Site at Britannia House
High Street
Shoreham
West Sussex

Combined Geotechnical and Ground Contamination Risk Assessment

Report No. R18-12694

February 2018

Report prepared for the benefit of:

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The risk assessment presented in this report follows 'source-pathway-receptor' techniques for the determination of whether a site is contaminated. This is standard practice in the UK, being intrinsic to Part 2A of the Environmental Protection Act 1990 as amended.

The report considers the proposed end users as the most sensitive human health receptors. If significant risks to construction workers are identified by the preliminary assessment attention is drawn to this, although it is noted that no assessment of risk from acute exposure has been undertaken in this connection.

EXECUTIVE SUMMARY

The following presents a summary of the main findings of the ground investigation. It is emphasised that no reliance should be placed on any individual point until the whole of the report has been read as other sections of the report may put into context the information contained herein.

It is proposed to redevelop a plot of land located adjacent to Britannia House, High Street, Shoreham, for residential use. The development proposals comprise the construction of a new two storey building to be used as student accommodation with garages at ground floor level. No areas of soft landscaping are proposed within the development.

Reference to geological datasets indicates that the site is expected to be underlain by Head deposits overlying the White Chalk Subgroup.

The Head deposits are classed as Secondary Undifferentiated Strata. The White Chalk Subgroup is classed as a Principal Aquifer. The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply. During the intrusive works groundwater was recorded at a depth of 4.3m within BH01. The remaining boreholes were dry during drilling. Groundwater monitoring undertaken to date has recorded standing water at a depth of 2.85m within the standpipe at WS05, although the remaining standpipe locations were dry.

The design of precautions against shrinkage and heave for any new foundation system should assume a medium volume change potential for the fine grained Head deposit soils.

Given the presence of deep made ground and locally low strength soils at the site, which given the historical use of the site possibly represent reworked soils, it is considered that a piled foundation solution is likely to be required for the proposed structure. Indicative pile capacities are included in the body of the report.

A DS-1 Design Sulfate Class and an AC-1 ACEC classification should be assumed as a minimum for the design of concrete in contact with the ground.

It is recommended that ground floors for structures sensitive to movement should be suspended.

The ground investigation has not identified any of the potential contaminants within the underlying soils at concentrations considered to pose an unacceptable risk to either end users or controlled waters. An addendum gas risk assessment will be issued on completion of the monitoring programme, which will confirm whether any gas protection measures are required.

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FIGURES

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1. INTRODUCTION

It is proposed to redevelop a plot of land located adjacent to Britannia House, High Street, Shoreham, West Sussex, for residential use. The development proposals comprise the construction of a new two storey building to be used as student accommodation with garages at ground floor level. No areas of soft landscaping are proposed within the development. A copy of the proposed development layout is presented in Appendix A.

Ashdown Site Investigation Limited was requested to provide an estimate for carrying out a geotechnical and ground contamination risk assessment of the site by Mr D. Shone of Boutique Modern Ltd., 3 Newhaven Industrial Park, Beach Road, Newhaven, BN9 0BX. The scope of the works allowed for and the terms and conditions under which the works were to be undertaken were set out within the offer letter Q18-6733/rev1, dated 10th January 2018. The instruction to proceed was received from the client, Boutique Modern Ltd., in an email dated 10th January 2018. The works were carried out under purchase order number SHS002.

The objectives of the works were to:
a) Establish the expected geology and hydrogeology at the site;
b) Investigate the ground and groundwater conditions prevailing at the site;
c) Provide advice to assist others in undertaking design of foundations and ground floors;
d) Test for the presence of contaminants identified by the preliminary conceptual model; and
e) Develop a quantitative conceptual model of the site, refining the preliminary model to identify any remaining pollutant linkages.

This report should be read in conjunction with the Preliminary Ground Contamination Risk Assessment Report prepared by Ashdown Site Investigation Ltd[1].

[1] Ashdown Site Investigation Report No. R18-12694/ds, dated February 2018.

2. SITE DESCRIPTION

The site comprises a rectangular shaped plot of land located to the west of Britannia House, High Street, Shoreham, West Sussex, and is centred on the approximate Ordnance Survey national grid reference TQ 2134 0504. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively.

The site is bounded by a retail unit to the north beyond which lies the High Street. To the east is an asphalt surfaced access way leading to the rear of Britannia House which lies further to the east. A block of flats lies to the south and a public house lies to the west. The site and surrounding area sloped gently downwards from north to south.

At the time of the ground investigation the site was clear of permanent structures and comprised concrete/asphalt surfacing.

3. GEOLOGICAL AND HYDROGEOLOGICAL INFORMATION

3.1 Expected Geology, Aquifer Designation & Groundwater Vulnerability

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Strata, Aquifer Designation and Description

Type	Stratum	Aquifer Designation	Source Protection Zone
Superficial	Head	Secondary Undifferentiated Aquifer	The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply.
Bedrock	White Chalk Subgroup	Principal Aquifer	

The superficial Head is a polymict deposit generally comprising clay and sandy clay with variable amounts of gravel and cobbles. The lithology of the Head reflects the nature of the parent solid strata; the gravel and cobble fraction comprising chalk and flint. The material is likely to have been disturbed by intense frost action in a periglacial environment. It is usually poorly sorted but may be stratified where it has been subject to by solifluction and/or hillwash and soil creep. It may form infill to solution features within the chalk.

