



Main Investigation Report

at

Day Nursery, 208 London Road, Waterlooville, Hampshire PO7 7AN

for

Woodberry Day Nursery

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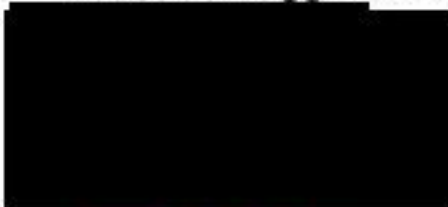
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Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations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

Commission

Soils Limited was commissioned by Woodberry Day Nursery to undertake an intrusive investigation and to prepare a Main Investigation Report on land at the Day Nursery, 208 London Road, Waterlooville, Hampshire PO7 7AN. The scope of the investigation was outlined in the Soils Limited quotation reference Q20171, dated 21st July 2018.

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

This Main Investigation Report must be read in conjunction with the Preliminary Investigation Report undertaken on the above site by Soils Limited, report ref.: 17077/PIR, dated August 2018.

This report has been updated to incorporate results from geotechnical laboratory testing and to provide comment on appropriate foundation options for the proposed development.

Standards

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

- BS 5930:2015 and BS EN ISO 22476-2 2005+A1:2011 for WS/DP
- BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design
- BS EN ISO 14688-1:2002+A1:2013 - Geotechnical investigation and testing - Identification and description
- BS EN ISO 14688-2:2004+A1:2013 - Geotechnical investigation and testing - Principles for a classification
- BS 10175:2011+A1:2013 - Investigation of potentially contaminated sites

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.

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

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

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Section I Introduction

I.1 Objective of Investigation

Soils Limited was commissioned by Woodberry Day Nursery to undertake an intrusive investigation and to prepare a Main Investigation Report to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any contamination identified as dictated by the Conceptual Site Model (CSM) in the Preliminary Investigation Report undertaken for the site by Soils Limited (Report ref: 17077/PIR, August 2018) and/or the Revised Conceptual Site Model presented in Appendix C.1.

This report has been updated to incorporate results from geotechnical laboratory testing and to provide comments on the appropriate foundation options for the proposed development.

I.2 Location

The site was located at Day Nursery, 208 London Road, Waterlooville, Hampshire PO7 7AN and had an approximate O.S Land Ranger Grid Reference of SU 679 089.

The site location plan is given in Figure 1.

I.3 Site Description

The site at the time of the investigation was vacant and unoccupied comprising a dilapidated two storey residential dwelling with a separate single storey domestic garage and shed. The site was generally flat with a slight dip to the north and was predominantly grass with areas of concrete and pavements associated with a driveway and some scattered mature trees and vegetation in the garden area.

An aerial photograph has been included in Figure 2.

I.4 Proposed Development

The proposed development comprised demolition of existing dwelling and subsequent erection of a single storey building to accommodate a children's nursery. The proposed development included areas soft landscaping to include an outside play area and areas of hard landscaping to include alterations to existing pedestrian and vehicle access routes and formation of a new carpark.

In compiling this report reliance was placed on drawings 208LR/PP/04-B, dated July 2017, prepared by The Planning Group Limited. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

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

1.5 Anticipated Geology

The 1:50,000 BGS map showed the site to be located directly upon the bedrock London Clay Formation with no noted overlying superficial deposits.

1.5.1 London Clay Formation

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

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

1.6 Limitations and Disclaimers

This Main Investigation Report relates to the site located at the Day Nursery, 208 London Road, Waterlooville, Hampshire PO7 7AN and was prepared for the sole benefit of Woodberry Day Nursery (The "Client"). The report was prepared solely for the brief described in Section 1.1 of this report.

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

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

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

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

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

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

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

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

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

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

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

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

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

Section 2 Site Works

2.1 Proposed Project Works

The proposed intrusive investigation was designed to provide information on the ground conditions and to aid the design of foundations for the proposed residential development. The intended investigation, as outlined within the Soils Limited quotation (Q20171, dated 21st July 2018), was to comprise the following items:

- 1 day windowless sampler boreholes and dynamic probes;
- Geotechnical laboratory testing;
- Contamination laboratory testing.

2.1.1 Actual Project Works

The actual project works were undertaken on 27th July 2018 and comprised:

- 5No. windowless sampler boreholes and dynamic probes;
- Installation of 2No. dual purpose soil gas and groundwater monitoring wells;
- Geotechnical laboratory testing;
- Contamination laboratory testing.

Five windowless sampler boreholes (WS1 - WS5) and three dynamic samples (DP1-3) were undertaken.

Two locations (WS3 and WS4) were installed with dual gas and water monitoring standpipe and backfilled with gravel packing and bentonite. The remainder of the locations were backfilled with bentonite.

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

Geotechnical laboratory testing and analysis were subsequently commissioned by the client.

2.2 Ground Conditions

On 27th July 2018, five windowless sampler boreholes (WS1 – WS5) were drilled, using a Premiere 3 drilling rig, to depths ranging between 1.00 and 5.00m below ground level (bgl) at locations selected by Soils Limited using a development plan provided by the client.

Three super heavy dynamic probes, (DP1 – DP3) were driven prior and adjacent to their corresponding windowless sampler borehole to depths ranging between 4.00 and 6.00m bgl.

Two standpipes were installed within window sample borehole locations (WS3 and WS4)

to allow for continued monitoring of both groundwater and soils gas, where present.

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)
WS1	5.00	DPI	5.00
WS2	4.00	DP2	4.00
WS3 ^w	4.00	DP3	6.00
WS4 ^w	2.00		
WS5	1.00		

Note: w - well installation

The approximate trial hole locations are shown on Figure 3.

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

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

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

Made Ground/Topsoil (MG/TS)
London Clay Formation (LCF)

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

Table 2.2 Ground Conditions

Strata	Epoch	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
		Top	Bottom		
Topsoil	Recent	GL	0.50	0.40	Turf over soft dark orange brown gravelly SILT with occasional brick fragments, rootlets and fine angular to sub-angular gravel.
Made Ground	Recent	0.30	1.00	0.60	Dark orange grey mottled brown CLAY with rare rootlets, fine angular gravel and fine ash fragments.
LCF	Eocene	0.40	5.00 ¹	Not proven ²	Light orange grey mottled brown slightly sandy CLAY.

Note: ¹ Final depth of trial hole. ² Base of strata not encountered. GL – Ground Level.

2.3 Ground Conditions Encountered in Trial Holes

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

2.3.1 Made Ground

Soils described as Made Ground were encountered in all five trial holes from ground level to depths ranging between 0.40 (WS5) and 1.00m bgl (WS1 and WS3).

The Made Ground typically comprised dark grey and brown gravelly SILT and gravelly silty SAND comprising fragments of flint, brick and concrete.

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)
WS1	1.00
WS2	0.60
WS3	1.00
WS4	0.50
WS5	0.40

2.3.2 London Clay Formation

Soils described as London Clay Formation were encountered in all five trial holes underlying the Made Ground and persisted to the full investigatory depth of 5.00m bgl.

The London Clay Formation typically comprised orangish grey mottled brown slightly sandy CLAY becoming dark grey CLAY with depth.

The depth of London Clay Formation has been included in Table 2.4.

Table 2.4 Final Depth of London Clay Formation

Trial Hole	Depth (m bgl)
WS/DPI	5.00 ¹
WS/DP2	4.00 ¹
WS/DP3	6.00 ¹
WS4	2.00 ¹
WS5	1.00 ¹

Note: ¹ Final depth of trial hole.

2.4 Roots

Roots/rootlets were encountered in all five trial holes, persisting to a maximum depth of 3.20m 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)
WS1	3.00
WS2	3.00
WS3	3.20
WS4	2.00 ¹
WS5	1.00 ¹

Note: ¹ Final depth of trial hole.

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

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

2.5 Groundwater

Groundwater was not encountered with any of the exploratory trial holes at the time of the intrusive works. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in July (2018), when groundwater levels should be reducing towards their annual minimum (lowest) elevation, which typically occurs around September.

Groundwater monitoring was ongoing at the time of investigation. The results will be provided as an addendum once the regime is completed.

Section 3 Discussion of Geotechnical In-Situ and Laboratory Testing

3.1 Dynamic Probe Tests

Dynamic probing (DPSH) was undertaken at three locations (DP1 – DP3) adjacent and prior to the drilling for corresponding windowless sampler boreholes to depths ranging between 4.00m and 6.00m bgl.

The blow results were converted to equivalent SPT “N₆₀” values based on dynamic energy using commercial computer software (Geostru). The results were then interpreted based on the classifications outlined in Appendix B.1. The energy ratio was 75%, therefore $1.25 \times \text{equivalent SPT } N = \text{SPT } N_{60}$. It should be noted that SPT ‘N₆₀’ values used within the foundation design in this report, are corrected values in accordance with BS EN 22476 Part 3, to account for the rig efficiency, borehole depth, overburden factors etc. Further correction of the ‘N₆₀’ values should therefore not be necessary.

The results were then interpreted based on the classifications outlined in Appendix B.1.

The London Clay formation recorded equivalent SPT “N₆₀” values between 4 and 36, classifying the cohesive soils as very low to very high strength with inferred undrained cohesive strengths of 20kPa to 180kPa. The dynamic probes showed an increasing strength with depth trend with a low strength weathered interface to a maximum depth of 2.00m bgl.

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

3.2 Atterberg Limit Tests

Atterberg Limit tests were performed on six samples obtained from the London Clay Formation.

The London Clay Formation was classified as low to high volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

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

3.3 Particle Size Distribution Tests

Particle Size Distribution (PSD) tests were performed on two samples from granular fractions of the London Clay Formation.

PSD classified the London Clay Formation as having a volume change potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2. Note that a cohesive soil is only classified as having a volume change potential if it is also plastic and an Atterberg Limit test can be conducted on the strata.

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

3.4 Sulphate and pH Tests

Two samples were taken from the London Clay Formation 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 of <10mg/l with pH values of 7.7.

