thorough ground investigation and detailed design.'*

Soils described as Made Ground were encountered in both trial holes from ground level to depths of 2.00 and 2.40m bgl. It should be noted that the site was noted to be raised up above the surrounding ground level across the site, up to 0.45m in places. It is unknown if an infilled basement is present onsite from the previous development.

The Made Ground typically comprised dark brown slightly silty very gravelly SAND. Gravel was angular fine to coarse flint. Abundance of angular to rounded fine to coarse limestone scalping's, concrete, and brick. Occasional fine to coarse plasterboard and burnt wood. The base of the Made Ground (>1.60m bgl) was noted to become increasingly cohesive with less anthropogenic material evident. The depths of Made Ground have been included in Table 2.3.

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

4.1.2 Hackney Gravel Member

Soils described as Hackney Gravel Member were encountered underlying the Made Ground and persisted to the full investigatory depth of 2.80m bgl in the windowless sampler boreholes and inferred to the full investigatory depth of 3.70m bgl in the corresponding dynamic probes.

The Hackney Gravel Member typically comprised yellowish brown, slightly clayey silty gravelly SAND. Gravel was angular to sub-rounded, fine to coarse flint. Sand was fine to coarse.

The results from DPSH testing recorded equivalent SPT “N60” values between 20 and greater than 50, classifying the granular soils as **medium dense to very dense**. Both dynamic probe profiles showed increasing strength with depth, with both probes terminating shallower than the proposed depth due to high blow counts in the very dense soils.

The results from the grading analysis classified the granular soils of the Hackney Gravel Member as having **no volume change potential** in accordance BRE Digest 240 or NHBC Standards Chapter 4.2.

Soils of the Hackney Gravel Member are normally consolidated, predominantly granular soils and as such are expected to display moderate to high bearing capacities with low to moderate settlement characteristics. The soils of the Hackney Gravel Member were considered a suitable bearing stratum for the proposed development.

4.1.3 London Clay Formation

The London Clay Formation was not encountered during this intrusive investigation. The nearest available BGS borehole (ref.TQ38SE4658), noted 410m northwest, recorded the depth to London Clay Formation to be 7.40m bgl.

4.1.4 Roots

Roots were encountered in both boreholes from just below surface, persisting to depths of 1.80m and 2.30m bgl.

During a site walkover mature trees were noted in the northeast corner and on the western boundary. Images from google earth, dated June 2018, show the site to be densely covered in mature bushes/shrubs. Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that may have been removed both within the site and its close environs.

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

4.1.5 Groundwater

No groundwater strikes or seepages were recorded during the construction of the windowless sampler boreholes onsite.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in July (2020), when groundwater levels should be falling from their annual maximum (highest) elevation, which typically occurs around March.

4.2 Foundation Scheme General

At the time of reporting no drawings had been submitted to Soils Limited. Through correspondence with the client, it was believed that the proposed development was to comprise a residential development, and as such is assumed to incorporate private gardens in line with the neighbouring properties.

Any change or deviation from the scheme outlined above could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes

4.2.1 Guidance on Shrinkable Soils

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

Cohesive soils were only encountered within the Made Ground. Grading analysis classified the granular soils of the Hackney Gravel Member as not having a volume change potential in accordance BRE Digest 240 or NHBC Standards Chapter 4.2.

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

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

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

Estimate the potential for swelling or shrinkage and try to avoid large changes in the water content, for example by not planting trees near the foundations.

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

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

4.3 Foundation Scheme

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

Roots were encountered in both trial holes at depths ranging between 1.80m and 2.30m 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, if encountered**. 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.

Based on the reasons presented below, a piled foundation solution is considered the most appropriate for the proposed development:

- The excessive depth of roots being recorded to 2.30m bgl within a narrow diameter borehole;
- The depth of Made Ground, up to 2.40m bgl recorded in WS02;
- Unknown foundation layout of previous dwelling and the potential for an infilled basement onsite;
- Excavations for strip footings to a depth of 2.40m bgl has the potential to undermine the foundations of the neighbouring property.

Strip footings may well still prove to be feasible provided that earthworks are undertaken with precautions to avoid the undermining of neighbouring foundations and that further investigation is undertaken to establish the previous foundation layout and the determine if a basement was present onsite. A Strip foundation scheme has been discussed below in Section 4.2.1.

4.3.1 Strip Foundations into the Hackney Gravel Member

Based on a 5.00 by 0.75m strip foundation, using commercial software Table 4.1 shows the calculated bearing values and anticipated settlement characteristics.

The Made Ground encountered across the site to depths of 2.00m and 2.40m bgl. It should be remembered that the Made Ground was noted as being raised above the natural ground level up to 0.45m in places. Strip foundations **must** be taken through the Made Ground and into the natural soils of the Hackney Gravel Member.

Table 4.1 Allowable Bearing Capacities within the Hackney Gravel Member

Depth (m bgl)	Size (m)	Bearing Capacity (kPa)	Anticipated Settlement (mm)
2.40	5.00 x 0.75	125	<10

On removing the mounded made ground, noted up to 0.45m in places, foundations are expected to be in the region of 2.00m bgl from the actual ground level.

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. 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). The bearing values given in Table 4.1, were limited by the safe bearing value, with a factor of safety of at least 3 applied.

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

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

4.3.2 Ground Floor Slab

NHBC Standards 2019 states ground floors should be constructed as suspended floors where:

- *“the foundation depth dictated by the NHBC Standards 2019, 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.”*

Suspended floor slabs should be adopted due to the depth of Made Ground encountered across the site.

4.4 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts fell into Class **DS-1** of the BRE Special Digest 1 2005, *‘Concrete in Aggressive Ground’*. Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classifications of **AC-1**. The pH of the soils tested ranged between 8.5 and 8.8. The classification given was determined using the mobile groundwater case, in the view of the granular soils encountered. The laboratory results are presented in Appendix B.3.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1 2005, *‘Concrete in Aggressive Ground’* taking into account any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

4.5 Excavations

Excavations in the Made Ground and Hackney Gravel Member are likely to be marginally stable in the short term at best. Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose before excavations are entered by personnel.

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

Section 5 Determination of Chemical Analysis

5.1 Site Characterisation and Sample Analysis

No Preliminary Investigation Report (Phase I Desk Study) was undertaken on the site that would allow a Conceptual Site Model to be developed and potential contamination risks to be identified and assessed.

Two samples of Made Ground were analysed for a wide range of common brownfield contaminants to determine if the soils on site had been impacted.

The nature of the analyses is detailed below:

- 2 No. Metal suites:
Arsenic, Boron, Cadmium, Chromium (total & hexavalent), Copper, Lead, Mercury, Nickel, Selenium, Zinc
- 2 No. Polycyclic aromatic hydrocarbons (PAH) – USEPA 16 suite
- 2 No. pH values
- 2 No. Organic matter contents
- 2 No. Asbestos screens
- 2 No. Total Phenols
- 2 No. Total TPH

The soil testing was carried out in accordance with the MCERTS performance standard, with results shown in Appendix C.1, Test Report 20-08614.

Section 6 Qualitative Risk Assessment

6.1 Assessment Criteria

The assessment criteria used to determine risks to human health are derived and explained within Appendix C.2.

6.2 Representative Contamination Criteria - Soil

At the time of reporting no drawings had been submitted to Soils Limited. Through correspondence with the client, it was believed that the proposed development was to comprise a residential development, and as such is assumed to incorporate private gardens in line with the neighbouring properties.

Any change or deviation from the scheme outlined above could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

Based on the proposed development, the results of the chemical analysis have been compared against generic guidance values 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, generic screening values 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 4.9% and 5.3%. For each soil sample tested, the resultant Soil Organic Matter allowed for the correct comparison to be made with the appropriate guideline value for each organic determinants analysed.