The White Chalk Subgroup comprises a weak, white chalk locally with flint bands together with scattered nodular flints. It may be expected to have a deeply convoluted upper surface as a result of solution weathering. The presence of natural cavities in the chalk is very rare and solution features, if present, can be expected to be infilled with Quaternary deposits such as the Head deposits. The infill material may be significantly weaker than the surrounding chalk. Solution features can comprise pipes extending to several metres deep into the chalk or conical depressions and basin shaped structures.

Historically, chalk deposits were often mined locally. Most commonly historical mines characteristically comprise a narrow shaft with a number of chambers radiating from the base. These structures are colloquially known as "deneholes", "chalk-wells" or "chalkangles". The depth of the features reflects the depth to the underlying chalk bedrock. The shaft width was commonly in the order of 2m to 3m, widening out into galleries at depth. The chalk was extracted

for soil improvement and was usually applied directly to fields though sometimes the chalk was processed, typically by burning in kilns where the chalk was used to produce quicklime (calcium oxide). Once they had reached their limits the mines were commonly capped. Various capping techniques were used; examples include the use of upturned trees or brick arching. Records pertaining to the distribution of these localised mines are incomplete, usually being limited to features marked as shafts or the occurrence of circular depressions on historic Ordnance Survey maps. In the field they are most likely to be visible as shallow depressions, if at all.

Site inspection and inspection of historical maps extending back in time to the 1870's does not reveal the presence of any significant features at the site though, for reasons given above, their presence cannot be fully discounted. It is therefore recommended that all stripped formation levels should be inspected for evidence of historical backfilled shafts as a precaution.

4. GROUND INVESTIGATION

4.1 Introduction

The ground investigation comprised the excavation of a series of dynamic sampler boreholes with accompanying in situ geotechnical testing. Gas and groundwater monitoring standpipes were installed in selected exploratory holes and monitored on subsequent site visits. The fieldwork was carried out on 15th and 26th January 2018. The exploratory hole locations are shown on Figure 2.

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in Appendix B, together with notes to assist in their interpretation.

4.2 Exploratory Holes

4.2.1 Dynamic Sampler Boreholes

Six boreholes (designated BH01 and WS01 to WS05) were drilled to depths of between 3.0m and 9.0m below ground level.

The boreholes were formed by a series of 1.0m long, open ended, hollow steel tubes of up to 100mm diameter, each containing a removable plastic liner. The tubes, progressively reducing in diameter, were driven into the ground by means of a track-mounted drop weight. Each tube was extracted from the ground using a hydraulically operated jack and the enclosed sample was recovered in its plastic liner.

The system enables the recovery of both sub-samples and relatively undisturbed samples for laboratory testing and detailed examination.

4.3 Sampling

Undisturbed and disturbed samples of soil were taken at the depths shown in the exploratory hole records and were collected in plastic liners, plastic bags, plastic tubs or amber jars fitted with gas tight lids.

On collection the amber jars were stored in cool boxes with cooling blocks to maintain temperatures below 4°C until transferred to refrigerators upon return to the office and subsequently forwarded to the external accredited chemical testing laboratory.

4.4 In Situ Testing

The depths of in situ testing, together with the test results, are either given on the exploratory hole records or are summarised separately in Appendix B. Notes providing additional information on the tests performed are included in the appendix.

4.4.1 DPSH Dynamic Probe (Super Heavy) Testing

Continuous dynamic probe tests were undertaken adjacent to each borehole. The tests were conducted to depths of between 5.0m and 12.4m below ground level using a super heavy DPSH-B[2] probing geometry.

The DPSH-B configuration is similar to that of the standard penetration test (SPT); the main differences being that the tip comprises a 90° cone, the driving rods are lighter than those used for SPT testing and the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT.

The blow counts recorded and the calculated dynamic point resistances, which account for inertia of the anvil and driving rods, are presented on the borehole records and separately in Appendix B.

4.4.2 Undrained Shear Strength

Undrained shear strength determinations were made in situ within the fine grained soils using a Geonor hand shear vane. Additionally, undrained shear strength determinations were made within samples of the fine grained soils held in the dynamic sampler liners using a hand penetrometer.

4.5 Installations

Gas and groundwater monitoring standpipes were installed to depths of 3.0m within boreholes WS01, WS03 and WS05. Descriptions of the installations are shown on the exploratory hole records in Appendix B.

The concentrations of gases and depths to groundwater within the standpipes have been recorded on one occasion to date, on 24th January 2018. A further five monitoring visits are scheduled to be undertaken at approximately fortnightly intervals. The readings obtained to date are presented in Appendix B.

4.6 Laboratory Testing

Laboratory testing was scheduled by Ashdown Site Investigation Ltd. Results from the laboratory tests are provided in Appendix C.

4.6.1 Geotechnical Testing

Geotechnical testing was undertaken by Ashdown Site Investigation Ltd in accordance with the methods given in BS1377[3]. Chemical testing to enable classification of the chemical environment of soils in accordance with BRE SD1[4] was undertaken by an external UKAS accredited laboratory. Notes to assist with the interpretation of the tests are contained within Appendix C.

[2] As defined by BS EN ISO 22476-2:2005.

[3] BS1377:1990 Parts 1 to 8, Methods of test for soils for civil engineering purposes.

[4] BRE Special Digest 1:2005 Concrete in Aggressive Ground.

4.6.2 Chemical Testing

Chemical testing of selected samples was undertaken by a laboratory with recognised (UKAS and MCERTS) accreditation for quality control.

5. GROUND CONDITIONS

5.1 Stratigraphy

5.1.1 Surface Covering

Boreholes BH01, WS02 and WS04 were excavated through a surface cover of concrete some 150mm thick. WS01 was excavated through a cover of asphalt over concrete some 150mm thick.