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

Section 4 Foundation Design

4.1 General

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

4.1.1 Made Ground and Topsoil

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

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

Soils described as Made Ground were encountered in all five trial holes from ground level to depths ranging between 0.40 (WS5) and 1.00m bgl (WS1 and WS3). The Made Ground typically comprised dark grey and brown gravelly SILT and gravelly silty SAND comprising fragments of flint, brick and concrete. The depths of Made Ground have been included in Table 2.3.

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

4.1.2 London Clay Formation

Soils described as London Clay Formation were encountered in all five trial holes underlying the Made Ground and persisted to the full investigatory depth of 5.00m bgl. The London Clay Formation typically comprised orangish grey mottled brown slightly sandy CLAY becoming dark grey CLAY with depth.

The results from DPSH testing inferred that the cohesive soils of the London Clay Formation were of a very low to very high strength, with undrained cohesions of between 20kPa and 180kPa. The DP profiles showed an increasing strength with depth trend with a low strength weathered interface to a maximum depth of 2.00m bgl.

The results from Atterberg Limits tests confirmed that the soils of the London Clay Formation had **low to high volume change potential** in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

Soils of the London Clay Formation are overconsolidated and are expected to display moderate to high bearing capacities with low settlement characteristics and were therefore considered a suitable bearing stratum for the proposed development.

4.1.3 Roots

Roots/rootlets were encountered in all five trial holes, persisting to a maximum depth of 3.20m bgl. Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

4.1.4 Groundwater

Groundwater was not encountered with any of the exploratory trial holes at the time of the intrusive works. Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in July (2018), when groundwater levels should be reducing towards their annual minimum (lowest) elevation, which typically occurs around September.

Groundwater monitoring was ongoing at the time of reporting and the results will be provided in an addendum once the regime has been completed.

4.2 Foundation Scheme General

The proposed development comprised demolition of existing dwelling and subsequent erection of a single storey building to accommodate a children's nursery. The proposed development included areas soft landscaping to include an outside play area and areas of hard landscaping to include alterations to existing pedestrian and vehicle access routes and formation of a new carpark.

In compiling this report reliance was placed on drawings 208LR/PP/04-B, dated July 2017, prepared by The Planning Group Limited. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

Development plans provided by the client are presented in Appendix D. These show that the proposed building footprint will be over an area where trees will have to be removed.

4.2.1 Guidance on Shrinkable Soils

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

The results from Atterberg Limits Tests showed that the London Clay Formation

had **low to high volume change potential** in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

high volume change potential must therefore be adopted where foundations pass through or found within the cohesive soils of the London Clay Formation.

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**”.*

Moisture content recovery can take up to 20 years in soils of the London Clay Formation.

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.”

Neither of the courses of action is appropriate to the proposed low-rise, lightweight development.

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

4.3 Foundation Scheme

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

Due to the presence of roots to depths of at least 3.2 metres; the need to fell trees across the footprint of the proposed building and the presence of high volume change soils the recommendations given by BRE 241 must be followed *‘where trees or hedges have been cut down prior to building... if there is any doubt that recovery is complete... bored pile foundations with suspended beams and floors should be used’.*

To prevent any adverse effect from soil heave (both vertically and laterally), piles should be designed to resist uplift and compressible mediums and collapsible void formers

incorporated in the design and construction of both ground beams and suspended slabs.

4.3.1 Piled Foundations

The construction of a piled foundation is a specialist job with the actual pile working load depending on the particular type pile and installation method.

Prior to finalising the foundation design, the advice from a reputable contractor who is familiar with the ground and groundwater conditions present at the site should be sought.

Guidance on the design of a working platform for piling rigs can be provided by Soils Limited in accordance with the BRE "Working platform for tracked plant, 2004" documentation.

The construction of a piled foundation would potentially require further investigation by means of light cable percussive boreholes, from which samples could be recovered and in-situ tests (SPT) could be undertaken at greater depth.

4.3.2 Ground Floors

BRE241 dictates that that suspended beams and floors should be used.

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-1s**. The pH of the soils tested ranged between 7.7. The classification given was determined using the static groundwater case. The laboratory results are presented in Appendix B.3

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

4.5 Excavations

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

Deeper excavations taken into the London Clay Formation are likely to be stable in the short term, depending on the thickness of overlying Made Ground. 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 Revised Conceptual Site Model

The Preliminary Investigation Report undertaken by Soils Limited (report ref: 17077/PIR dated August 2018) identified only a low to very low risk of ground contamination from current or historic uses of the site and or from historic or current offsite sources.

The Main Investigation Report identified Made Ground to depths of 0.40-1.00m generally comprising dark grey brown sandy clayey gravelly silt. Gravel was fine to medium angular brick, concrete and flints. The Made Ground was found to overlie the London Clay Formation at depth.

5.2 Soil Sampling

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

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

A targeted sampling strategy is appropriate when there is:

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

The CSM identified no especially significant potential sources and a non-targeted sampling pattern was adopted.

5.3 Determination of Chemical Analysis

The driver for determination of the analysis suite was the information obtained from the Preliminary Investigation Report and Main Investigation Report intrusive investigation. Table 5.1 outlines the specification for each sample tested.

Table 5.1 Chemical Analysis Specification

Substance	Locations:Depths (m bgl)					
	WS1:0.20 ^s	WS1:0.50 ^s	WS2:0.40 ^s	WS3:0.20 ^s	WS4:0.40 ^s	WS5:0.20 ^s
Asbestos Screen	✓	✓	✓	✓	✓	✓
Total Phenols	✓	✓	✓	✓	✓	✓
Total Cyanide	✓	✓	✓	✓	✓	✓
Organic Matter	✓	✓	✓	✓	✓	✓
pH	✓	✓	✓	✓	✓	✓
Metals	✓	✓	✓	✓	✓	✓
Metalloids	✓	✓	✓	✓	✓	✓
Organics	✓	✓	✓	✓	✓	✓

Substance	Locations:Depths (m bgl)					
	WS1:0.20 ^s	WS1:0.50 ^s	WS2:0.40 ^s	WS3:0.20 ^s	WS4:0.40 ^s	WS5:0.20 ^s
PAHs	✓	✓	✓	✓	✓	✓
TPH-CWG	✓					✓
BTEX	✓					✓

Notes: **Metals:** Cd, Cr, Pb, Hg, Ni, Se, CN, S, Cu, Zn, Bo, V. **metalloids:** As. **organics:** USEPA 16 speciated PAH, TPH-CWG (speciated TPH), BTEX, VOC/SVOC. **Asbestos screening** was undertaken in accordance with HSG 248. ^s = Soil sample

Section 6 Qualitative Risk Assessment

6.1 Assessment Criteria

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

6.2 Representative Contamination Criteria - Soil

The proposed development comprised demolition of existing dwelling and subsequent erection of a single storey building to accommodate a children's nursery. The proposed development included areas soft landscaping to include an outside play area and areas of hard landscaping to include alterations to existing pedestrian and vehicle access routes and formation of a new carpark.

In compiling this report reliance was placed on drawings 208LR/PP/04-B, dated July 2017, prepared by The Planning Group Limited. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

The chemical laboratory results were compared against the representative contaminants concentration for human health receptor to Soil Guideline Values (SGV), Category 4 Screening Levels (C4SL's) or Suitable 4 Use Level (S4UL). The proposed development is indicated to be a children's nursery, as there are no published values for this land-use type, it has been considered appropriate as the closest approximate to adopt the guidance value for 'residential without plant uptake' land-use scenario.

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

Table 6.1 Summary of Chemical Analysis of Soils Sample Exceedance

Substance	Sample locations where SGV, C4SL or S4UL adopted were exceeded for the 'Residential without plant uptake' land-use scenario
None	None

The guideline values are assessed against the "Residential" land-use no plants scenario, which was considered the most appropriate land-use scenario, given the type of the proposed redevelopment and to provide a sufficiently conservative allowance given the potential ages of the receptors.

To assess the potential toxicity to the human health receptor from the concentrations of organic compounds tested for, Soil Organic Matter (SOM) tests were undertaken on the samples submitted for chemical testing, which revealed SOM values of between 0.8% and 3.6%. For each soil sample tested, the Soil Organic Matter recorded was used to derive the appropriate guideline value for organic determinants.

In summary, none of the samples tested showed concentrations in excess of the relevant C4SL for a residential land-use scenario.

6.2.1 Asbestos

No Asbestos Containing Material (ACM) was detected within any samples.

6.3 Risk to Groundwater

No water samples have yet been taken and no water strike was noted during the investigation works down to 5.00m.

6.4 Tier 1 Quantitative Risk Assessment

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

6.4.1 Soils

None of the soils analysed exceeded the relevant guideline values.

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

However, there are slightly elevated levels of lead above background which may be associated with the ash recorded on the log descriptions. PAH ratio analysis suggests this material may be related to coal or wood burning and/or the historical incorporation of solid fuel ash as fertilizer.

6.4.2 Groundwater

The Groundwater Risk Assessment established that **there was no risk** to the groundwater receptor as no water was encountered during the investigation and the underlying bedrock is a noted non-aquifer. However, uncertainty remains as to possible transmission through the overlying Made Ground. However, given the lack of granular material, obvious connectivity and sources within the overlying ground, risk is considered low to negligible.

6.4.3 Soil Gas

The Preliminary Investigation Report identified a low risk of soil gas associated with an adjacent infilled pond.

Monitoring of the installed wells onsite was ongoing at the time of reporting. The results of the soil gas risk assessment will be provided as an addendum once the regime is completed.

6.5 Remedial Objective

No identified or confirmed risks to Human Health, Building Structures and Services and Groundwater receptors, which would require a remediation strategy, have been identified.

The remedial objective for the site is to ensure site clean-up removes any unacceptable risk to the identified receptors of Human Health, Building Structures and Services and Groundwater receptor. In essence, the remedial objective should sever any source-pathway-receptor pollutant linkages that have been established. Once this has been achieved, by whatever means, there can theoretically be no risk.

6.6 Development of Soil Remediation Strategy

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

6.7 Soil Gas and Groundwater Monitoring

Whilst the risk is considered low to negligible from soil gas and to the groundwater, it would be necessary to monitor these parameters over time in line with current standards and guidance to reduce remaining uncertainty. At the time of reporting, soil gas monitoring was ongoing and the soil gas risk assessment will be provided as an addendum once the regime is completed.