6.3 Risk Assessment – Made Ground

Table 6.1 outlines the samples that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix C.1. Table 6.2 presents the results of the asbestos screening.

Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance (Made Ground)

Location	Depth (m bgl)	Contaminant	Concentration	Guidance Level
WS01	0.30	Lead	269	200
		Benzo(b)fluoranthene	2.79	2.60
		EPH (C10 – C40)	256	None ¹
WS02	0.80	Lead	1070	200
		Benzo(a)anthracene	36.70	13.00
		Chrysene	27.9	15.00
		Benzo(b)fluoranthene	39.4	2.6
		Benzo(a)pyrene	31.7	5.0
		Di-benzo(a,h)anthracene	2.79	0.24
		EPH (C10 – C40)	841	None ¹

Note: Units mg/kg. ¹no screening levels for total TPH available, worst case scenario adopted

Total EPH (TPH C10 – C40) were also noted to be elevated. In the absence of TPH banded testing, the worst case scenario must be adopted, which is that all recorded TPH levels are from the lower bands – meaning that the screening levels will be exceeded.

Table 6.2 Summary of Asbestos Screening (Made Ground)

Location	Depth (m bgl)	Type	Matrix
WS01	0.30	Chrysotile	Present as bundles

Note: the presence of asbestos is classified as an exceedance.

In summary, both of the samples tested showed concentrations of Lead and PAH were in excess of screening values for a residential with home grown produce land-use scenario.

Marginally elevated PAH concentrations were recorded in WS01:0.30, however these did not exceed the adopted screening values.

None of the other substances tested recorded concentrations above the residential with home grown produce end-use screening values.

6.3.1 Asbestos

Asbestos Containing Material (ACM) was detected within the sample from WS01 at 0.30m bgl. The ACM was determined to comprise chrysotile asbestos which was present in bundles.

As asbestos containing material was identified in one of the samples tested it is possible that asbestos is present in other areas of the site. If encountered, care must be taken to ensure any such material is separated and disposed of in an appropriate manner to a licensed waste facility.

6.4 Environmental Conclusions

Soil chemical analysis was performed on two samples of Made Ground, analysing for a wide range of brownfield contaminants.

Both samples tested recorded elevated lead, PAH and TPH concentrations, with concentrations exceeding the residential with home grown produce screening values.

Given the depth of the impacted soils within WS01 at 0.30m bgl it is likely that this material will be removed from site during the site strip and as such a risk to construction workers is present.

Contamination has been recorded to be present onsite. In the absence of a development plan or a Preliminary Investigation Report, no further assessment can be undertaken. Once a development plan has been made available further assessment can be made. Further sampling and analysis is likely to be required in areas of soft landscaping in order to quantify the risks to the end user.

6.5 Asbestos

Asbestos-containing soils (ACSs) were identified at the site. The asbestos matrix identified was described as 'bundles.' The asbestos type was chrysotile. In collaboration with a licensed asbestos removal contractor consultation must be made with the local authority to determine a remediation strategy.

Asbestos-containing soils (ACSs) do not necessarily require removal or treatment, but would require a suitable capping layer to remain in-situ. All future works should have suitable health and safety procedures in place to protect workers from airborne asbestos fibres. If ACSs remain in-situ measures should be put in place to ensure the risk of exposures is not increased, such as exposing buried asbestos at the surface. Where ACSs have to be removed from site quantification of the asbestos would be required. Waste containing asbestos will be hazardous waste if it contains more than 0.1% by weight of asbestos, (CIRIA C733, Asbestos in soil and made ground: a guide to understanding and managing risks). Asbestos quantification would be recommended on the soil samples where asbestos was identified, so an assessment can be carried out.

6.6 Duty of Care

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

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

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

6.7 Excavated Material

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

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

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

Other options are available that may lead to significant savings against disposal to landfill and expert advice should always be sought from a competent person to advise on their relative costs or benefits and advise on any additional analysis, sampling or investigation that may be required to reduce remaining uncertainties and comply with current guidance. Further consideration of results using HazWasteOnline™ can be undertaken on request to give an indication of potentially hazardous properties in the materials analysed.

6.8 Re-use of Excavated Material On-site

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

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

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

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

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

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

6.9 Imported Material

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

6.10 Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

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

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

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

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Appendix A Field Work

Appendix A.1 Engineers Logs

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

Appendix B.2 Interpretation

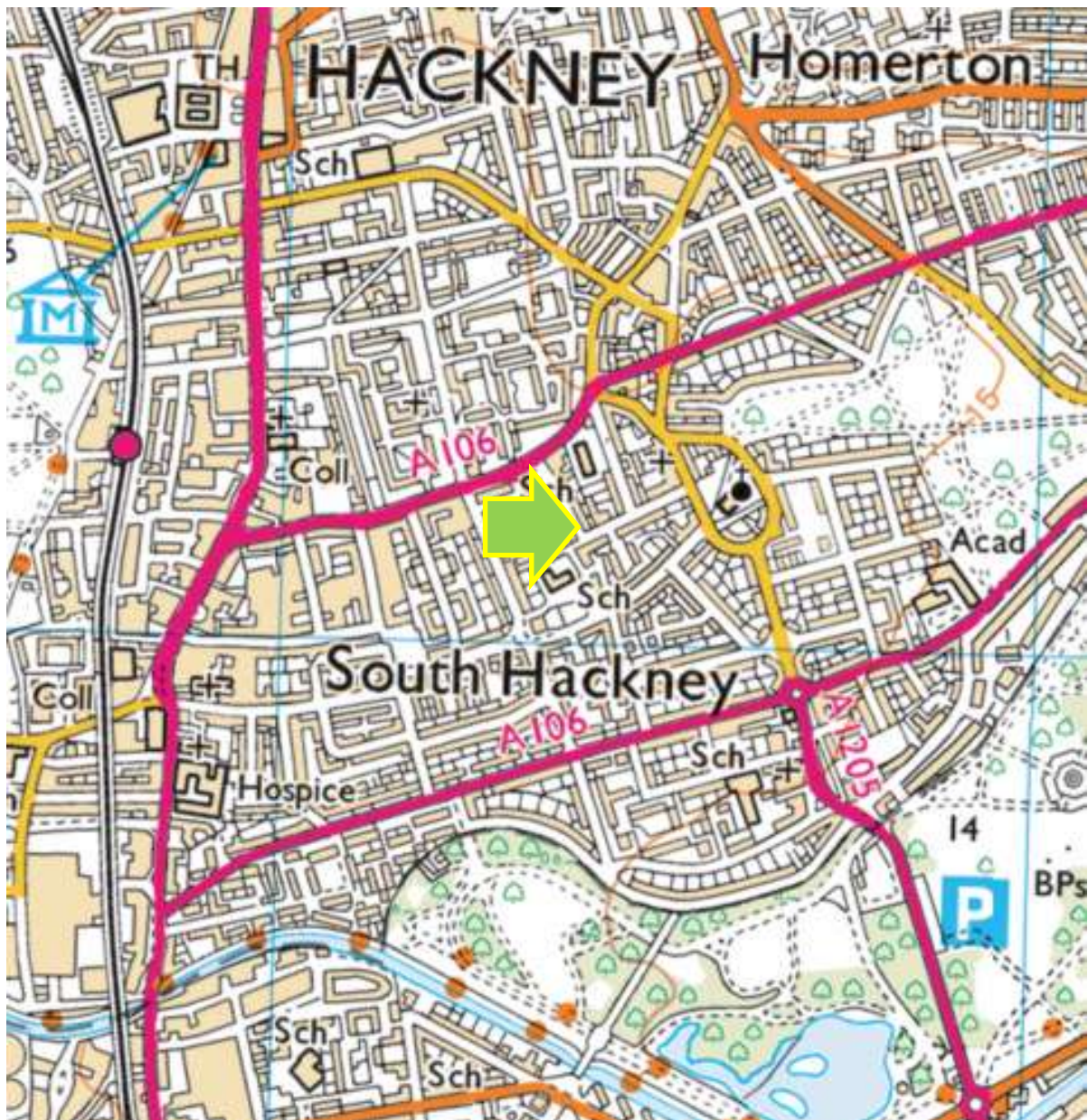
Appendix B.3 Geotechnical In-Situ and Laboratory Results