No specific surfacing materials were encountered at boreholes WS03 or WS05.

5.1.2 Made Ground

Made ground, generally comprising sandy gravelly clay was recorded extending to depths ranging from 0.50m to 1.90m below ground level. The gravel fraction comprised variable quantities of flint, chalk, brick, mortar, concrete and charcoal-type material.

The depth of the made ground appears to increase towards the southern end of the site.

5.1.3 Head

Underlying the made ground, the investigation progressed into undisturbed sandy gravelly clay deposits which were recorded to the full depths of boreholes WS01, WS02, WS03 and WS05 and to a depth of some 4.50m and 6.20m below ground level in boreholes WS04 and BH01, respectively. These soils are considered to represent the Head deposits indicated on the published geological map.

In general, the consistency of the clay deposits was noted as being firm varying stiff, however locally soft clays were encountered within the upper part of the stratum (as recorded to a depth of approximately 1.80m at WS02 and 1.75m in WS03). It is also noted that the in situ dynamic probe undertaken adjacent to borehole WS02 recorded only a single blow for the probe to progress between 0.40m and 1.60m. Furthermore, the dynamic probe results indicate that below a depth of approximately 3m, locally soft/firm clays may be present. It is possible that these soft clay soils may be representative of reworked soils, particularly given the historical use of the area as a shipbuilding yard with associated docks.

5.1.4 White Chalk Subgroup

Beneath the Head deposits, where penetrated, boreholes BH01 and WS04 encountered chalk deposits which continued to the full depth of the investigation of 9.0m below ground level (BH01).

These deposits are considered to be representative of the White Chalk Subgroup indicated on the published geology map.

5.2 Stability

With the exception of borehole BH01 which was noted to be unstable, each of the exploratory holes was recorded to remain stable during the course of drilling.

5.3 Groundwater Conditions

Groundwater was recorded at a depth of 4.3m within borehole BH01 during drilling. The remaining exploratory holes were dry during the intrusive ground investigation

Standing water was recorded at a depth of 2.85m in the WS05 standpipe during the first monitoring visit. The remaining two standpipes, installed to 3.0m depth were dry.

6. GEOTECHNICAL ASSESSMENT

The geotechnical assessment has been prepared in connection with the development proposals shown on the drawing produced by Bale House CAD Ltd and included in Appendix A.

In summary the proposed development comprises the construction of a new studio apartment block up to two-storey in height, incorporating four ground floor garage units.

At the time of writing, no details were available concerning the specific loads likely to be applied to the foundations.

6.1 Foundations

6.1.1 Soil Shrinkage/Heave Potential

The fine grained soils of the Head deposits have been classified as clays of intermediate to high plasticity and with modified plasticity indices in the range of 9% to 24% the soils may be expected to exhibit a non-plastic through to medium volume change potential.

It is recommended that the design of precautions against shrinkage and heave for any new foundation system (piles, pile caps and ground beams etc.) should assume a medium volume change potential for the fine grained Head deposit soils and take into account current guidance such as that given by the Building Research Establishment (BRE)[5] or the National House Builders Council (NHBC)[6].

Whilst this report has been prepared to provide advice to assist designers in undertaking detailed design, the report itself does not represent a detailed design statement. It is recommended that an arboricultural survey of the site should be conducted to establish the species and maturity of the existing trees in the areas of the proposed new buildings. The survey should be extended to include a review of historical photographs and detailed site plans (if available) to establish the species and location of any felled trees that may affect foundation design. The information obtained from the arboricultural survey, information on proposed planting schemes and the findings of this report should be provided to the structural engineer responsible for the detailed design of foundation systems, including assessment of minimum founding depths for spread foundations, requirements for sleeving or reinforcing of piled foundations and requirements for placement of void formers et cetera.

6.1.2 Piled Foundations

Locally deep made ground and soft clays were encountered to variable and locally significant depths across the site. Made ground should be regarded as being unsuitable as a founding medium and as such foundations should be deepened to bear beneath all made ground soils.

Given the low shear strength of the Head deposits and that, given the historical use of the site, these soils may represent reworked soils, they should also be regarded as being unsuitable as a founding medium for shallow foundations. In view of the depth to the competent Head strata it is therefore considered that a piled foundation solution is likely to be required for the site.

[5] www.bre.co.uk : BRE Digests 40, 241 and 242, Low rise buildings on shrinkable clay soils, parts 1, 2 and 3; and BRE Digest 298 , The influence of trees on house foundations in clay soils and BRE Digest 412, Desiccation in clay soils.
[6] http://www.nhbc.co.uk/ : NHBC Standards, Chapter 4.2.

It is considered that the Head deposits and underlying White Chalk Subgroup would provide support to piled foundations by a combination of side adhesion (skin friction) and end bearing.

The proven ground conditions would indicate that bored piles could be employed to provide a suitable foundation solution. However the method of installation would have to accommodate the presence of groundwater, potential relict structural obstructions and/or naturally occurring hard strata that were recorded during excavation of the deeper borehole. In addition, the selection of piling techniques should consider access constraints applicable to particular plant and potential vibration effects on existing services, structures and roadways.

Depending on the method employed it is considered likely that driving displacement (driven) piles could prove difficult and be disruptive to nearby structures.

For the purpose of this initial discussion and for reasons given above, consideration has been given to the adoption of bored piles, the use of which would prove beneficial as, this method enables temporary steel casing to be installed to stabilise the pile bore and a range of boring tools, including chisels, can be employed to progress pile bores through difficult ground. The use of bentonite slurry may be required where high groundwater pressures are encountered within sand horizons in order to avoid sand rising within the pile bore.