6.8 Imported Material

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

6.9 Discovery Strategy

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

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

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

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

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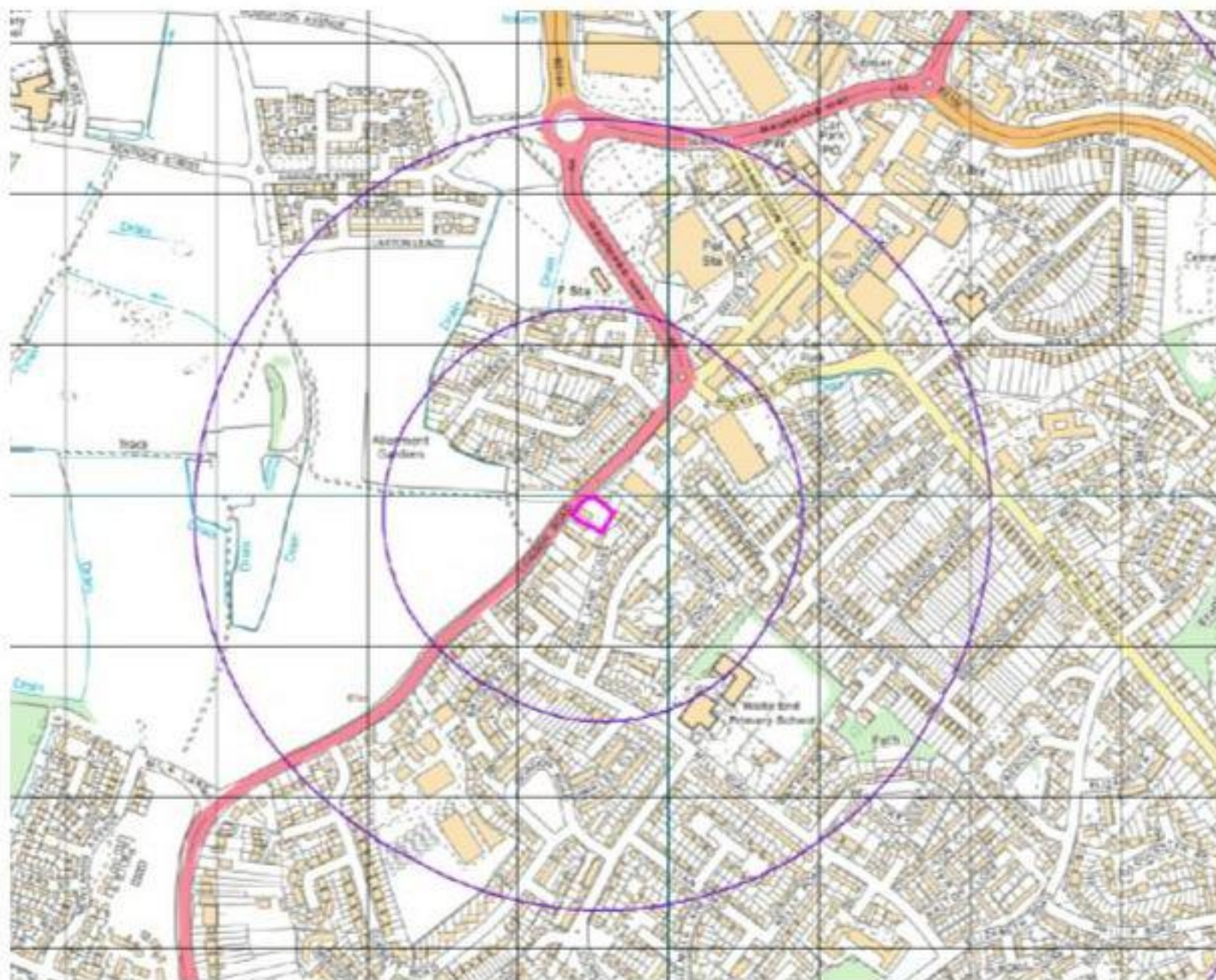


Figure 1 – Site Location Map

Job Number
17077

Project

Day Nursery, 208 London Road, Waterlooville,
Hampshire PO7 7AN

Client
Woodberry Day Nursery

Date
September 2018



Figure 2 – Aerial Photograph

Project

Day Nursery, 208 London Road,
Waterlooville, Hampshire PO7
7AN

Client

Woodberry Day Nursery

Date

September 2018

Job Number

17077





Figure 3 – Trial Hole Plan

Project

Day Nursery, 208 London Road,
Waterlooville, Hampshire PO7
7AN

Client

Woodberry Day Nursery

Date

September 2018

Job Number

17077



Appendix A Field Work

Appendix A.1 Engineers Logs

Project Name: Day Nursery, 208 London Road

Project No.: 17077

Co-ords:

 Hole Type
WS

Location: Waterloooville, Hampshire PO7 7AN

Level:

 Scale
1:50

Client: Woodberry Day Nurseries

Dates: 27-07-2018

Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D+J		0.40			Turf over dark grey brown slightly desiccated gravelly Silt with occasional fine angular brick and ash fragments, rootlets. MADE GROUND	1
		0.50	D+J					Dark orangish grey mottled brown desiccated gravelly CLAY with rare rootlets, fine angular gravel and ash fragments. MADE GROUND.	
		0.80	D+J						
		1.50	D		1.00			Light orange grey mottled brown slightly sandy CLAY. Sand is fine. Rare rootlets and fine angular gravel. LONDON CLAY FORMATION	2
		2.00	D						
		2.50	D						
		3.00	D						
		3.50	D		3.50			Dark grey CLAY. Rare fine selenite. LONDON CLAY FORMATION	3
		4.00	D						
		4.50	D						
		5.00	D		5.00			End of Borehole at 5.00m	4
									5
									6
									7
									8
									9
									10

 General Remarks:
 No groundwater encountered

Groundwater Remarks:

Borehole Type
 CP: Cable Percussive
 WS: Windowless Sampler
 RC: Rotary Cored

Sample Types
 D: Disturbed
 B: Bulk
 J: Jar
 W: Water
 U: Undisturbed

In-Situ Testing
 SPT: Split spoon - Standard Penetration Test
 CPT: Cone - Standard Penetration Test

Project Name: Day Nursery, 208 London Road

Project No.: 17077

Co-ords:

Hole Type
WS

Location: Waterlooville, Hampshire PO7 7AN

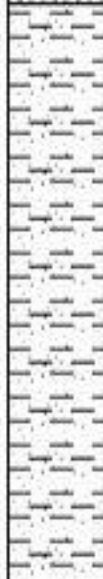
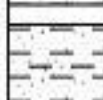
Level:

Scale
1:50

Client: Woodberry Day Nurseries

Dates: 27-07-2018

Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D+J		0.30			Turf over dark grey brown slightly desiccated gravelly Silt with occasional fine angular brick and ash fragments, rootlets. MADE GROUND.	1
		0.40	D+J						
		0.80	D+J		0.60			Light orange grey mottled brown slightly sandy CLAY. Sand is fine with rare rootlets and fine angular gravel. Very sandy from 2.0 - 3.5m. LONDON CLAY FORMATION	
		1.00	D						
		1.50	D						
		2.00	D						
		2.50	D						
		3.00	D						
		3.50	D		3.50			Dark grey very sandy CLAY. Sand is fine, with rare fine selenite. LONDON CLAY FORMATION	
		4.00	D		4.00		End of Borehole at 4.00m		
									2
									3
									4
									5
									6
									7
									8
									9
									10

General Remarks:

No groundwater encountered

Groundwater Remarks:

Borehole Type

CP: Cable Percussive
WS: Windowless Sampler
RC: Rotary Cored

Sample Types

D: Disturbed
B: Bulk
J: Jar
W: Water
U: Undisturbed

In-Situ Testing

SPT: Split spoon - Standard Penetration Test
CPT: Cone - Standard Penetration Test

Project Name: Day Nursery, 208 London Road

Project No.: 17077

Co-ords:

 Hole Type
WS

Location: Waterloooville, Hampshire PO7 7AN

Level:

 Scale
1:50

Client: Woodberry Day Nurseries

Dates: 27-07-2018

Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D+J					Turf over soft dark orange brown gravelly SILT. Occasional brick fragments. Occasional rootlets. Occasional fine angular to sub angular gravel. MADE GROUND	
		0.50	D+J		0.50			Dark orange grey mottled brown CLAY. Rare fine gravel flint. Rare fine brick, ash fragments. Band of fine to medium chalk fragments 0.5-0.7m BL/GL. MADE GROUND	
		1.00	D+J		1.00			Light orange grey mottled brown slightly sandy CLAY. Sand is fine. Rare rootlets. Rare fine angular gravel. Very sandy from 3.0 - 3.5m BL/GL. LONDON CLAY FORMATION	1
		1.50	D						2
		2.00	D						3
		2.50	D						4
		3.00	D						5
		3.50	D						6
		4.00	D		3.70			Dark grey sandy CLAY. Sand is fine. Rare fine selenite. LONDON CLAY FORMATION	7
					4.00			End of Borehole at 4.00m	8
									9
									10

General Remarks:

No groundwater encountered

Groundwater Remarks:
Borehole Type

 CP: Cable Percussive
 WS: Windowless Sampler
 RC: Rotary Cored

Sample Types

 D: Disturbed
 B: Bulk
 J: Jar
 W: Water
 U: Undisturbed

In-Situ Testing

 SPT: Split spoon - Standard Penetration Test
 CPT: Cone - Standard Penetration Test

 Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk						Borehole Log		Borehole No. WS4 Sheet 1 of 1	
Project Name: Day Nursery, 208 London Road				Project No.: 17077		Co-ords:		Hole Type WS	
Location: Waterloooville, Hampshire PO7 7AN						Level:		Scale 1:50	
Client: Woodberry Day Nurseries						Dates: 27-07-2018		Logged By	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D+J		0.30 0.50			Turf over soft dark orange brown gravelly SILT. Occasional brick fragments. Occasional rootlets. Occasional fine angular to sub angular gravel. MADE GROUND Light yellow orange brown clayey silty SAND. Sand is fine to coarse. Rare fine gravel flint. Rare fine ash, brick fragments. MADE GROUND Light orange grey mottled brown slightly sandy CLAY. Sand is fine. Rare rootlets. Rare fine angular gravel. LONDON CLAY FORMATION	1
		0.40	D+J						
		0.80	D+J						
			1.20	D		2.00		End of Borehole at 2.00m	2
			1.50	D					
			2.00	D					
									4
									5
									6
									7
									8
									9
									10
General Remarks: No groundwater encountered Groundwater Remarks:								Borehole Type CP: Cable Percussive WS: Windowless Sampler RC: Rotary Cored In-Situ Testing SPT: Split spoon - Standard Penetration Test CPT: Cone - Standard Penetration Test	
Sample Types D: Disturbed B: Bulk J: Jar W: Water U: Undisturbed									

Project Name: Day Nursery, 208 London Road

Project No.: 17077

Co-ords:

 Hole Type
 WS

Location: Waterloooville, Hampshire PO7 7AN

Level:

 Scale
 1:50

Client: Woodberry Day Nurseries

Dates: 27-07-2018

Logged By

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10			BLOCK PAVING	
		0.20	D+J		0.30			Dark grey brown gravelly sandy SILT. Sand is fine. Occasional fine brick, ash fragments. Occasional rootlets. Occasional fine angular to sub angular gravel. Rare fine chalk fragments. MADE GROUND	
		0.50	D+J		0.40			Light green grey very sandy CLAY. Sand is fine to coarse. Rare fine gravel flint. Occasional light orange staining. LONDON CLAY FORMATION	
		0.80	D+J					Light orange grey mottled brown CLAY. Rare fine gravel flint. Rare rootlets. Occasional light orange staining. LONDON CLAY FORMATION	
		1.00	D		1.00			End of Borehole at 1.00m	
									1
									2
									3
									4
									5
									6
									7
									8
									9
									10

General Remarks:

No groundwater encountered

Groundwater Remarks:

Borehole Type

 CP: Cable Percussive
 WS: Windowless Sampler
 RC: Rotary Cores

Sample Types

 D: Disturbed
 B: Bulk
 J: Jar
 W: Water
 U: Undisturbed

In-Situ Testing

 SPT: Split spoon - Standard Penetration Test
 CPT: Cone - Standard Penetration Test

Appendix B Geotechnical In Situ and Laboratory Testing

Appendix B.1 Classification

Classification based on SPT "N" values:

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

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

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

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

Appendix B.2 Interpretation

Table B.2.1 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength
DPI	LCF 0.80 – 1.80 Sandy CLAY	4	Very low to low ($C_u = 20\text{kPa}$)
	LCF 1.80 – 2.40 Sandy CLAY	7 – 11	Low to medium ($C_u = 35 - 55\text{kPa}$)
	LCF 2.40 – 3.50 Sandy CLAY	14 – 18	Medium to high ($C_u = 70 - 90\text{kPa}$)
	LCF 3.50 – 5.00 CLAY	22 – 25	High ($C_u = 110 - 125\text{kPa}$)
DP2	LCF 0.70 – 2.00 Sandy CLAY	4	Very low to low ($C_u = 20\text{kPa}$)
	LCF 2.00 – 3.00 Sandy CLAY	11 – 14	Medium ($C_u = 55 - 70\text{kPa}$)
	LCF 3.00 – 4.00 CLAY	22 – 25	High ($C_u = 110 - 125\text{kPa}$)
DP3	LCF 1.00 – 1.70 Sandy CLAY	4	Very low to low ($C_u = 20\text{kPa}$)
	LCF 1.70 – 2.80 Sandy CLAY	7 – 11	Low to medium ($C_u = 35 - 55\text{kPa}$)
	LCF ¹ 2.80 – 5.20 CLAY	22 – 29	High ($C_u = 110 - 145\text{kPa}$)
	LCF ¹ 5.20 – 6.00 CLAY	32 – 36	Very high ($C_u = 160 - 180\text{kPa}$)

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

Table B.2.2 Interpretation of Atterberg Limit Tests

Stratum	Moisture Content (%)	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Soil Classification	Volume Change Potential	
						BRE	NHBC
LCF	23 - 32	16 - 44	100	16 - 44	Cl - CH	Low to high	Low to high

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

NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2

Soils Classification based on British Soil Classification System

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

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

Table B.2.3 Interpretation of PSD Tests

Location	Depth (m bgl)	Soil Description	Volume Change Potential		Passing 63µm Sieve (%)
			BRE	NHBC	
WS2	1.50	Slightly sandy CLAY	Yes	Yes	75
WS2	2.50	Sandy CLAY	Yes	Yes	58

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

Project Name:	Day Nursery, 208 London Road	Project No.	17077	Co-ords:		Hole Type	DP
Location:	Waterlooville, Hampshire PO7 7AN	Level:	m AOD			Scale	1:50
Client:	Woodberry Day Nurseries	Dates:	27-07-2018			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
0.0	2				
0.1	5				
0.2	4				
0.3	3				
0.4	3				
0.5	3				
0.6	2				
0.7	2				
0.8	2				
0.9	2				
1.0	2				20
1.1	2				
1.2	2				
1.3	2				
1.4	2				
1.5	3				65
1.6	3				
1.7	3				
1.8	4				
1.9	4				
2.0	4				
2.1	4				
2.2	4				
2.3	4				125
2.4	5				
2.5	5				
2.6	5				
2.7	6				
2.8	6				
2.9	6				
3.0	7				15
3.1	7				
3.2	5				
3.3	6				
3.4	6				
3.5	7				
3.6	7				
3.7	7				
3.8	7				
3.9	6				
4.0	7				210
4.1	6				
4.2					
4.3					
4.4					
4.5					
4.6					
4.7					
4.8					
4.9					
5.0					
5.1					
5.2					
5.3					
5.4					
5.5					
5.6					
5.7					
5.8					
5.9					
6.0					
6.1					
6.2					
6.3					
6.4					
6.5					
6.6					
6.7					
6.8					
6.9					
7.0					
7.1					
7.2					
7.3					
7.4					
7.5					
7.6					
7.7					
7.8					
7.9					
8.0					
8.1					
8.2					
8.3					
8.4					
8.5					
8.6					
8.7					
8.8					
8.9					
9.0					
9.1					
9.2					
9.3					
9.4					
9.5					
9.6					
9.7					
9.8					
9.9					
10.0					

Remarks	Fall Height	mm	Cone Base Diameter	mm
	Hammer Weight	kg	Final Depth	5m
	Probe Type		Energy Ratio (Er)	%

Project Name:	Day Nursery, 208 London Road	Project No.	17077	Co-ords:		Hole Type	DP
Location:	Waterlooville, Hampshire PO7 7AN	Level:	m AOD			Scale	1:50
Client:	Woodberry Day Nurseries	Dates:	27-07-2018			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
0	2	5			
0.1	3	3			
0.2	2				
0.3	2				
0.4	2				
0.5	2				
0.6	2				
0.7	2				
0.8	2				
0.9	2				
1.0	2				5
1.1	2				
1.2	2				
1.3	2				
1.4	2				
1.5	2				
1.6	2				
1.7	2				
1.8	2				
1.9	2				
2.0	2				70
2.1	2				
2.2	2				
2.3	2				
2.4	2				
2.5	2				
2.6	2				
2.7	2				
2.8	2				
2.9	2				
3.0	2				
3.1	2				
3.2	2				
3.3	2				
3.4	2				
3.5	2				
3.6	2				
3.7	2				
3.8	2				
3.9	2				
4.0	2				135
4.1	2				
4.2	2				
4.3	2				
4.4	2				
4.5	2				
4.6	2				
4.7	2				
4.8	2				
4.9	2				
5.0	2				210
5.1	2				
5.2	2				
5.3	2				
5.4	2				
5.5	2				
5.6	2				
5.7	2				
5.8	2				
5.9	2				
6.0	2				
6.1	2				
6.2	2				
6.3	2				
6.4	2				
6.5	2				
6.6	2				
6.7	2				
6.8	2				
6.9	2				
7.0	2				
7.1	2				
7.2	2				
7.3	2				
7.4	2				
7.5	2				
7.6	2				
7.7	2				
7.8	2				
7.9	2				
8.0	2				
8.1	2				
8.2	2				
8.3	2				
8.4	2				
8.5	2				
8.6	2				
8.7	2				
8.8	2				
8.9	2				
9.0	2				
9.1	2				
9.2	2				
9.3	2				
9.4	2				
9.5	2				
9.6	2				
9.7	2				
9.8	2				
9.9	2				
10.0	2				

Remarks	Fall Height	mm	Cone Base Diameter	mm
	Hammer Weight	kg	Final Depth	4m
	Probe Type		Energy Ratio (Er)	%

Project Name:	Day Nursery, 208 London Road	Project No.	17077	Co-ords:		Hole Type	DP
Location:	Waterlooville, Hampshire PO7 7AN	Level:	m AOD			Scale	1:50
Client:	Woodberry Day Nurseries	Dates:	27-07-2018			Logged By	

Depth (m)	Blows/100mm				Torque (Nm)
	10	20	30	40	
1	3 5 9 7 4 2 4 2 2 2				5
2	2 2 1 2 3 2 3 2 4 3 4 5 5				50
3	7 8 6 8 8 8 8 7 7 6 8 8 7 7 8 6 7 6 7 7 9 8 10 10 14 10 10				140
4					150
5					180
6					210
7					
8					
9					
10					

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



2788

Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 40753

Client Ref: **17077**Report Date: **22-09-2018**Client PO: **17077**

Client **Soils Limited**
Thomas Telford House
Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

Contract Title: **Day Nursery, Waterloooville**
 For the attention of: **Tim Rudkin**

Date Received: **14-09-2018**
 Date Commenced: **14-09-2018**
 Date Completed: **22-09-2018**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	6
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	6
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	2
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
 * - denotes test included in laboratory scope of accreditation
 # - denotes test carried out by approved contractor
 @ - denotes non accredited tests

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

Approved Signatories:

Alex Wynn (Associate Director) - Ben Sharp (Contracts Manager) - Emma Sharp (Office Manager)
 Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager) - Sean Penn (Administrative/Accounts Assistant)
 Wayne Honey (Administrative/Quality Assistant)



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

Contract Number

40753

Borehole/Pit No.