Appendix C Chemical Laboratory Testing

Appendix C.1 Chemical Laboratory Results

Appendix C.2 General Assessment Criteria

Appendix D Site Survey

Figure 1 – Site Location Map

Job Number
18536

Project
Plot Adjacent to 35 Balcorne Street, Hackney,
London E9 7JW

Client
Hackney London Borough Council

Date
September 2020

Figure 2 – Aerial Photograph

Project

Plot Adjacent to 35 Balcorne Street, Hackney, London E9 7JW

Client

Hackney London Borough Council

Date

September 2020

Job Number

18536





Figure 3 – Trial Hole Plan

Project

Plot Adjacent to 35 Balcorne Street, Hackney, London E9 7JW

Client

Hackney London Borough Council

Date


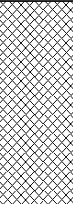





September 2020

Job Number

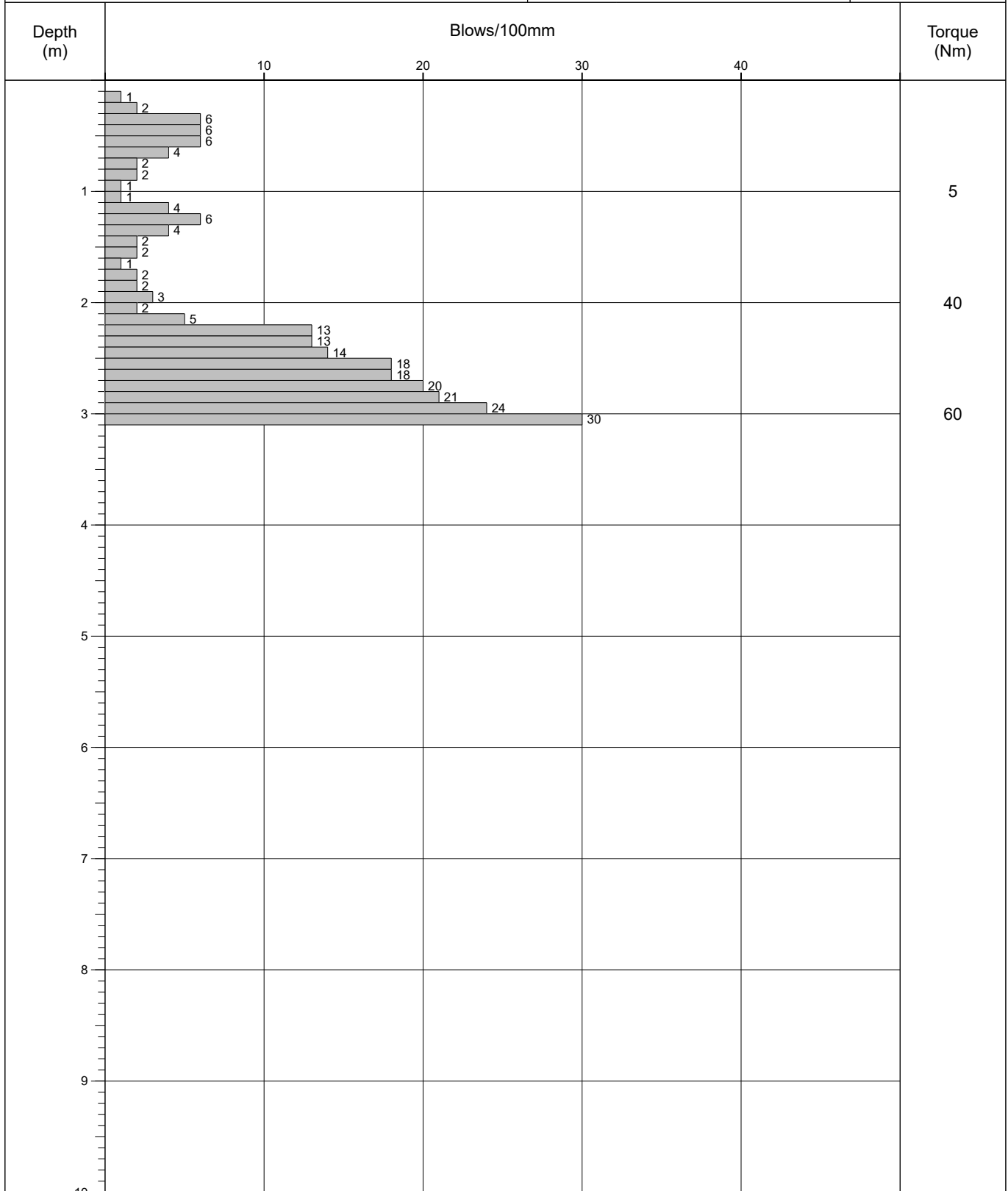
18536

Appendix A Field Work

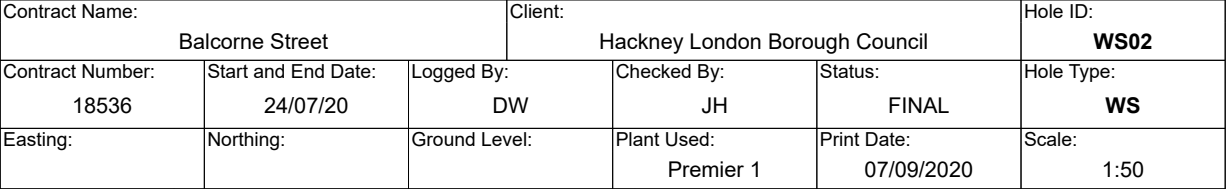
Appendix A.1 Engineers Logs

	Contract Name: Balcorne Street				Client: Hackney London Borough Council				Hole ID: WS01					
	Contract Number: 18536		Start and End Date: 24/07/20		Logged By: DW		Checked By: JH		Status: FINAL		Hole Type: WS			
	Easting:		Northing:		Ground Level:		Plant Used: Premier 1		Print Date: 07/09/2020		Scale: 1:50			
Weather:			Termination: Refusal					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	
0.30	D					Dark brown, slightly silty, very gravelly SAND. Gravel is angular to rounded, fine to coarse concrete, limestone, clinker, brick and plaster. Occasional clay pockets. Occasional rootlets. Wooden fragments in top 20cm. Fragment of plastic woven liner at 0.3m bgl. MADE GROUND.						1		
0.60	ES			(1.40)										
0.90	ES													
1.50	D			1.40		Firm to stiff, greyish brown, slightly sandy, silty CLAY. Sand is fine to medium. Occasional angular to rounded, fine to medium flint, clinker and brick gravel. Occasional rootlets. Re-worked material. MADE GROUND.						2		
1.70	ES			(0.40)										
1.90	D			2.00		Firm, slightly black speckled, brown, slightly sandy, silty CLAY. Sand is fine to medium. Frequent angular to sub-angular, fine to coarse flint gravel from 1.8m bgl. Rare angular, fine brick and clinker gravel. Rare rootlets. MADE GROUND <i>Medium to coarse sand lenses from 1.85 - 2.0m bgl.</i>						3		
2.10	D			(0.40)										
2.50	D			2.40		Orangish brown, slightly clayey, slightly gravelly fine to medium SAND. Gravel is angular to sub-angular, fine to coarse flint. HACKNEY GRAVEL MEMBER						4		
				2.60										
						Yellowish brown, slightly clayey SAND. Occasional angular to sub-rounded, fine to medium flint gravel. HACKNEY GRAVEL MEMBER						5		
						End of Borehole at 2.60m						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 1.80m bgl. Refused at 2.60m bgl due to high blow counts.					
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.														