Calculations to determine illustrative working loads for axially loaded piles have been undertaken; each calculation assuming a single pile acting in compression. Indicative capacities are presented in the following table. Available capacities may vary for piles acting in tension.

The soil profile assumed for these calculations has been based on examination of the recovered samples and the results of in situ and laboratory testing. A modelled ground profile comprising made ground/soft soils to a depth of 2m, underlain by firm clay of the Head deposits to a depth of 6.5m, overlying the White Chalk Subgroup for the remaining length of the pile has been adopted. Groundwater has been assumed to be present at a depth of 3.0m below ground level.

Table 2. Indicative Axially Loaded Pile Working Capacities

Working Loads of Piles (kN)			
	Size (mm)		
Length (m)	**150**	**300**	**450**
8	50	140	260
10	85	205	360
12	120	280	470

Notes:
The structural strength of the concrete used in construction may limit the available working loads of the piles. Indicated pile lengths are from existing ground level. A factor of safety of 3.0 has been applied. The benefit of shaft resistance within the upper 3m has been discounted. The ground conditions between 9m and 12m have been assumed to be similar to those encountered at 9.0m based upon the dynamic probe results.

Working capacities for pile groups should be assessed when final design details are known, although for preliminary design purposes it is likely that piles spaced at least 3 x pile diameter from other piles in any group will behave as single piles.

Where preliminary and working pile load tests are undertaken it may be appropriate to reduce Safety Factors, although 2.5 may be a minimum local authority requirement. Should testing not be undertaken it is suggested that a factor of safety of at least 3.0 should be adopted.

For all piling options it is recommended that the advice of specialist foundation contractors should be sought at the earliest opportunity and that piling specifications should be obtained with reference to their particular products as this may affect the calculated pile capacity.

6.2 Groundwater

Groundwater was recorded at a depth of 4.3m within borehole BH01 during the intrusive works. Standing groundwater was recorded at a depth of 2.85m below ground level within the standpipe at WS05 during the first monitoring round. Whilst it is unlikely that any proposed excavations will extend below the groundwater, the potential for perched groundwater to be present at various levels should not be overlooked. It is also possible that heavy precipitation during construction could lead to the ingress of perched groundwater or surface water run-off into excavations. In such circumstances it would be expected that water entering into excavations would be adequately managed by natural drainage or pumping from sumps.

6.3 Stability of Excavations

All made ground exposed in excavations should be assumed to be unstable, even in the short term. Whilst fine grained natural soils may remain stable for a short period of time if not subjected to surcharge loads (such as may be imposed by existing foundations, traffic or storage of materials), the stability of these deposits if left unsupported should be assumed to have the potential to deteriorate. Where stable excavations are required, excavations should either be suitably supported or, if practicable, side slopes should be battered back to a safe angle of repose.

All excavations requiring human entry must be shored or battered as necessary to conform to current best practice, as accepted by the Health and Safety Executive (HSE)[7]. Current legislation requires that where personnel access is required into any excavation a competent person must inspect excavation supports or battering of slopes at the start of the working shift and at other specified times. No work should take place until the excavation is safe. Excavations should also be inspected after any event that may have affected their stability, such as a significant weather event, changes in surcharge loadings imposed by temporary storage of materials or changes in site traffic plans or alteration of support systems. Inspections should be formally recorded and any faults that are found should be corrected immediately.

Particular attention must be paid to ensuring the stability of nearby structures, services and neighbouring sites as well as the road frontages.

6.4 Aggressivity to Concrete

The aggressivity of the soils to concrete has been assessed in accordance with guidance published by the BRE[8].

In consideration of the soils encountered beneath the site it is considered that 'natural ground conditions' may be assumed for the purpose of assessing the aggressivity of the chemical environment for concrete classification (ACEC class). Given the presence of groundwater in the boreholes, 'mobile groundwater' conditions should be assumed.

Assessment of the chemical analysis of the soil indicates a sulphate content falling into Design Sulfate Class DS-1. The results of the pH tests indicate that the underlying soils are alkaline.

[7] Relevant guidance is given on the HSE website, www.hse.gov.uk

[8] BRE Special Digest 1:2005 Concrete in Aggressive Ground.

A DS-1 Design Sulfate Class and an AC-1 ACEC classification should be assumed for the design of concrete in contact with the ground.

6.5 Ground Floors

In view of the variable and locally significant thickness of made ground and the presence of soils of medium volume change potential underlying the site, it is recommended that ground floors for all structures sensitive to movements should be suspended.

7. QUANTITATIVE CONTAMINATION ASSESSMENT

7.1 Introduction

The risk assessment for the site considers the sources of contamination identified, the receptors that may be present in view of the development proposals and the contaminant pathways by which these may be linked.

A complete pollutant linkage is only deemed to exist where all three are present and a site is considered suitable for use where no complete pollutant linkages are identified.

Where a complete pollutant linkage is considered to be present, an assessment of the level of risk associated with the pollutant linkage has been carried out in line with published guidance[9].

The level of risk is determined using the risk matrix presented in the following table. Classifications of probability, consequence and risk are presented in Appendix D.

Table 3. Risk Assessment Matrix

		Probability			
		Very Low	**Low**	**Moderate**	**High**
Consequence	**Very Minor**	Negligible	Very Low	Low	Low/Moderate
	Minor	Very Low	Low	Low/Moderate	Moderate
	Moderate	Low	Low/Moderate	Moderate	High
	Severe	Low/Moderate	Moderate	High	Very High

7.2 Preliminary Conceptual Model

A copy of the preliminary conceptual model taken from the preliminary ground contamination risk assessment[10] is presented in Appendix E.