WS2

Site Name

Day Nursery, Waterloooville

Sample No.

Soil Description

Brown fine to coarse sandy SILT/ CLAY

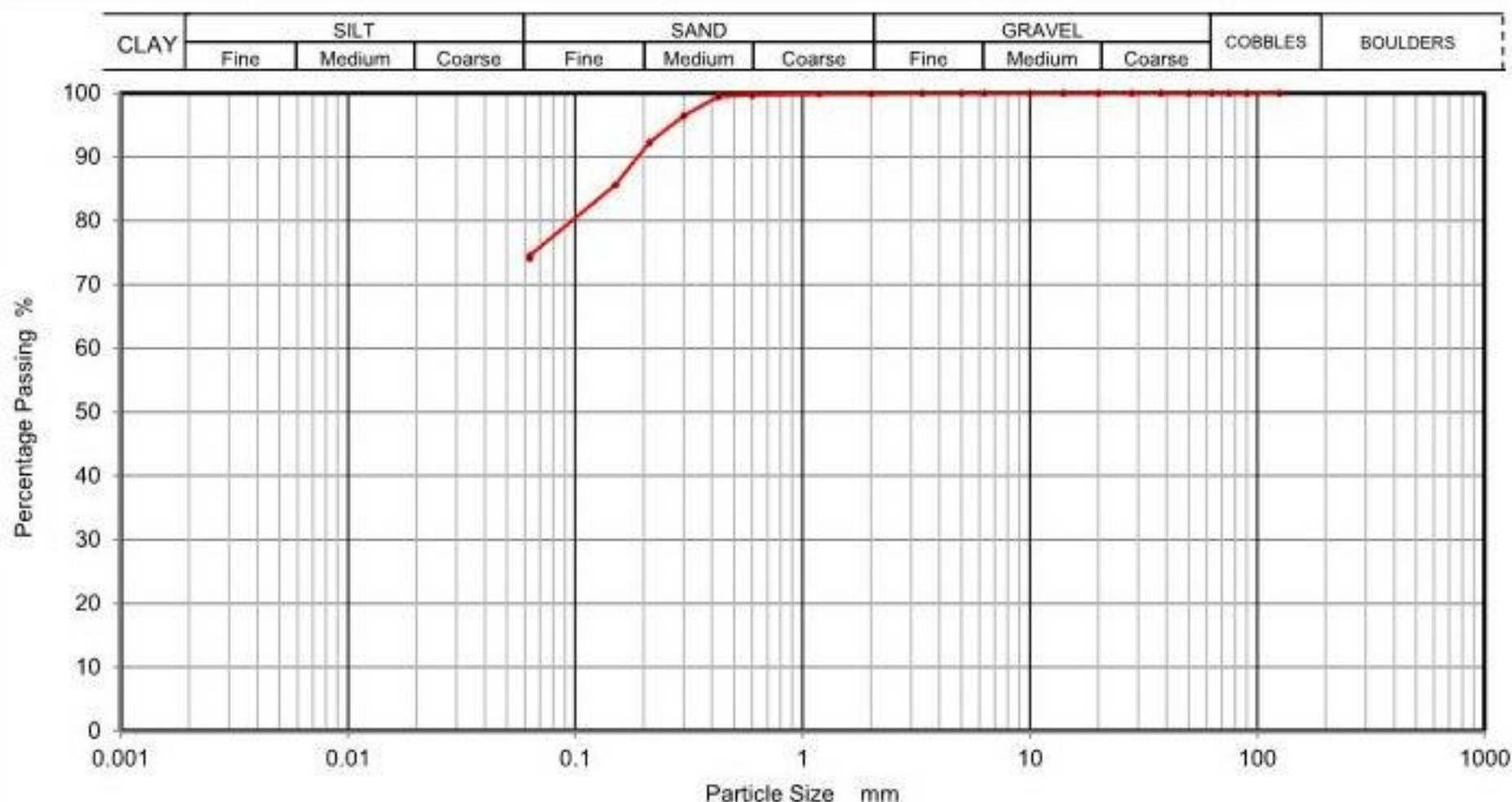
Depth Top

1.50

Depth Base

Sample Type

D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	96		
0.212	92		
0.15	86		
0.063	75		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	25
Silt and Clay	75

Grading Analysis	
Uniformity Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	21/09/2018	Wayne Honey	W. Honey
RO/MH	Approved	22/09/2018	Ben Sharp	





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

Contract Number

40753

Borehole/Pit No.

WS2

Site Name

Day Nursery, Waterloooville

Sample No.

Soil Description

Brown fine to coarse sandy SILT/ CLAY

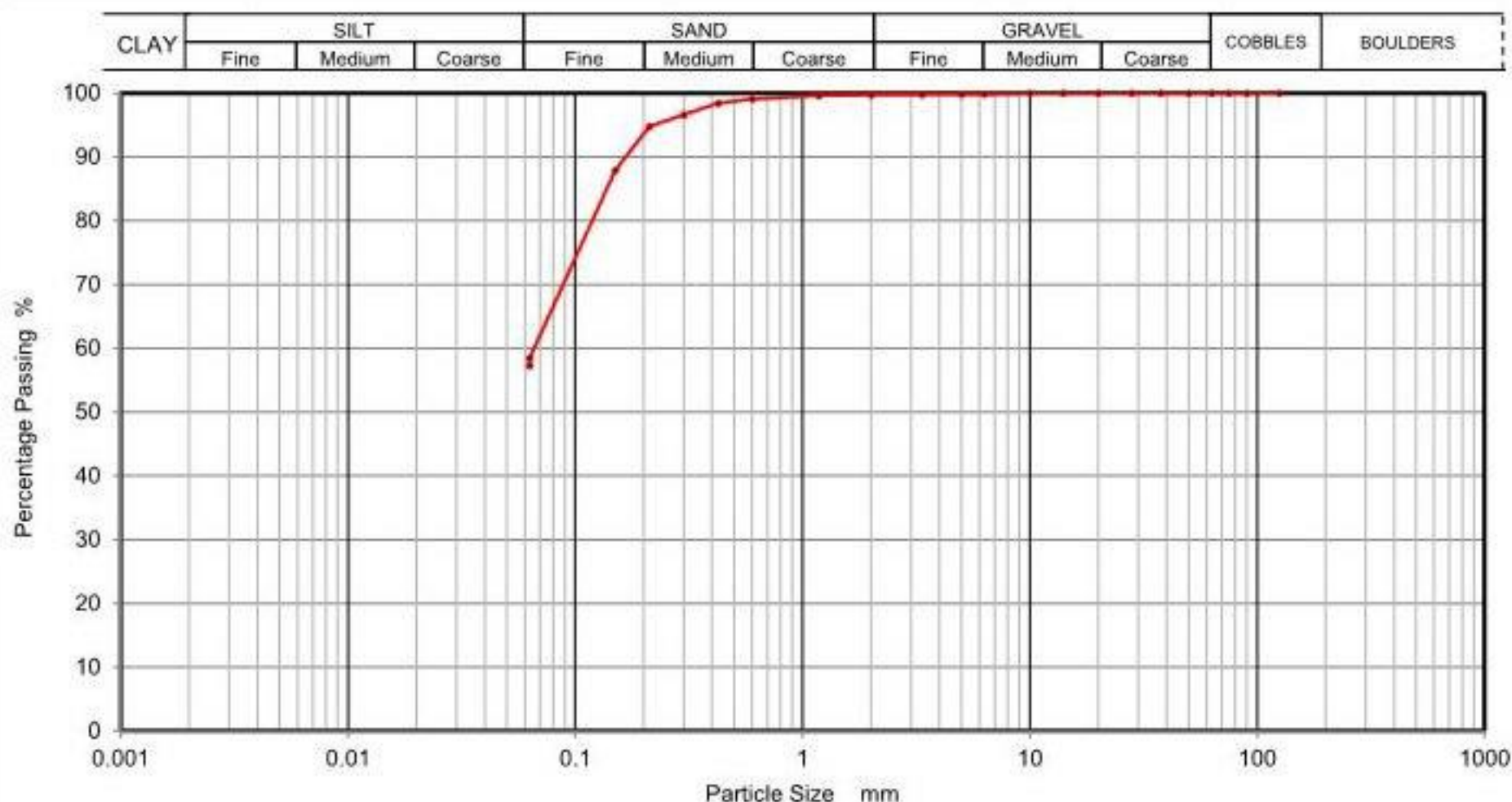
Depth Top

2.50

Depth Base

Sample Type

D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	98		
0.3	97		
0.212	95		
0.15	88		
0.063	58		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	42
Silt and Clay	58

Grading Analysis	
Uniformity Coefficient	

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	21/09/2018	Wayne Honey	W. Honey
RO/MH	Approved	22/09/2018	Ben Sharp	





Tim Rudkin
Soils Ltd
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@dets.co.uk

DETS Report No: 18-82212

Site Reference: Day Nursery, Waterlooovle

Project / Job Ref: 17077

Order No: None Supplied

Sample Receipt Date: 14/09/2018

Sample Scheduled Date: 14/09/2018

Report Issue Number: 1

Reporting Date: 20/09/2018

Authorised by:



Russell Jarvis
Associate Director of Client Services

Authorised by:



Dave Ashworth
Deputy Quality Manager

Soil Analysis Certificate						
DETS Report No: 18-82212	Date Sampled	None Supplied	None Supplied			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Day Nursery, Waterlooovile	TP / BH No	WS1	WS3			
Project / Job Ref: 17077	Additional Refs	D	D			
Order No: None Supplied	Depth (m)	2.00	1.00			
Reporting Date: 20/09/2018	DETS Sample No	360303	360304			

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	MCERTS	7.7	7.7		
Total Sulphate as SO ₄	mg/kg	< 200	NONE	< 200	< 200		
Total Sulphate as SO ₄	%	< 0.02	NONE	< 0.02	< 0.02		
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	< 10	< 10		
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	< 0.01	< 0.01		
Total Sulphur	%	< 0.02	NONE	< 0.02	< 0.02		
Ammonium as NH ₄	mg/kg	< 0.5	NONE	7.9	6.4		
Ammonium as NH ₄	mg/l	< 0.05	NONE	0.79	0.64		
W/S Chloride (2:1)	mg/kg	< 1	MCERTS	12	12		
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS	5.8	6.1		
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS	< 3	9		
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS	< 1.5	4.7		
W/S Magnesium	mg/l	< 0.1	NONE	3.9	1.1		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C.