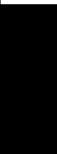











Project Name:	Balcorne Street	Project No.	18536	Co-ords:		Hole Type	DP
Location:	Hackney, London E9 7JW	Level:	m AOD	Scale	1:50	Logged By	
Client:	Hackney London Borough Council	Dates:	24/07/2020				



Remarks Refused at 3.00m bgl due to high blow counts.	Fall Height	760mm	Cone Base Diameter	50.5mm
	Hammer Weight	63.5kg	Final Depth	3m
	Probe Type	DPSH	Energy Ratio (Er)	78.58%



Weather:	Termination: Refusal		Sheet 1 of 1
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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			0.20		Firm dark brown, slightly sandy, very gravelly SILT/CLAY. Gravel is angular to sub-angular, fine to coarse flint and clinker. Frequent wood fragments. Frequent fragments of plastic. Rare rootlets. Underlain by plastic woven liner. MADE GROUND.	1		
0.30	D			0.40		Dark brown, slightly sandy, silty GRAVEL. Gravel is angular, fine to coarse limestone and flint, with rare brick. Underlain by angular brick cobbles. MADE GROUND.			
0.50	ES			(0.30)		Multicoloured mottled, brown, slightly silty SAND AND GRAVEL. Gravel is angular to sub-rounded, fine to coarse flint, with rare brick, concrete and cement. Occasional rootlets. MADE GROUND.			
0.80	D			0.70		Black and dark brown mottled, slightly sandy, gravelly SILT. Gravel is angular, fine to coarse brick, concrete, flint clinker and porcelain. Frequent fine ash. Rare rootlets. MADE GROUND.			
1.10	ES			0.95		Stiff, brown to greyish brown, slightly sandy, slightly gravelly SILT. Gravel is angular, fine to coarse brick, flint, clinker and plaster. Occasional rootlets. MADE GROUND.			
	D			(0.55)		Greyish brown, clayey gravelly SAND/ slightly gravelly, sandy SILT. Gravel is angular, fine to coarse brick, flint, clinker and plaster. Frequent fine ash. Rare rootlets. MADE GROUND.			
1.60	ES			1.50		<i>Recovered as stiff when higher proportion of fines. Becomes clayey towards base of stratum.</i>			
	D			(0.70)					
2.10	ES			2.20		Firm greyish brown and brown mottled, slightly sandy, silty CLAY. Sand is fine to medium.			
2.30	D			2.40		Occasional angular to rounded, fine to medium flint, clinker and brick gravel. Rare rootlets. Re-worked material. MADE GROUND.			
2.50	ES	(0.40)		Yellowish brown, slightly clayey/silty SAND AND GRAVEL. Gravel is angular to sub-rounded, fine to coarse flint. HACKNEY GRAVEL MEMBER					
2.70	D	2.80		End of Borehole at 2.80m			3		
							4		
							5		
							6		
							7		
							8		
							9		
							10		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks: Rootlets observed to 2.30m bgl. Refused at 2.80m bgl due to high blow counts.					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)						
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.														

Appendix B Geotechnical In-Situ and Laboratory Testing

Appendix B.1 Classification

The relative density of granular soils was classified based of the relationship given in Table B.1.1.

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

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

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

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

Appendix B.2 Interpretation

Table B.2.1 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Granular Density
DPI	HAGR 2.00 – 3.00 Clayey Sandy GRAVEL ¹	>50	Very dense
DP2	HAGR 2.40 – 2.80 Clayey Sandy GRAVEL	20 - 26	Medium dense
	HAGR 2.80 – 3.70 Clayey Sandy GRAVEL ¹	>50	Very dense

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

Table B.2.2 Interpretation of PSD Tests

Location	Depth (m bgl)	Soil Description	Volume Change Potential		Passing 63µm Sieve (%)
			BRE	NHBC	
WS01	2.10	Brown slightly clayey/silty fine to coarse gravelly fine to coarse SAND	No	No	8
WS01	2.50	Brown slightly clayey/silty fine to coarse gravelly fine to coarse SAND	No	No	6
WS02	2.50	Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL	No	No	6

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

Appendix B.3 Geotechnical In-Situ and Laboratory Results



Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 49603

Client Ref: **18536**

Report Date: **18-08-2020**

Client PO: **18536**

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

Contract Title: **Balcorne Street**
For the attention of: **Sam Bevins**

Date Received: **04-08-2020**

Date Completed: **18-08-2020**

Test Description	Qty
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	3
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:

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

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

GEO Site & Testing Services Ltd

Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk



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

Contract Number **49603**

Borehole/Pit No. **WS01**

Site Name **Balcorne Street**

Sample No.

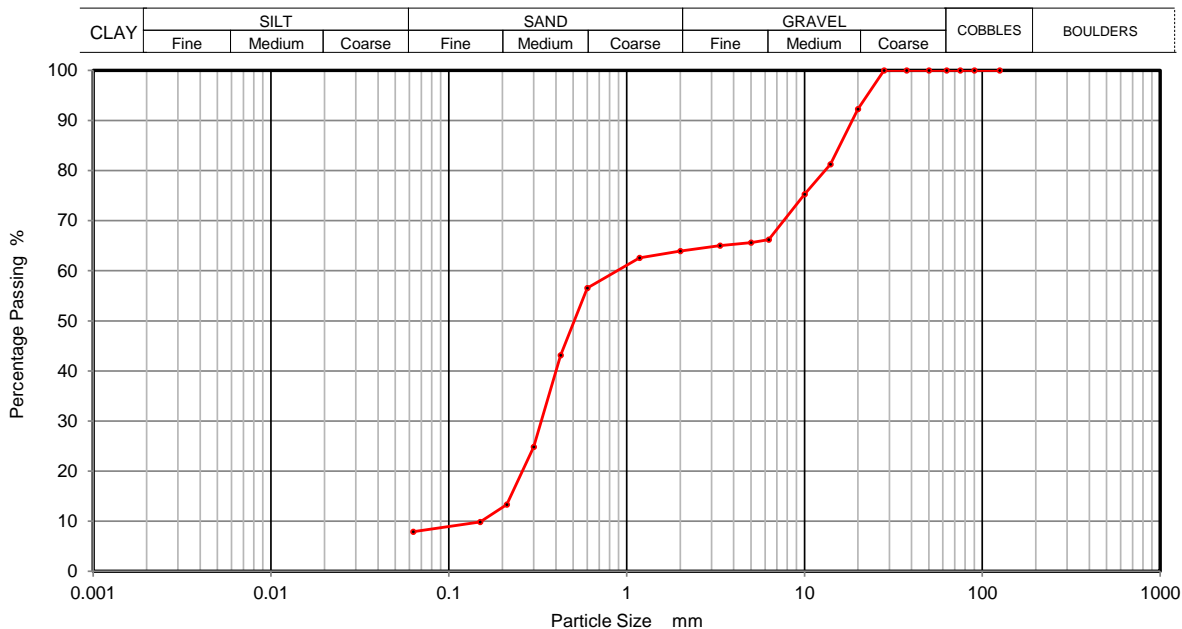
Soil Description **Brown slightly clayey/silty fine to coarse gravelly fine to coarse SAND**

Depth Top **2.10**

Depth Base

Date Tested **15/08/2020**

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	92		
14	81		
10	75		
6.3	66		
5	66		
3.35	65		
2	64		
1.18	63		
0.6	57		
0.425	43		
0.3	25		
0.212	13		
0.15	10		
0.063	8		

Sample Proportions	% dry mass
Cobbles	0
Gravel	36
Sand	56
Silt and Clay	8

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	17/08/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	18/08/2020	Paul Evans	<i>P. Evans</i>





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

Contract Number **49603**

Borehole/Pit No. **WS01**

Site Name **Balcorne Street**

Sample No.