7.3 Assessment Strategy

The identified sources comprised the potential for contamination anywhere beneath the site from historical uses, and the presence of an off-site landfill.

The ground investigation therefore comprised a series of non-targeted boreholes across the footprint of the site, within some of which were installed gas monitoring standpipes.

7.4 Analysis of Contamination Test Results

For the assessment of risk to human health, the laboratory test results have initially been compared directly with the published 'Suitable For Use Levels' (S4ULs) calculated as a joint project between LQM and CIEH[11]. In lieu of an S4UL screening value for lead, the Category 4

[9] Contaminated Land Risk Assessment: A guide to good practice, CIRIA C552, 2001.
[10] Ashdown Site Investigation Report No. R18-12694/ds, February 2018
[11] The LQM/CIEH Suitable 4 Use Levels, 2015.

Screening Level (C4SL) was used, as published within SP1010[12]. The soil screening values (SSV) used were those calculated for the generic "Residential" land use[13], but without the pathways associated with ingestion of site grown vegetables and ingestion of soil attached to vegetables.

The critical receptor used in modelling this land use is a female child resident on site from birth to age 6. Exposure routes that are considered include the potential for direct ingestion of the soil, the outdoor and indoor ingestion of dust and the potential inhalation of dust and vapours.

In view of the development proposals, which do not include for any areas of soft landscaping where direct contact or dust generation pathways could be present, the screening values used are considered to be highly conservative.

For the assessment of risk to controlled waters a qualitative assessment has been undertaken based upon the concentrations of contaminants recorded within the soil samples and the information obtained about the sensitivity of the underlying strata or nearby surface water receptors.

7.4.1 Volatile Organic Compounds (VOC)

A total of four made ground soil samples were analysed for concentrations of VOC's.

Concentrations of Tetrachloroethene of 59µg/kg and 13µg/kg were recorded in the samples taken from WS01 at 0.4m and WS05 at 0.6m, respectively. The recorded concentrations are well below the relevant residential SSV[14] of 180µg/kg.

All of the remaining compounds tested for were recorded at concentration below the laboratory limits of detection.

In view of the very low concentrations of VOC recorded, these are not considered to pose a significant risk to controlled waters.

7.4.2 Petroleum Hydrocarbons

Nine samples of made ground and undisturbed soils were tested to determine their total concentrations of petroleum hydrocarbons with the results speciated by equivalent carbon weight fractions.

The following table lists the screening values for petroleum hydrocarbon equivalent carbon weight fractions calculated for 1% organic content.

[12] SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report, published by DEFRA, 2014.
[13] As defined within Science Report SC050021/SR3, January 2009, with the amendments discussed in the LQM/CIEH report.
[14] The LQM/CIEH Suitable 4 Use Levels, 2015.

Table 4. Soil Screening Values for petroleum hydrocarbon equivalent carbon weight fractions

Petroleum Hydrocarbon Fraction	SSV (mg/kg)	Petroleum Hydrocarbon Fraction	SSV (mg/kg)
Aliphatic EC 5-6	42	Aromatic EC 5-7	370
Aliphatic EC >6-8	100	Aromatic EC >7-8	860
Aliphatic EC >8-10	27	Aromatic EC >8-10	47
Aliphatic EC >10-12	130	Aromatic EC >10-12	250
Aliphatic EC >12-16	1100	Aromatic EC >12-16	1800
Aliphatic EC >16-35	65000	Aromatic EC >16-21	1900
Aliphatic EC >35-44	65000	Aromatic EC >21-35	1900
		Aromatic EC >35-44	1900

Full speciation of petroleum hydrocarbons by aromatic and aliphatic fractions was not undertaken. However, the results of the testing undertaken can still be compared with the more stringent of the screening values for the respective equivalent carbon weight fraction and, where the concentration recorded is found to be lower, then it can be concluded that no significant risk is present.

None of the samples tested recorded petroleum hydrocarbons above the more conservative of the relevant screening values for each equivalent carbon weight fraction.

Comparison of the test results against the water supply pipe screening criteria[15] indicates that the protection of water supply services is unlikely to be required. However, it is strongly recommended that designers consult with the proposed water supply company to ascertain whether they require further laboratory testing and assessment specific to proposed routes of services.

Where petroleum hydrocarbons have been detected, these were found in the heavier and less mobile weight fractions which are relatively immobile and therefore not considered to pose a significant risk to controlled waters.

7.5 Ground Gases

Monitoring of the gas concentrations within the standpipes in the three boreholes is currently ongoing. An addendum report including a gas risk assessment will be issued on completion of the gas monitoring programme.

7.6 Quantitative Conceptual Model

In the absence of any evidence of contamination within the underlying soils that may pose an unacceptable risk to end users or controlled waters, the only remaining potential source of contamination is the off-site historical landfilling.

The quantitative conceptual model for the proposed development is presented in Appendix E. At present the conceptual model identifies a potential low risk from inhalation of gases but this will be re-assessed on completion of the gas monitoring programme.

[15] Set out within Table 3.1 of the Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UK Water Industry Research, 2010.

7.7 Risks to Other Potential Receptors

The following general guidance is given with regard to other potential on site receptors, which may not necessarily be statutory drivers for remedial works.

As a minimum and in accordance with industry best practice all ground-workers should be issued with the appropriate PPE and should be instructed in safe working methods.