Subcontracted analysis (S)



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



Soil Analysis Certificate - Sample Descriptions

DETS Report No: 18-82212	
Soils Ltd	
Site Reference: Day Nursery, Waterlooovile	
Project / Job Ref: 17077	
Order No: None Supplied	
Reporting Date: 20/09/2018	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 360303	WS1	D	2.00	17.5	Brown sandy clay
^ 360304	WS3	D	1.00	17.3	Brown sandy clay

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

Insufficient Sample ^{IS}

Unsuitable Sample ^{US}

^ no sampling date provided; unable to confirm if samples are within acceptable holding times

Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 18-82212

Soils Ltd

Site Reference: Day Nursery, Waterlooovile

Project / Job Ref: 17077

Order No: None Supplied

Reporting Date: 20/09/2018

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

D Dried
AR As Received

Appendix C Chemical Laboratory Testing

Appendix C.1 Conceptual Site Model

Table C.I.1 CSM Revised Pre Testing

Source	Potential Contaminant	Exposure Pathway	Receptor	Initial Assessment from Preliminary Investigation Report Information			Comments	Proposed Investigation
				Severity	Probability	Risk		
Historical site activities and redevelopment On-site historic and current site usage.	Metals, Semi-metals and non-metals, PAHs, Asbestos	Inhalation of dust	Site Workers/Site Maintenance End Users Off-site Users	Mild	Low	Low	Site located on bedrock of the London Clay Formation, which was classified as unproductive strata and would act as an aquiclude to the groundwater receptors.	Phase II ground investigation to confirm the ground conditions present and chemical testing prior to undertaking a generic quantitative risk assessment.
	PAHs, TPHs	Inhalation of Vapour/gases (including Radon)	Site Workers/Site Maintenance End Users Off-site Users	Minor	Unlikely	Very low		
	Metals, Semi-metals and non-metals, PAHs, TPHs, Asbestos, pH	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Minor	Low	Very low		
			End Users	Minor	Unlikely	Very low		
	Metals, Semi-metals and non-metals, PAHs, TPHs, pH	Migration via surface runoff	Surface Water	Minor	Unlikely	Very low		
		Direct contact with construction material	Buried structures Buried Services	Minor	Unlikely	Very low		
	PAHs, TPHs	Migration of gases via permeable soils	Site Workers/Site Maintenance End Users	Minor	Unlikely	Very low		
			Off-site Users	Minor	Unlikely	Very low		
			Building and confined spaces					
Infilled Pond and Historical Light Railway Off-site sources from which potential contamination would have migrated onto the site.	Metals, Semi-metals and non-metals, PAHs, Asbestos	Inhalation of dust	Site Workers/Site Maintenance End Users Off-site Users	Minor	Unlikely	Very low	Infilled pond directly on site boundary may pose possible risk of soil gas generation.	Phase II ground investigation to confirm the ground conditions present and chemical testing prior to undertaking a generic quantitative risk assessment. Regime of soil gas monitoring and development of Soil Gas Risk Assessment to quantify potential soil gas risk onsite.
	PAHs, TPHs	Inhalation of Vapour/gases (including Radon)	Site Workers/Site Maintenance End Users Off-site Users	Minor	Unlikely	Very low		
	Metals, Semi-metals and non-metals, PAHs, TPHs, Asbestos, pH	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Minor	Unlikely	Very low		
			End Users					
	Metals, Semi-metals and non-metals, PAHs, TPHs, pH	Migration via surface runoff	Surface Water	Minor	Unlikely	Very low		
		Direct contact with construction material	Buried structures Buried Services	Minor	Unlikely	Very low		
	PAHs, TPHs	Migration of gases via permeable soils	Site Workers/Site Maintenance End Users	Mild	Low	Low		
			Off-site Users					
			Building and confined spaces					

Table C.I.2 CSM Revised Post Testing

Source	Potential Contaminant	Exposure Pathway	Receptor	Initial Assessment from Preliminary Investigation Report Information			Comments	Proposed Investigation
				Severity	Probability	Risk		
Historical site activities and redevelopment On-site historic and current site usage.	Metals, Semi-metals and non-metals, PAHs, Asbestos	Inhalation of dust	Site Workers/Site Maintenance End Users Off-site Users	Minor	Unlikely	Very low	Site located on bedrock of the London Clay Formation, which was classified as unproductive strata and would act as an aquiclude to the groundwater receptors.	
	PAHs, TPHs	Inhalation of Vapour/gases (including Radon)	Site Workers/Site Maintenance End Users Off-site Users	Minor	Unlikely	Very low	No significant levels of contaminants noted in results of generic assessment or exceedance of appropriate criteria	
	Metals, Semi-metals and non-metals, PAHs, TPHs, Asbestos, pH	Ingestion and absorption via direct contact	Site Workers/Site Maintenance End Users	Minor	Unlikely	Very low	No water encountered during investigation.	
	Metals, Semi-metals and non-metals, PAHs, TPHs, pH	Migration via surface runoff	Surface Water	Minor	Unlikely	Very low		
		Direct contact with construction material	Buried structures Buried Services	Minor	Unlikely	Very low		
	PAHs, TPHs	Migration of gases via permeable soils	Site Workers/Site Maintenance End Users Off-site Users Building and confined spaces	Minor	Unlikely	Very low		
				Minor	Unlikely	Very low		
Infilled Pond and Historical Light Railway Off-site sources from which potential contamination would have migrated onto the site.	Metals, Semi-metals and non-metals, PAHs, Asbestos	Inhalation of dust	Site Workers/Site Maintenance End Users Off-site Users	Minor	Unlikely	Very low	Infilled pond directly on site boundary may pose possible risk of soil gas generation.	Regime of soil gas monitoring and development of Soil Gas Risk Assessment to quantify potential soil gas risk onsite.
	PAHs, TPHs	Inhalation of Vapour/gases (including Radon)	Site Workers/Site Maintenance End Users Off-site Users	Minor	Unlikely	Very low		Soil gas monitoring ongoing at the time of reporting.
	Metals, Semi-metals and non-metals, PAHs, TPHs, Asbestos, pH	Ingestion and absorption via direct contact	Site Workers/Site Maintenance End Users	Minor	Unlikely	Very low		
	Metals, Semi-metals and non-metals, PAHs, TPHs, pH	Migration via surface runoff	Surface Water	Minor	Unlikely	Very low		
		Direct contact with construction material	Buried structures Buried Services	Minor	Unlikely	Very low		
	PAHs, TPHs	Migration of gases via permeable soils	Site Workers/Site Maintenance End Users Off-site Users Building and confined spaces	Mild	Low	Low		

Appendix C.2 Chemical Laboratory Results



Tim Rudkin
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Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

DETS Ltd
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Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

DETS Report No: 18-80707

Site Reference: Day Nursery, Waterloooville

Project / Job Ref: 17077

Order No: None Supplied

Sample Receipt Date: 14/08/2018

Sample Scheduled Date: 14/08/2018

Report Issue Number: 1

Reporting Date: 20/08/2018

Authorised by:



Kevin Old
Associate Director of Laboratory

Authorised by:



Russell Jarvis
Associate Director of Client Services



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



Soil Analysis Certificate						
DETS Report No: 18-80707	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Day Nursery, Waterloooville	TP / BH No	WS1	WS1	WS2	WS3	WS4
Project / Job Ref: 17077	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	0.50	0.40	0.20	0.40
Reporting Date: 20/08/2018	QTSE Sample No	354121	354122	354123	354124	354125

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	6.6	7.7	8.0	8.2	6.8
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	84	50	44	29	19
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.08	0.05	0.04	0.03	0.02
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	< 5
Organic Matter	%	< 0.1	MCERTS	3.6	1.1	1.8	2.3	2.6
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	2.1	0.6	1	1.3	1.5
Antimony (Sb)	mg/kg	< 1	NONE	1	< 1	1.8	< 1	1.9
Arsenic (As)	mg/kg	< 2	MCERTS	8	7	10	10	8
Beryllium (Be)	mg/kg	< 0.5	NONE	0.5	< 0.5	0.6	0.5	< 0.5
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	16	15	13	12	14
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	35	10	33	39	26
Lead (Pb)	mg/kg	< 3	MCERTS	299	37	245	286	177
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	9	6	10	9	9
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	29	26	29	23	28
Zinc (Zn)	mg/kg	< 3	MCERTS	95	36	74	166	48
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Subcontracted analysis (S)



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



Soil Analysis Certificate						
DETS Report No: 18-80707	Date Sampled	None Supplied				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Day Nursery, Waterloooville	TP / BH No	WS5				
Project / Job Ref: 17077	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.20				
Reporting Date: 20/08/2018	QTSE Sample No	354126				

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected			
pH	pH Units	N/a	MCERTS	8.1			
Total Cyanide	mg/kg	< 2	NONE	< 2			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	< 10			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	< 0.01			
Sulphide	mg/kg	< 5	NONE	< 5			
Organic Matter	%	< 0.1	MCERTS	0.8			
Total Organic Carbon (TOC)	%	< 0.1	MCERTS	0.5			
Antimony (Sb)	mg/kg	< 1	NONE	< 1			
Arsenic (As)	mg/kg	< 2	MCERTS	3			
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5			
W/S Boron	mg/kg	< 1	NONE	< 1			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	8			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	24			
Lead (Pb)	mg/kg	< 3	MCERTS	46			
Mercury (Hg)	mg/kg	< 1	NONE	< 1			
Nickel (Ni)	mg/kg	< 3	MCERTS	5			
Selenium (Se)	mg/kg	< 3	NONE	< 3			
Vanadium (V)	mg/kg	< 2	NONE	13			
Zinc (Zn)	mg/kg	< 3	MCERTS	59			
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
 Subcontracted analysis (S)