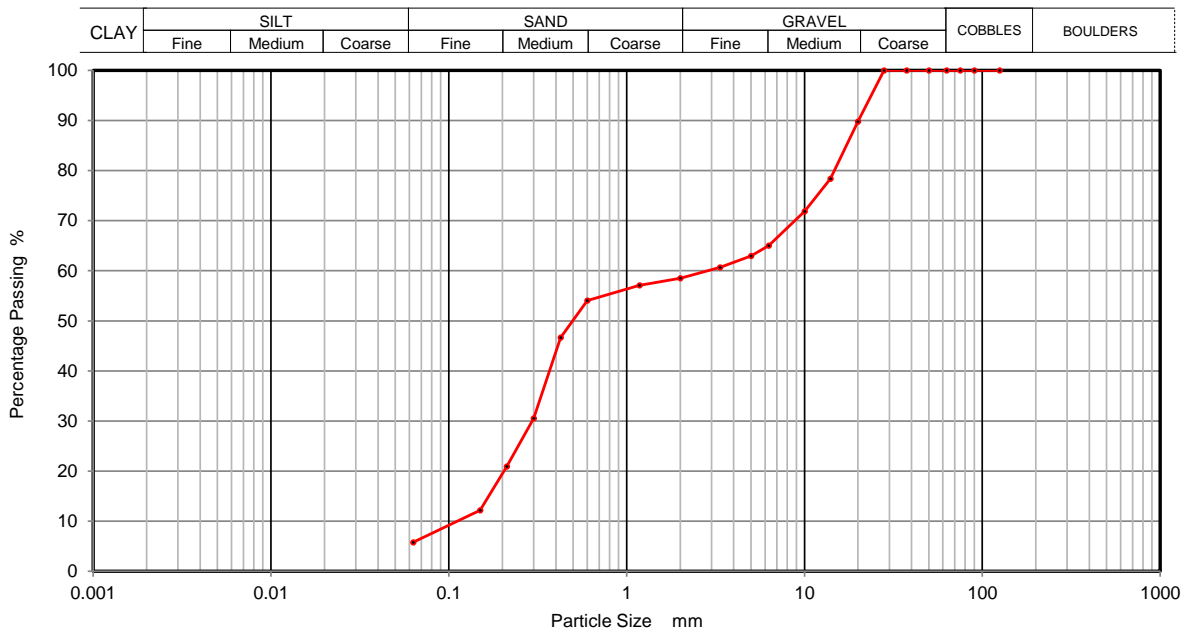
Soil Description **Brown slightly clayey/silty fine to coarse gravelly fine to coarse SAND**

Depth Top **2.50**

Depth Base

Date Tested **15/08/2020**

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	90		
14	78		
10	72		
6.3	65		
5	63		
3.35	61		
2	59		
1.18	57		
0.6	54		
0.425	47		
0.3	31		
0.212	21		
0.15	12		
0.063	6		

Sample Proportions	% dry mass
Cobbles	0
Gravel	41
Sand	53
Silt and Clay	6

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	17/08/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	18/08/2020	Paul Evans	<i>P. Evans</i>





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

Contract Number **49603**

Borehole/Pit No. **WS02**

Site Name **Balcorne Street**

Sample No.

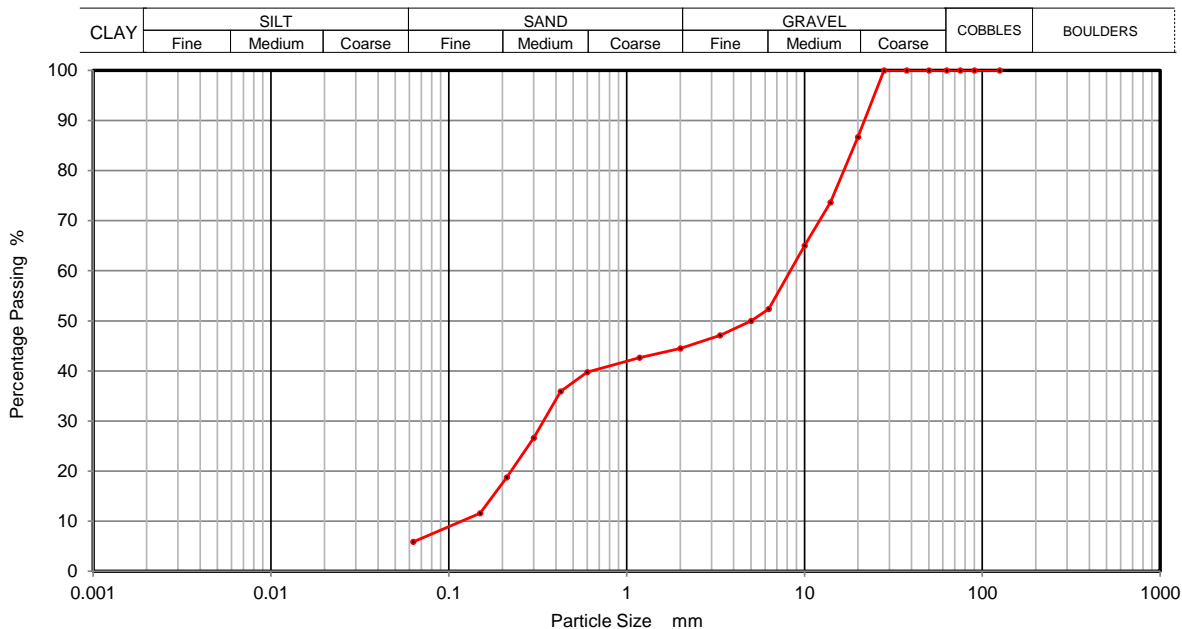
Soil Description **Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL**

Depth Top **2.50**

Depth Base

Date Tested **15/08/2020**

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	87		
14	74		
10	65		
6.3	52		
5	50		
3.35	47		
2	44		
1.18	43		
0.6	40		
0.425	36		
0.3	27		
0.212	19		
0.15	12		
0.063	6		

Sample Proportions	% dry mass
Cobbles	0
Gravel	56
Sand	38
Silt and Clay	6

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	17/08/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	18/08/2020	Paul Evans	<i>P. Evans</i>



Appendix C Chemical Laboratory Testing

Appendix C.1 Chemical Laboratory Results



Sam Bevins
Soils Ltd
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

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

DETS Report No: 20-08614

Site Reference: Balcorne

Project / Job Ref: 18536

Order No: 18536/SB

Sample Receipt Date: 03/08/2020

Sample Scheduled Date: 03/08/2020

Report Issue Number: 1

Reporting Date: 07/08/2020

Authorised by:

Dave Ashworth
Technical Manager

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

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



Soil Analysis Certificate						
DETS Report No: 20-08614	Date Sampled	24/07/20	24/07/20	24/07/20	24/07/20	
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Balcorne	TP / BH No	WS01	WS01	WS02	WS02	
Project / Job Ref: 18536	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 18536/SB	Depth (m)	0.30	1.90	0.80	2.70	
Reporting Date: 07/08/2020	DETS Sample No	490568	490569	490570	490571	

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Detected		Not Detected	
Sample Matrix ^(S)	Material Type	N/a	NONE	Chrysotile Present as bundles			
Asbestos Type ^(S)	PLM Result	N/a	ISO17025	Chrysotile			
pH	pH Units	N/a	MCERTS	7.5	7.6	8.0	7.9
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS		145	26	100
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS		0.14	0.03	0.10
Organic Matter	%	< 0.1	MCERTS	5.3		4.9	
Arsenic (As)	mg/kg	< 2	MCERTS	12		38	
W/S Boron	mg/kg	< 1	NONE	1.9		1.6	
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.5		1.8	
Chromium (III)	mg/kg	< 2	NONE	14		28	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2		< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	330		121	
Lead (Pb)	mg/kg	< 3	MCERTS	269		1070	
Mercury (Hg)	mg/kg	< 1	MCERTS	2.1		1.6	
Nickel (Ni)	mg/kg	< 3	MCERTS	11		41	
Selenium (Se)	mg/kg	< 2	MCERTS	< 3		< 3	
Zinc (Zn)	mg/kg	< 3	MCERTS	602		831	
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2		< 2	
VPH (C6 - C10)	mg/kg	< 0.05	NONE	< 0.05		1.10	
EPH (C10 - C40)	mg/kg	< 6	MCERTS	256		841	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
 Subcontracted analysis (S)