As a precautionary measure, instructions should be given in the recognition of potentially hazardous materials, including oily and odorous soil and water and discoloured or fibrous substances. Any oil-like substances contacting the skin must be washed off immediately using an appropriate cleanser. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food and smoking must be confined to designated clean areas. Suitable welfare (washing) facilities should be provided. These precautions should be taken in addition to anything highlighted by a site specific risk assessment which should be undertaken by any contractor prior to commencing work.

All site personnel should be appropriately briefed on what actions to take in the event that evidence of significant contamination is identified or suspected.

7.8 Discovery Strategy

If, during the course of the site clearance and development works, any materials not previously identified by the investigation that are suspected of being 'contaminants' are encountered, then the following procedure should apply:

- All works in that area should cease and the site manager should be informed.
- Advice should be sought from suitably qualified and experienced personnel as to whether any further site inspection, sampling, testing and/or assessment is deemed necessary.
- If required, the conclusions of any assessment and any proposed remedial works (if required) should be agreed by the local authority.
- If necessary, full details of any remedial works should be included in a verification report for the site.

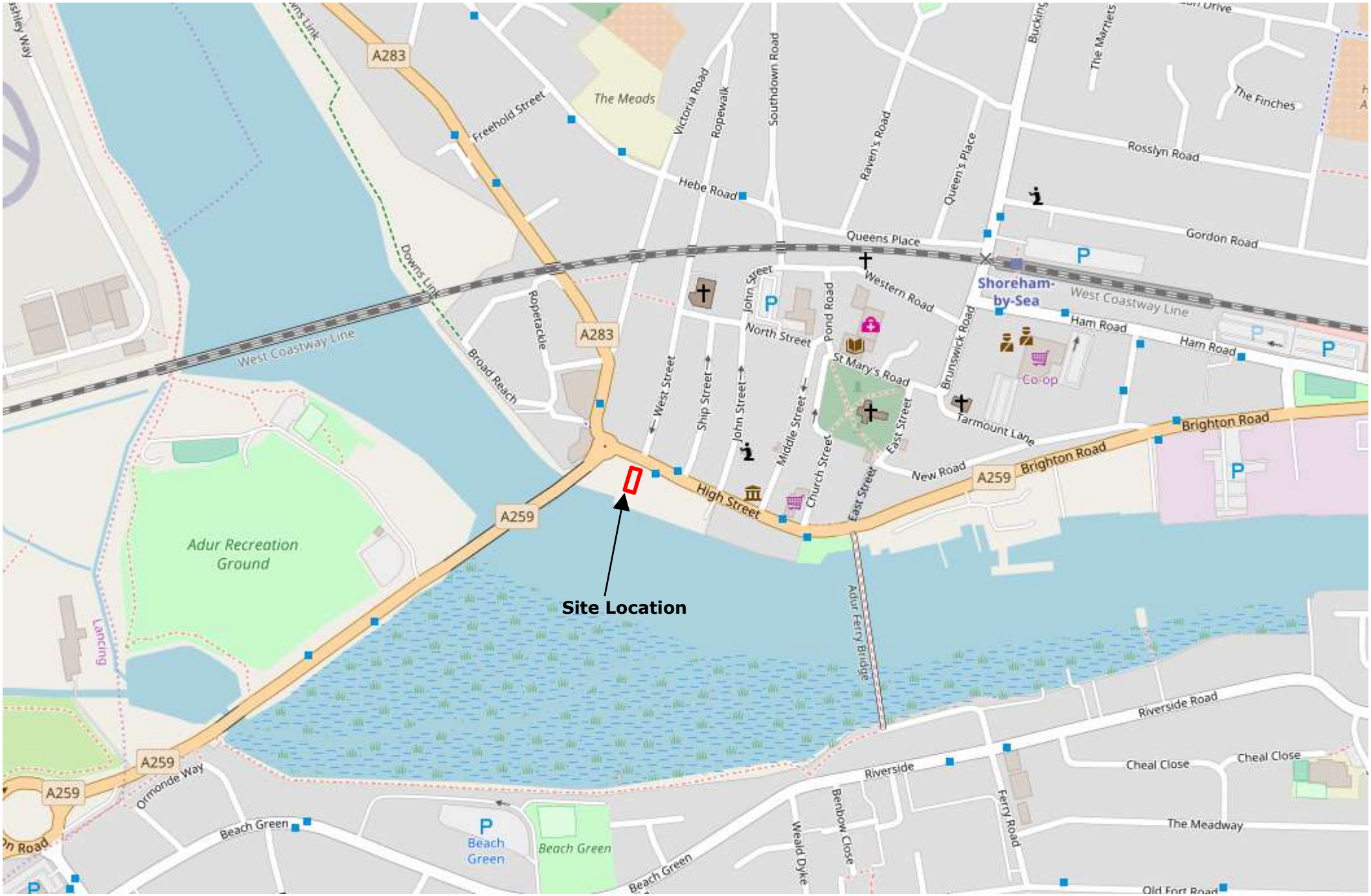
Suspected 'contamination' may take the following form, though it is noted that this list is not exhaustive and site operatives should ask if they are at all unsure of any findings:

- Soil or water looks oily and/or has an oily odour
- Soil or water has a solvent type of odour
- Significant quantities of man-made materials within fill such as paint cans, car parts, glass fragments
- Suspected asbestos containing materials (insulating boards, cement, loose fibres etc.)
- Significant volumes of clinker like or ashy material
- Sand bags, and/or subsurface concrete structures
- Animal carcasses or evidence of animal burial pits