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Soil Analysis Certificate - Speciated PAHs

DETS Report No: 18-80707	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Day Nursery, Waterloooville	TP / BH No	WS1	WS1	WS2	WS3	WS4
Project / Job Ref: 17077	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	0.50	0.40	0.20	0.40
Reporting Date: 20/08/2018	QTSE Sample No	354121	354122	354123	354124	354125

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.17	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	0.27	< 0.1	0.56	0.92	0.18
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.15	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.58	< 0.1	0.94	2.24	0.21
Pyrene	mg/kg	< 0.1	MCERTS	0.51	< 0.1	0.75	1.92	0.20
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.31	< 0.1	0.43	1.25	0.14
Chrysene	mg/kg	< 0.1	MCERTS	0.45	< 0.1	0.65	1.49	0.23
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.66	< 0.1	0.80	2.23	0.34
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.25	< 0.1	0.31	0.79	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.44	< 0.1	0.52	1.64	0.20
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.34	< 0.1	0.36	1.37	0.16
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.19	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.31	< 0.1	0.31	1.16	0.14
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	4.1	< 1.6	5.8	15.4	1.8

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - Speciated PAHs

DETS Report No: 18-80707	Date Sampled	None Supplied				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Day Nursery, Waterloooville	TP / BH No	WS5				
Project / Job Ref: 17077	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.20				
Reporting Date: 20/08/2018	QTSE Sample No	354126				

Determinand	Unit	RL	Accreditation				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1			
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1			
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1			
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1			
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1			
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1			
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1			
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1			
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1			
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1			
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1			
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1			
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1			
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1			
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1			
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1			
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6			

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Soil Analysis Certificate - TPH LQM Banded						
DETS Report No: 18-80707	Date Sampled	None Supplied	None Supplied			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Day Nursery, Waterlooille	TP / BH No	WS1	WS5			
Project / Job Ref: 17077	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	0.20	0.20			
Reporting Date: 20/08/2018	QTSE Sample No	354121	354126			

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2			
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2			
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3			
Aliphatic >C16 - C35	mg/kg	< 10	MCERTS	< 10	< 10			
Aliphatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10			
Aliphatic (C5 - C44)	mg/kg	< 30	NONE	< 30	< 30			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2			
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2			
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2			
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	4	< 3			
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	27	< 10			
Aromatic >C35 - C44	mg/kg	< 10	NONE	< 10	< 10			
Aromatic (>C5 - C44)	mg/kg	< 30	NONE	31	< 30			
Total >C5 - C44	mg/kg	< 60	NONE	< 60	< 60			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C



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Soil Analysis Certificate - BTEX / MTBE

DETS Report No: 18-80707	Date Sampled	None Supplied	None Supplied			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Day Nursery, Waterloooville	TP / BH No	WS1	WS5			
Project / Job Ref: 17077	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	0.20	0.20			
Reporting Date: 20/08/2018	QTSE Sample No	354121	354126			

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2			
Toluene	ug/kg	< 5	MCERTS	< 5	< 5			
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2			
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2			
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2			
MTBE	ug/kg	< 5	MCERTS	< 5	< 5			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Soil Analysis Certificate - Sample Descriptions

DETS Report No: 18-80707
Soils Ltd
Site Reference: Day Nursery, Waterloooville
Project / Job Ref: 17077
Order No: None Supplied
Reporting Date: 20/08/2018

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 354121	WS1	None Supplied	0.20	7.2	Brown sandy clay with vegetation
^ 354122	WS1	None Supplied	0.50	9.1	Brown sandy clay
^ 354123	WS2	None Supplied	0.40	7.3	Brown sandy clay
^ 354124	WS3	None Supplied	0.20	5.4	Brown sandy clay
^ 354125	WS4	None Supplied	0.40	7.8	Brown sandy clay
^ 354126	WS5	None Supplied	0.20	13.1	Brown sandy clay with brick and chalk

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

Insufficient Sample ^{U/S}

Unsuitable Sample ^{U/S}

^ no sampling date provided; unable to confirm if samples are within acceptable holding times



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 18-80707

Soils Ltd

Site Reference: Day Nursery, Waterlooville

Project / Job Ref: 17077

Order No: None Supplied

Reporting Date: 20/08/2018

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

D Dried
AR As Received

Appendix C.3 General Assessment Criteria

HUMAN HEALTH RISK ASSESSMENT

1.1 Introduction

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

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

1.2 General Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

1.2.1 Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

- EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
 - EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
 - EA CLEA Bulletin (2009).
 - CLEA software version 1.04 (2009)
 - Toxicological reports and SGV technical notes.
-

The CLEA guidance and tools:

1. do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.
 2. do not cover risks to the environment, such as groundwater, ecosystems or buildings.
 3. do not provide a definitive test for telling when human health risks are significant.
 4. are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.
-

1.3 Soil Guideline Values (2009)

The EA are publishing a series of SGV reports for a selection of common contaminants relevant to the assessment of land contamination.

SGV's are generic assessment criteria based on CLEA standard land-uses and can be used to simplify the assessment of human health risks from long-term exposure to

chemical contamination in soil. They do not cover short-term exposure (i.e. construction and maintenance workers), acute exposure or other risks such as fire, suffocation or explosion, as might arise from an accumulation of gases such as methane and carbon dioxide, or either odour or aesthetic issues.

SGV's represent 'trigger values', indicators that soil concentrations above the SGV level may pose a possibility of *significant harm* to human health. The converse, where soil concentrations are less than the SGV, is that the long-term human health risks are considered to be tolerable or minimal.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.4 Ongoing development of CLEA based guidance

The EA is involved in a programme of publishing SGV's and related toxicity data (the TOX reports). As at July 2009 ten SGV's and matching TOX reports had been published. Soil Assessment Criteria (SAC's) may be derived using toxicity data from the updated TOX reports, where these are published, or from the original TOX reports. SGV reports also take account of recent updates for plant uptake and other factors.

-
- GAC's developed by CLEA guidance and given in this report will need to be assessed against updated TOX reports and SGV's when these are published.
 - SGV reports may give values that differ from the GAC's used in this report.
 - These variations may materially alter the remediation requirement for the site, requiring either an increase or decrease in the extent, type and cost of remediation.
-

1.5 Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

ICRCL 70/90: *Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.*

1.6 Other Generic Assessment Criteria

If an SGV is not available for a substance identified in the soil then the range of Generic Assessment Criteria published from a collaborative research by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH) are used for example. In the case of Lead, Category 4 screening levels (C4SLs) have replaced the AtRisk Soil SSV.

1.6.1 EIC/AGS/CL: AIRE

The report represents the collaborative effort of risk assessors from 26 EIC and AGS member companies to produce generic assessment criteria (GAC) for soils for human health risk assessment. The project involved the collation and review of physico-chemical data, toxicological data and information on background

exposure for 44 contaminants sometimes encountered on land affected by contamination in the UK and the derivation of GAC for 351 of these using the CLEA model (v1.06). The GAC are intended to complement soil guideline values (SGV) produced by the Environment Agency of England and Wales and the 2nd edition GAC produced by LQM and CIEH (Nathanail et al, 2009). All three sets of assessment criteria have been derived in general accordance with the Environment Agency of England and Wales Contaminated Land Exposure Assessment (CLEA) guidance and thus the combined efforts of these three groups have resulted in a useful set of screening criteria for the assessment of risks to human health from soil contamination for more than 120 potentially contaminative substances.

1.6.2 Category 4 screening levels (C4SLs) (2014)

A new statutory DEFRA guidance recently (i.e. August 2014) published some GACs with a more pragmatic (but still strongly precautionary) approach in their derivation called the Category 4 screening levels (C4SLs). These values provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land. They are intended as generic screening values, (ii) they describe a level of risk that whilst above 'minimal' is still 'low' and (iii) they provide a 'higher simple test' for deciding that land is suitable for use and definitely not contaminated. These values were derived for four generic land uses: residential, commercial, allotments, and public open space.

1.6.3 LQM/CIEH Suitable 4 Use Level (S4UL) (2015)

The new S4UL's ((Nathanail *et al*, 2015), was developed for around 85 substances and are intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants. The S4ULs were:

- based on Health Criteria Values, updated to reflect changes since 2009
- derived for the standard CLEA land uses and the two public open space scenarios developed by Defra SP1010
- developed for ca 85 substances (those previously covered by the LQM/CIEH GAC and the SGV substances);
- Compliant with SR2 and the long standing principle of 'suitable for use' and reflecting changes to exposure parameters produced by Defra SP1010.

For derivation of these Generic Assessment Criteria reference must be made to: Nathanail, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (3rd edition)*. **Land Quality Press**. 2015.

1.7 Standard Land-use Scenarios

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

1.7.1 Residential

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

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

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur.

1.7.2 Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption.

Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

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

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

1.7.3 Commercial/Industrial

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

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

1.7.4 Public Open Space within Residential Area

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

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

1.7.5 Public Open Space Park

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

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

1.8 Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an SGV/GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
- Developing more accurate parameters using site data.

1.9 Current Criteria

Table 1 presents the current Generic Assessment Criteria and reference should be made to the original publications if needed.