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



Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 20-08614	Date Sampled	24/07/20	24/07/20			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Balcorne	TP / BH No	WS01	WS02			
Project / Job Ref: 18536	Additional Refs	None Supplied	None Supplied			
Order No: 18536/SB	Depth (m)	0.30	0.80			
Reporting Date: 07/08/2020	DETS Sample No	490568	490570			

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	0.11	0.61			
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	0.12	0.55			
Fluorene	mg/kg	< 0.1	MCERTS	0.14	0.36			
Phenanthrene	mg/kg	< 0.1	MCERTS	2.62	6.89			
Anthracene	mg/kg	< 0.1	MCERTS	0.33	2.79			
Fluoranthene	mg/kg	< 0.1	MCERTS	4.57	60.20			
Pyrene	mg/kg	< 0.1	MCERTS	4.03	59.50			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	2.07	36.70			
Chrysene	mg/kg	< 0.1	MCERTS	2.08	27.90			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	2.79	39.40			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.74	12			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	1.93	31.70			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	1.11	18.60			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	0.22	2.79			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	1.06	16.70			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	23.9	317			



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Lenham Heath
Maidstone
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Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 20-08614	
Soils Ltd	
Site Reference: Balcorne	
Project / Job Ref: 18536	
Order No: 18536/SB	
Reporting Date: 07/08/2020	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
490568	WS01	None Supplied	0.30	6.2	Brown sandy gravel with stones and concrete
490569	WS01	None Supplied	1.90	5.5	Light brown sandy clay with stones
490570	WS02	None Supplied	0.80	8.6	Black loamy sand with stones and concrete
490571	WS02	None Supplied	2.70	7.7	Brown sandy gravel with stones

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

Insufficient Sample ^{1/s}

Unsuitable Sample ^{u/s}



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



Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 20-08614

Soils Ltd

Site Reference: Balcorne

Project / Job Ref: 18536

Order No: 18536/SB

Reporting Date: 07/08/2020

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 dphenylcarbazine followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Appendix C.2 General Assessment Criteria

HUMAN HEALTH RISK ASSESSMENT

Introduction

The statutory definition of contaminated land is defined in the Environmental Protection Act 1990, ref. 1.1, which was introduced by the Environment Act 1995, ref. 1.2;

‘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 has developed as a direct result of the introduction of these two Acts. The technical guidance supporting the new legislation has been summarised in a number of key documents collectively known as the Contaminated Land Reports (CLRs), a proposed series of twelve documents. Seven were originally published in March 1994, four more were published in April 2002, while the last remaining guidance document, CLR 11, ref 1.3 was published in 2004. In 2008 CLR reports 7 to 10 were withdrawn by DEFRA and the Environment Agency and updated version of CLR 9 and 10 were produced in the form of Science Reports SR2, ref. 1.4 and SR3, ref. 1.5.

In establishing whether a site fulfils the statutory definition of ‘contaminated land’ it is 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 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 be defined as the link between a contaminant ‘source’ and a ‘receptor’ by means of a ‘pathway’.

Assessment Methodology

The guidance proposes a four-stage assessment process for identifying potential pollutant linkages on a site. These stages are set out 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.

Stages 1 and 2 develop a '*conceptual model*' based upon information collated from desk based studies, and frequently a walkover of the site. The walkover survey should be conducted in general accordance with CLR 2, ref. 1.6. The formation of a conceptual model is an iterative process and as such, it should be updated and refined throughout each stage of the project to reflect any additional information obtained.

The extent of the desk studies and enquiries to be conducted should be in general accordance with CLR 3, ref. 1.7. The information from these enquiries is presented in a desk study report with recommendations, if necessary, for further work based upon the conceptual model. Specific DoE 'Industry Profiles' provide guidance on the nature of contaminants relating to specific industrial processes.

If potential pollutant linkages are identified within the conceptual model, a Phase 2 site investigation and report will be recommended. The investigation should be planned in general accordance with CLR 4, ref 1.8. The number of exploratory holes and samples collected for analysis should be consistent with the size of the site and the level of risk envisaged. This will enable a contamination risk assessment to be conducted, at which point the conceptual model can be updated and relevant pollutant linkages can be identified.

A two-stage investigation may be more appropriate where time constraints are less of an issue. The first stage investigation being conducted as an initial assessment for the presence of potential sources, a second being a more refined investigation to delineate wherever possible the extent of the identified contamination.

All site works should be in general accordance with the British Standards BS 10175:2011, ref. 1.9. and BS 5930:2015, ref. 1.10.

The generic contamination risk assessment screens the results of the chemical analysis against generic guidance values which are dependent on the proposed end-use of the development.

The end-use may be defined as one of the following ref. 1.15;

- Residential with homegrown produce – domestic low rise and low density housing with gardens where vegetables may be grown for home consumption
- Residential without homegrown produce – domestic low density and low density housing where no gardens are present.
- Allotments – specific areas where vegetables are grown for home consumption.
- Public open space in close proximity to residential housing – includes the predominantly grassed area adjacent to high density housing and the central green area around which houses are developed. This land-use includes the smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting.
- Public open space in use as general parkland – provided for recreational use and may be used for family visits and picnics, children's play area, sports grounds and dog walking.
- Commercial – industrial premises where there is limited exposure to soil.

Standard Land-use Scenarios

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

Residential with homegrown produce

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

• Critical receptor is a young female child (zero to six years old)
• Exposure duration is six years.
• Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
• Building type is a two-storey small terraced house.

A sub-set of the Residential land-use is **Residential without Homegrown produce**. The generic scenario assumes low density housing with communal landscaped gardens where the consumption of home grown vegetables will not occur.

Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

-
- Critical receptor is a young female child (zero to six years old)
 - Exposure duration is six years.
 - Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
 - There is no building.
-

Commercial

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

-
- Critical receptor is a working female adult (aged 16 to 65 years old).
 - Exposure duration is a working lifetime of 49 years.
 - Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
 - Building type is a three-storey office (pre 1970).
-

Public Open Space within Residential Area

The generic scenario refers to any grassed area 0.05 ha and that is close to Housing.

-
- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil
 - Predominantly used by children for playing and may be used for activities such as a football kick about
 - Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
 - older children as the critical receptor on basis that they will use site most frequently (Age class 4-9)
 - ingestion rate 75 mg.day⁻¹
-

Public Open Space Park

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

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

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC).

GAC are conservative values adopted to ensure that they are applicable to the majority of possible contaminated site. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC derived by a third party or the Environment Agency/ DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC to ensure that they are used appropriately. Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific values for relevant soil contaminants based on the site specific conditions.

In 2014, the publication of Category 4 Screening Levels (C4SL) ref 1.15, 1.16, 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 1.5 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 (LLTC; see Section 2.3 of research project report SP1010 ref 1.16. 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 4 Use Levels (S4ULs) published by LQM ref. 1.12, 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, the assessment criteria (AC) may be generated using the Contaminated Land Exposure Assessment (CLEA) Software Version 1.07, ref. 1.13. Toxicological and physico-chemical/fate and transport data used to generate the AC 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 from the relevant CLR 9 TOX report, or updated toxicological data published by the Environment Agency (2009), ref. 1.6, where available. Where no TOX report is available reference has been made to the health criteria values, derived for use in Land Quality Press (2006), ref. 1.17, as this is considered to represent a peer reviewed data source. Similarly, fate and transport data has been derived in the first instance from Environment Agency (2003), ref. 1.18 and for contaminants not considered in this

document the fate and transport data used in previous versions of the CLEA model has been used.