Ashdown Site Investigation Ltd.
February 2018

FIGURES

Figure 1 Site Location Plan
Figure 2 Site Plan



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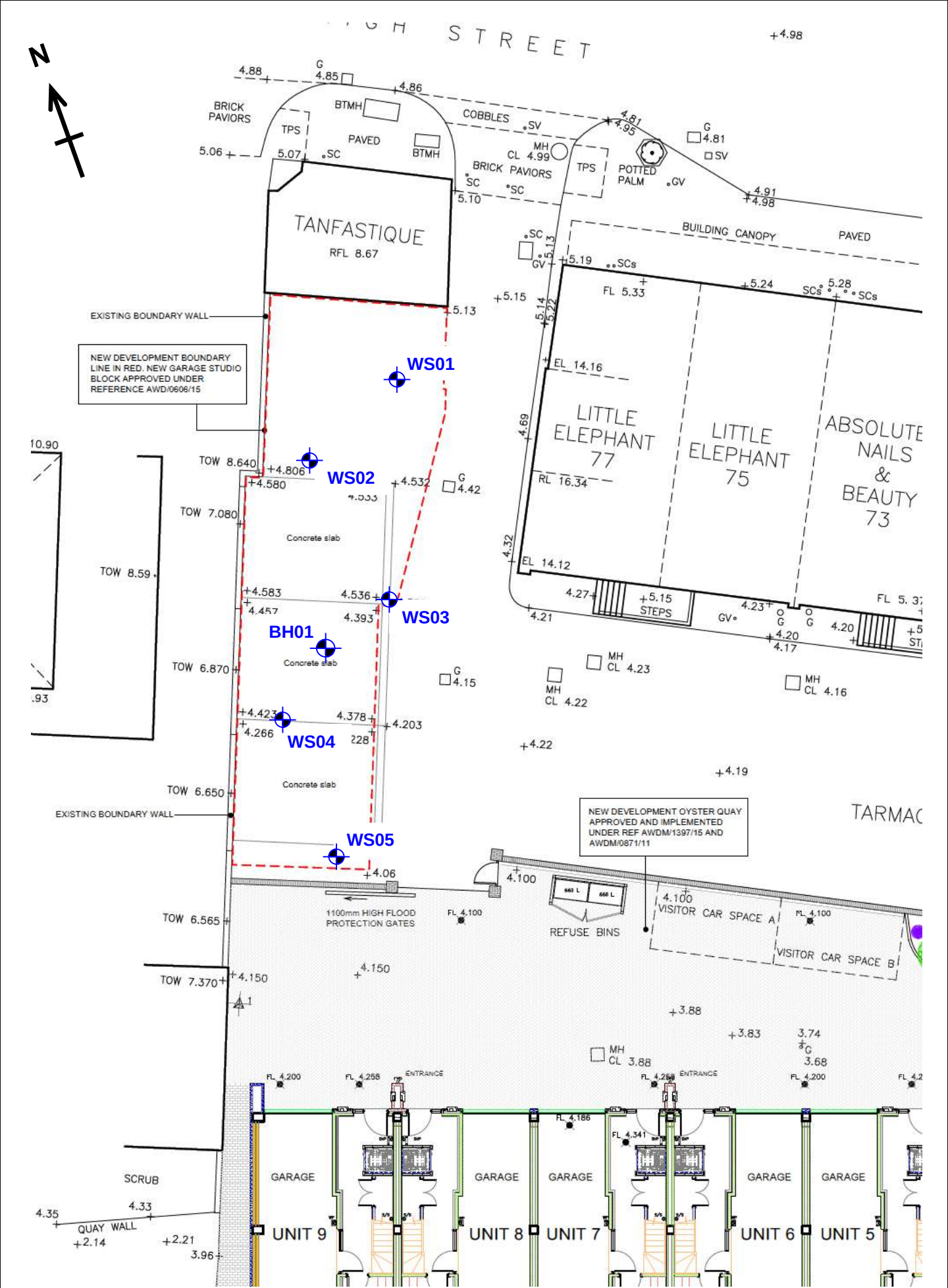
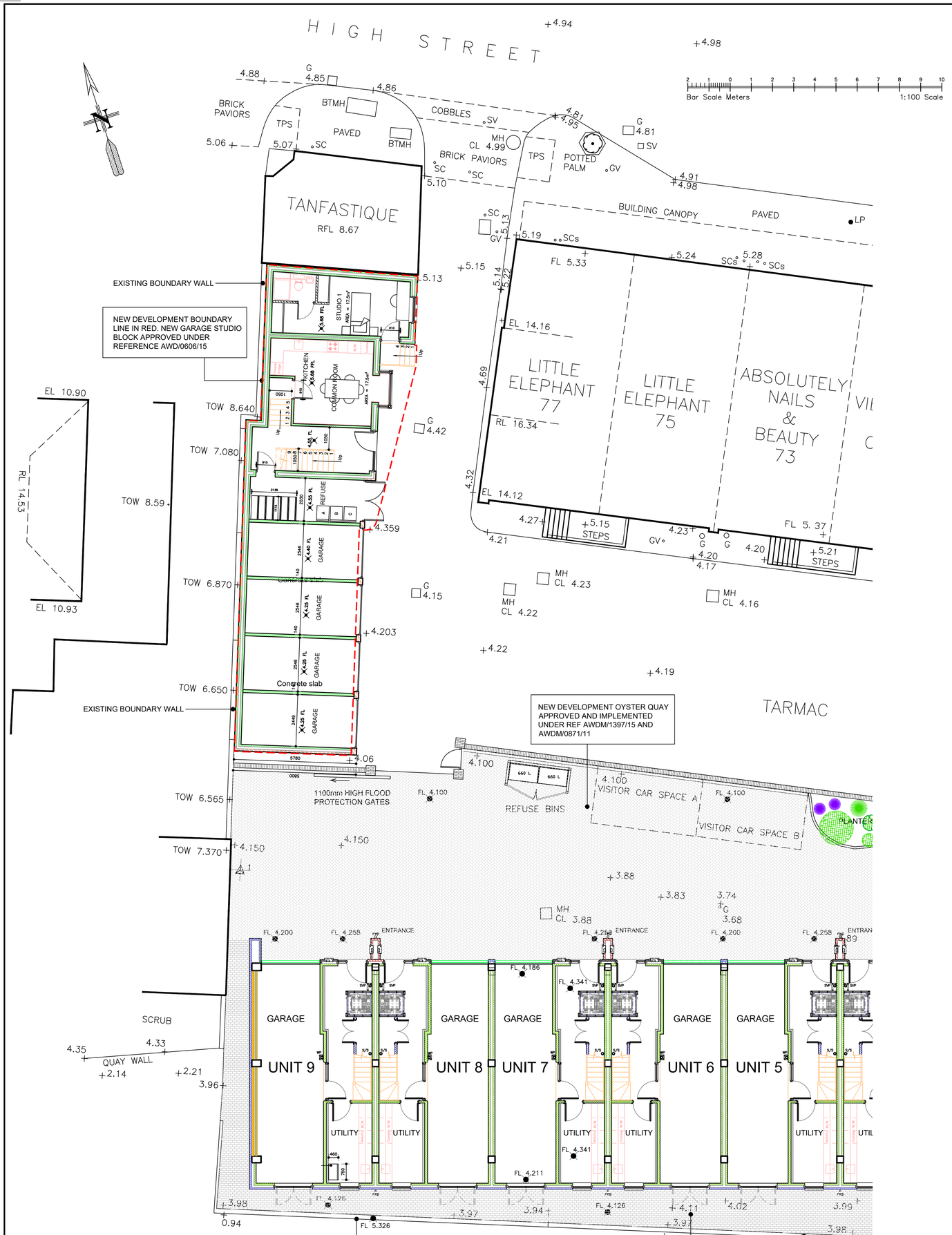
ASHDOWN SITE INVESTIGATION LIMITED	Site: Site at Britannia House, High Street, Shoreham, West Sussex	Site Location Plan. Not To Scale	Figure 1 R18-12694