1.10 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) and Category 4 screening levels (C4SLs) (2014) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CL:AIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CL:AIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

Treatment of Hot-Spots

- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
 - Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.
-

Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date	
			With			Without			Allotments			Commercial			Residential			Park						
			SOM	home-grown produce	6	home-grown produce	6																	
Type	Contaminants	Species	Year	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

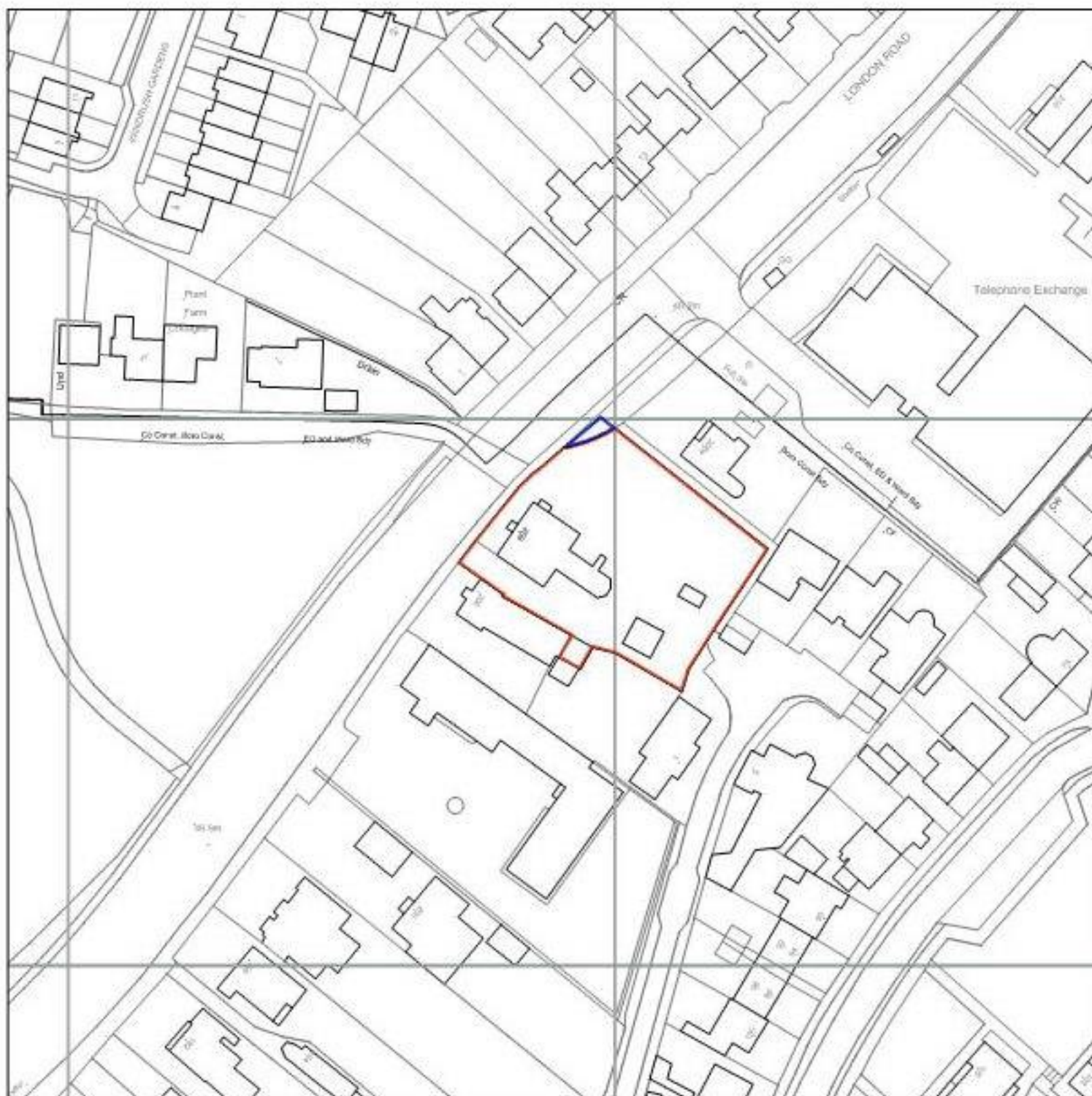
Land Use			Residential With or Without Plant Uptake									Public Open Space (POS)									Name	Authority	Date	
			With			Without			Allotments			Commercial			Residential			Park						
			SOM	1.0	2.5	6	1	2.5																6
Type	Contaminants	Species	Year																					
	Aromatic >C21 - C35		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aromatic >C34 - C44		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aliphatic + Aromatic >C44 - C70			1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
Polycyclic Aromatic Hydrocarbons (PAH's) (mg/kg)	Acenaphthene		2015	210	510	1100	3000	4700	6000	34	85	200	84000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Acenaphthylene		2015	170	420	920	2900	4600	6000	28	69	160	83000	97000	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Anthracene		2015	2400	5400	11000	31000	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	S4UL	LQM/CIEH	2015
	Benzo(a)anthracene		2015	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	S4UL	LQM/CIEH	2015
	Benzo(a)pyrene		2014		5			5.3				5.7			76			10		21	C4SL	DEFRA	2014	
			2015	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	S4UL	LQM/CIEH	2015
	Benzo(b)fluoranthene		2015	2.6	3.3	3.7	3.9	4.0	4.0	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16	S4UL	LQM/CIEH	2015
	Benzo(ghi)perylene		2015	320	340	250	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	S4UL	LQM/CIEH	2015
	Benzo(k)fluoranthene		2015	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	S4UL	LQM/CIEH	2015
	Chrysene		2015	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	S4UL	LQM/CIEH	2015
	Dibenz(a,h)anthracene		2015	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	S4UL	LQM/CIEH	2015
	Fluoranthene		2015	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400	S4UL	LQM/CIEH	2015
	Fluorene		2015	170	400	860	2800	3800	4500	27	67	160	63000	68000	71000	9900	9900	9900	20000	20000	20000	S4UL	LQM/CIEH	2015
	Indeno(1,2,3-cd)pyrene		2015	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	S4UL	LQM/CIEH	2015
	Naphthalene		2015	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190	460	1100	4900	4900	4900	1200	1900	3000	S4UL	LQM/CIEH	2015
	Phenanthrene		2015	95	220	440	1300	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	S4UL	LQM/CIEH	2015
	Pyrene		2015	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	S4UL	LQM/CIEH	2015
	Coal Tar(Bap as surrogate matter)		2015	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	S4UL	LQM/CIEH	2015
Chloroalkanes & alkenes	1,2 Dichloroethane		2015	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	S4UL	LQM/CIEH	2015
	1,1,1 Trichloroethane		2015	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000	76000	100000	S4UL	LQM/CIEH	2015
	1,1,2,2 Tetrachloroethane		2015	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	S4UL	LQM/CIEH	2015
	1,1,1,2 Tetrachloroethane		2015	1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	110	250	560	1400	1400	1400	1500	1800	2100	S4UL	LQM/CIEH	2015
	Tetrachloroethene		2015	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	42	95	1400	1400	1400	810	1100	1500	S4UL	LQM/CIEH	2015
	Tetrachloromethane (Carbon Tetrachloride)		2015	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	S4UL	LQM/CIEH	2015
	Trichloroethene		2015	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	S4UL	LQM/CIEH	2015
	Trichloromethane		2015	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	S4UL	LQM/CIEH	2015
	Vinyl Chloride (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
	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
Explosives	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									

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

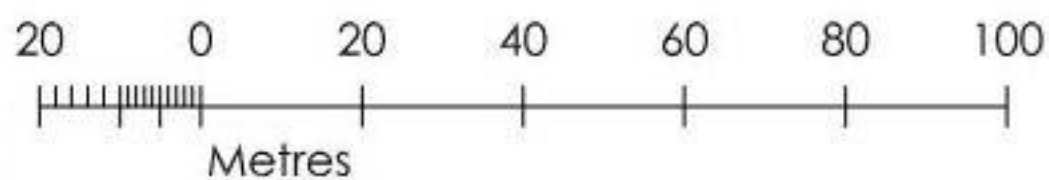
NOTE

Priority	Guideline (mg kg ⁻¹)
1	Site Specific Assessment Criteria (SSAC) (Soils Limited)
2	2014: Category 4 Screening Level (C4SL) (Contaminated Land: Application in Real Environment (CL:ARE), 2014)
3	2012: Soil Guideline Value (SGV) (Environment Agency, 2009)
4	2015: Suitable 4 Use Level (S4UL) (Nathanail <i>et al</i> , 2015)
For Generic Risk Assessment, the values in Bold have priority	
Table reviewed February 2018	

Appendix D Information Provided by the Client



Site Location Plan Scale ~ 1:1250



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Address
208 London Road,
Waterlooville,
PO7 7AN

Unit D1, Pinley Bams
Pinley Manor
Sundome Road
Shrewsbury
SY4 4SD
Tel: 01743 361211

**THE
PLANNING
GROUP
LIMITED**

info@planning-group.co.uk

Project
Proposed Day Nursery

Drawing
Site Location Plan

scale	paper size	drawing no.	date
1:1250	A4	208LR / PP / 01	Oct 17



Landscaping:

- Deciduous trees and shrubs.
- Conifers and evergreens.
- Herbaceous plants (including marginals).
- Wildflower plugs.
- Aquatic plants.
- Grass seed.

Hibernacula:

Nest boxes are widely used in the ecology profession to provide additional habitat or mitigate for habitat losses due to development work. Wildcare provide sturdy bat and bird boxes tailored to specific species, times of year and situations, from brands such as Schwegler, Wildlife World and The Nest Box Company.

3 No tree mounted Softwood Bat boxes to be provided.

Existing tree protection:

Galv Mesh 'stock fence' 80:80:15 high tensile galv mesh, stapled to treated turned softwood posts at average 3m centres.

Boundary Treatments:

- 2 metre high acoustic fencing around perimeter of Play Area.
- - - 0.9 metre high brick wall with 0.9 metre railings above



B 14.05.18 Bin Store & Bike Store relocated.
A 22.02.18 Frontage boundary amended; Play Area acoustic fencing added; landscaping added.

Unit D1, Pimley Bams
Pimley Manor
Sundome Road
Shrewsbury
SY4 4SD

**THE
PLANNING
GROUP
LIMITED**
info@planning-group.co.uk

Project

Proposed Day Nursery at:
208 London Road, WATERLOOVILLE,
PO7 7AN

Drawing

Proposed Site Plan

scale	paper size	drawing no.	date
1:200	A3	208LR/PP/04 B	July 17

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