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. 1.14. Individual concentrations are compared to the selected guideline values to identify concentrations of contaminants that are above the selected screening criteria.

Where the risk estimation identifies significant concentrations of one or more contaminants, a further risk evaluation needs to be undertaken.

References

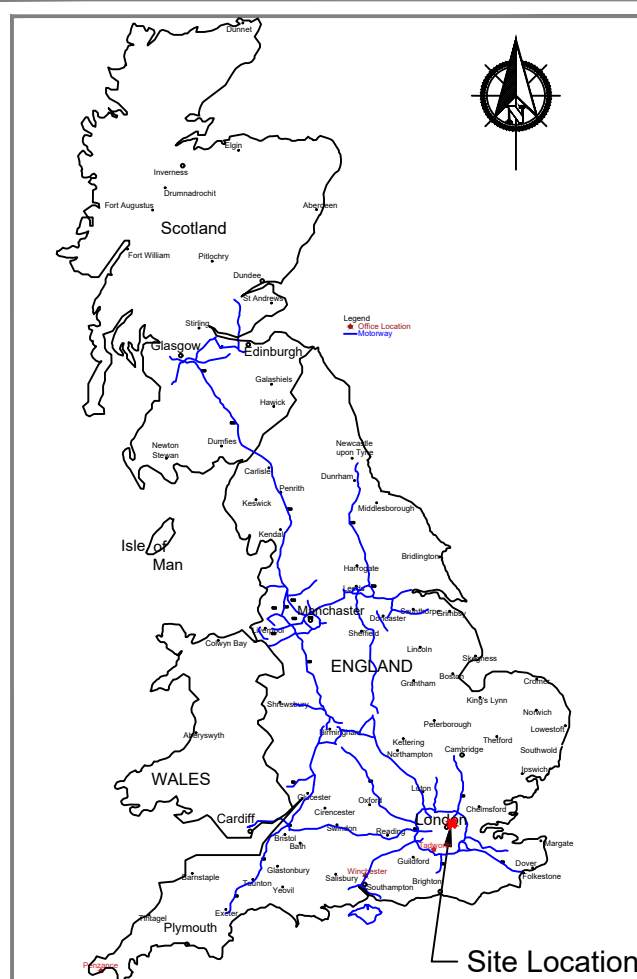
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- 1.18 CLR 2, '*Guidance on preliminary site inspection of contaminated land*', Report by Applied Environmental, DoE 1994.

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date		
			With			Without			Allotments			Commercial			Residential			Park							
			home-grown produce			home-grown produce																			
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			
Metals	Antimony		2010							550						7500							EIC/AGS/CL:AIRE	EIC/AGS/CL:AIRE	2010
	Arsenic		2014				37			40			49			640			79		168		C4SL	DEFRA	2014
			2015				37			40			40			640			79		170		S4UL	LQM/CIEH	2015
	Beryllium		2015				1.7			1.7			35			12			2.2		63		S4UL	LQM/CIEH	2015
	Boron		2015				290			11000			45			240000			21000		46000		S4UL	LQM/CIEH	2015
	Cadmium		2015				11			85			1.9			190			120		532		S4UL	LQM/CIEH	2015
			2014				26			149			4.9			410			220		880		C4SL	DEFRA	2014
	Chromium	III	2015				910			910			18000			8600			1500		33000		S4UL	LQM/CIEH	2015
		VI	2014				21			21			170			49			23		250		C4SL	DEFRA	2014
		VI	2015				6			6			1.8			33			7.7		220		S4UL	LQM/CIEH	2015
	Copper		2015				2400			7100			520			68000			12000		44000		S4UL	LQM/CIEH	2015
	Lead						200			310			80			2330			630		1300		C4SL	DEFRA	2014
	Mercury	Elemental	2012				1.0			1.0			26			26							SGV	DEFRA	2012
			2015				1.2			1.2			21			58			16		30		S4UL	LQM/CIEH	2015
		Inorganic	2012				170			170			80			36000							SGV	DEFRA	2012
			2015				40			56			19			1100			120		240		S4UL	LQM/CIEH	2015
		Methyl	2012				11			11			8			410							SGV	DEFRA	2012
			2015				11			15			6			320			40		68		S4UL	LQM/CIEH	2015
	Nickel		2012				130			130			230			1800							SGV	DEFRA	2012
			2015				130			180			53			980			230		800		S4UL	LQM/CIEH	2015
	Selenium		2012				350			350			120			13000							SGV	DEFRA	2012
			2015				250			430			88			12000			1100		1800		S4UL	LQM/CIEH	2015
	Vanadium		2015				410			1200			91			9000			2000		5000		S4UL	LQM/CIEH	2015
	Zinc		2015				3700			40000			620			730000			81000		170000		S4UL	LQM/CIEH	2015
BTEX & MTBE	Benzene		2012				0.33		0.33			0.07			95							SGV	DEFRA	2012	
			2014				0.87		3.3			0.18			98			140		230		C4SL	DEFRA	2014	
			2015	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110		S4UL	LQM/CIEH	2015
	Toluene		2012				610		610			120			4400							SGV	DEFRA	2012	
			2015	130	290	660	880	1900	3900	22	51	120	65000	110000	180000	56000	56000	56000	87000	95000	100000		S4UL	LQM/CIEH	2015
	Ethylbenzene		2012				350		350			90			2800							SGV	DEFRA	2012	
			2015	47	110	260	83	190	440	16	39	91	4700	13000	27000	24000	24000	25000	17000	22000	27000		S4UL	LQM/CIEH	2015
	Xylenes	o-xylene	2012				250		250			160			2600							SGV	DEFRA	2012	
			2015	60	140	330	88	210	480	28	67	160	6600	15000	33000	41000	42000	43000	17000	24000	33000		S4UL	LQM/CIEH	2015
		m-xylene	2012				240		240			180			3500							SGV	DEFRA	2012	
			2015	59	140	320	82	190	450	31	74	170	6200	14000	31000	41000	42000	43000	17000	24000	32000		S4UL	LQM/CIEH	2015
		p-xylene	2012				230		230			160			3200							SGV	DEFRA	2012	
			2015	56	130	310	79	180	310	29	69	160	5900	14000	30000	41000	42000	43000	17000	23000	31000		S4UL	LQM/CIEH	2015
Petroleum Hydrocarbons Fractions	Aliphatic >C5 - C6		2015	42	78	160	42	78	160	730	1700	3900	3200	5900	12000	570000	590000	600000	95000	130000	180000		S4UL	LQM/CIEH	2015
	Aliphatic >C6 - C8		2015	100	230	530	100	230	530	2300	5600	13000	7800	17000	40000	600000	610000	620000	150000	220000	320000		S4UL	LQM/CIEH	2015
	Aliphatic >C8 - C10		2015	27	65	150	27	65	150	320	770	1700	2000	4800	11000	13000	13000	13000	14000	18000	21000		S4UL	LQM/CIEH	2015
	Aliphatic >C10 - C12		2015	130	330	760	130	330	770	2200	4400	7300	9700	23000	47000	13000	13000	13000	21000	23000	24000		S4UL	LQM/CIEH	2015
	Aliphatic >C12 - C16		2015	1100	2400	4300	1100	2400	4400	11000	13000	13000	59000	82000	90000	13000	13000	13000	25000	25000	26000		S4UL	LQM/CIEH	2015
	Aliphatic >C16 - C35		2015	65000	92000	110000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000		S4UL	LQM/CIEH	2015
	Aliphatic >C35 - C44		2015	65000	92000	140000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000		S4UL	LQM/CIEH	2015
	Aromatic >C5 - C7		2015	70	140	300	370	690	1400	13	27	57	26000	46000	86000	56000	56000	56000	76000	84000	92000		S4UL	LQM/CIEH	2015
	Aromatic >C7 - C8		2015	130	290	660	860	1800	3900	22	51	120	56000	110000	180000	56000	56000	56000	87000	95000	100000		S4UL	LQM/CIEH	2015
	Aromatic >C8 - C10		2015	34	83	190	47	110	270	8.6	21	51	3500	8100	17000	5000	5000	5000	7200	8500	9300		S4UL	LQM/CIEH	2015
	Aromatic >C10 - C12		2015	74	180	380	250	590	1200	13	31	74	16000	28000	34000	5000	5000	5000	9200	9700	10000		S4UL	LQM/CIEH	2015
	Aromatic >C12 - C16		2015	140	330	660	1800	2300	2500	23	57	130	36000	37000	38000	5100	5100	5000	10000	10000	10000		S4UL	LQM/CIEH	2015
	Aromatic >C16 - C21		2015	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800		S4UL	LQM/CIEH	2015
	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

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)										Name	Authority	Date					
			Allotments						Commercial						Residential						Park								
			With home-grown produce			Without home-grown produce			1		2.5		6		1		2.5		6		1				2.5		6		1
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 >C34 - C44		2015		1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015				
	Aliphatic + Aromatic >C44 - C70				1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015				
Polycyclic Aromatic Hydrocarbons (PAH' s) (mg/kg)	Acenaphthene		2015		210	510	1100	3000	4700	6000	34	85	200	84000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015				
	Acenaphthylene		2015		170	420	920	2900	4600	6000	28	69	160	83000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015				
	Anthracene		2015		2400	5400	11000	31000	35000	37000	380	950	2200	520000	54000	540000	74000	74000	74000	150000	150000	150000	S4UL	LQM/CIEH	2015				
	Benzo(a)anthracene		2015		7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	S4UL	LQM/CIEH	2015				
	Benzo(a)pyrene		2014				5				5.3			5.7			76			10		21	C4SL	DEFRA	2014				
			2015		2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	S4UL	LQM/CIEH	2015				
	Benzo(b)fluoranthene		2015		2.6	3.3	3.7	3.9	4.0	4.0	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16	S4UL	LQM/CIEH	2015				
	Benzo(ghi)perylene		2015		320	340	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				
	Tetrachloromethane (Carbon Tetrachloride)		2015		0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	S4UL	LQM/CIEH	2015				
	Trichloroethene		2015		0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	S4UL	LQM/CIEH	2015				
	Trichloromethane		2015		0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	S4UL	LQM/CIEH	2015				
	Vinyl Chloride (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				
Explosives	2,4,6 Trinitrotoluene		2015		1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	S4UL	LQM/CIEH	2015				
	RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)		2015		120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000	51000	53000	S4UL	LQM/CIEH	2015				
	HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)		2015		5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000	23000	24000	S4UL	LQM/CIEH	2015				
Pesticides	Aldrin		2015		5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	S4UL	LQM/CIEH	2015				
	Dieldrin		2015		0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	S4UL	LQM/CIEH	2015				
	Atrazine		2015		3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	S4UL	LQM/CIEH	2015				
	Dichlorvos		2015		0.032	0.066	0.14	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	S4UL	LQM/CIEH	2015				
	Alpha - Endosulfan		2015		7.4	18	41	160	280	410	1.2	2.9	6.8	5600	7400	8400	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015				
	Beta - Endosulfan		2015		7	17	39	190	320	440	1.1	2.7	6.4	6300	7800	8700	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015				
	Alpha -Hexachlorocyclohexanes		2015		0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	S4UL	LQM/CIEH	2015				
	Beta -Hexachlorocyclohexanes		2015		0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	S4UL	LQM/CIEH	2015				
	Gamma -Hexachlorocyclohexanes		2015		0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	S4UL	LQM/CIEH	2015				
Chlorobenzenes	Chlorobenzene		2015		0.46	1	2.4	0.46																					

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Appendix D Site Survey



LEGEND

- BUILDING (Red dashed line)
- BUILDING OVERHANG (Red dashed line with a hook)
- BANK BOTTOM (Red dashed line)
- BANK TOP (Red dashed line)
- KERF LINE (Red dashed line)
- CHANGE OF SURFACE (Red dashed line)
- HEDGE (Red dashed line)
- FENCE (Red dashed line)

MANHOLE

MH CL:57.31 Cover Level

GULLY

G CL:15.65 Cover Level

SURVEY STATION

STN2 Station Number
17.26 Elevation

GATE

Gatepost

BUSH

TREE

- Spread
- Girth
- Height

WINDOW SAMPLE / BOREHOLE

WS3 Location name
528918.827 Easting
519506.060 Northing
47.92 Elevation

BANKS

- Top of the Bank
- Bank Symbol
- Bottom of the Bank
- Spot level

[illegible]

SOILS LIMITED - Topographical Survey Disclaimer

1. SURVEY INFORMATION WAS COLLECTED IN MAY 2019. NO RECENT SITE VERIFICATION HAS BEEN CARRIED OUT BY SOILS LIMITED. THEREFORE, THERE ARE NO LIABILITIES ATTACHED TO THIS DRAWING. WE STRONGLY RECOMMEND UNDERTAKING A FULL FIELD CHECK AND UPDATE OF THIS SURVEY BEFORE ANY DESIGN OR CONSTRUCTION WORKS ARE UNDERTAKEN.

2. SURVEY IS IN METRIC UNITS AND IS COORDINATED BY THE EASTING AND NORTHING CO-ORDINATES TO THE SITE GRID, ORDNANCE SURVEY NATIONAL GRID.

3. ALL SLEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN POINTS WITH THE EXCEPTED OF A FEW MINOR ACCIDENT METHODS ONLY. THESE ARE TO BE CONSIDERED ASSUMED AND SHOULD BE INVESTIGATED FURTHER IN CRITICAL AREAS.

4. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

5. THE LENGTH AND HEIGHT OF ADJACENT BUILDINGS HAVE BEEN OBTAINED USING HIGHER LEVEL REFLECTORLESS MEASUREMENT AND MAY NOT TAKE ACCOUNT OF SINGLE STOREY EXTENSIONS OR CONSERVATORIES BELOW THE LINE OF SIGHT.

soils
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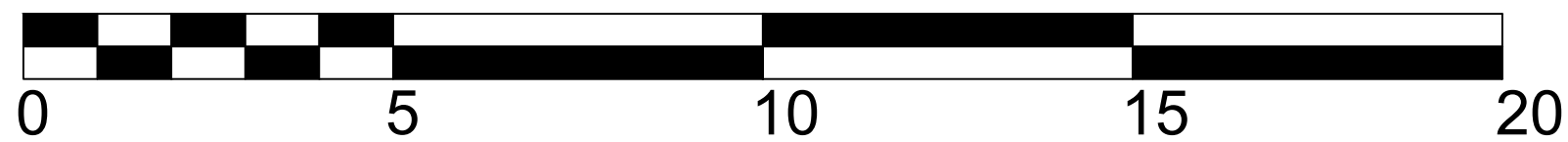
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Site details	
Address Plot Adjacent to 35 Balcombe Street,	
Postcode E9 7JW	City Hackney

Client:
Hackney Council

<h1 style="margin: 0;">Topographical Survey</h1>			
Scale <div style="font-size: 1.5em; font-weight: bold; text-align: center;">1:100</div>	Sheet Size: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">A1</div>	Sheet Number: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">1 of 1</div>	Date: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">03.09.2021</div>
Project Number: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">18536</div>	Rev: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">1.0</div>	Surveyed By: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">BW/PF</div>	Drawn By: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">BW</div>
			Approved By: <div style="font-size: 1.5em; font-weight: bold; text-align: center;">SB/CM</div>



SCALE BAR 1:100

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