ASHDOWN SITE INVESTIGATION L·I·M·I·T·E·D	Site: Site at Britannia House, High Street, Shoreham, West Sussex	Site Plan. Not To Scale	Figure 2 R18-12694

APPENDIX A

Proposed Development Layout



This scheme is subject to town planning and all other necessary consents. Dimensions, areas and levels where given are only approximate and subject to site survey.

All dimensions are to be checked on site.
Any discrepancies are to be reported to this Agent before work commences. Figured dimensions only are to be taken from this drawing.

This drawing is to be read in conjunction with all relevant consultants' and/or specialists' drawings/documents and any discrepancies or variations are to be notified to this Agent.

notes

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Client
Riverside Developments

Address
Garage Studios
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BN43 5EN

Title
Proposed Site Layout
New Studio Garage Block

scale	date	Signed
1=100 @ A1	19.01.2017	

drawing number
BC-306-03

APPENDIX B

Exploratory Hole Notes
Chalk Classification Notes
In Situ Testing Notes
Exploratory Hole Records
DPSH-B Dynamic Probe Records
Gas Concentration and Groundwater Monitoring Results

NOTES FOR THE INTERPRETATION OF EXPLORATORY HOLE RECORDS

1 Symbols and abbreviations

Samples

U 'Undisturbed' Sample: - also known as 'U100' or 'U4' - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
Uo Sample not obtained.
U* Full penetration of sample not obtained.
Pi Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D Disturbed Sample.
R Root Sample.
B Bulk Disturbed Sample.
W Water Sample.
J Jar Sample (sample taken in amber glass jar fitted with gas tight lid)
T Tub Sample
Vi Vial Sample

In situ Testing

S Standard penetration test (SPT): In the borehole record the depth of the test is that at the start of the normal 450mm penetration. The number of blows per 75mm penetration is recorded, with the initial 150mm for seating blows being recorded followed by the blows recorded for the remaining 300mm of the test. The total blows to achieve the standard penetration of 300mm, discounting the seating blows, is noted as the N value on the log. Where the full penetration of the test cannot be achieved (a refusal) the number of blows achieved and the penetration achieved will be reported.

C Standard Penetration Test (SPT) conducted usually in coarse grained soils or weak rocks using the same procedure as for the SPT but with a 50mm diameter, 60º apex solid cone fitted in place of the sampler. Variations in test results are indicated by the same symbols as for the SPT (above).

V Shear Vane Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.

H Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.

P Perth Penetrometer Test: See "In Situ Testing Notes" for full description. Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column. In sand the number of blows is approximately equivalent to the SPT "N" value.

Excavation Method

CP Cable Percussion Borehole
WLS Dynamic Sampler Borehole using windowless sampler tubes
WS Dynamic Sampler Borehole using window sampler tubes
TP Trial Pit excavated using mechanic excavator
HDP Trial Pit excavated using hand tools

2 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1:2002+A1:2013) and Part 2 Principles of classification (BS EN 14688-2:2004+A1:2013) as well as the BS5930:2015 code of Practice for Ground Investigations.

Fine Grained Soils

The consistency of fine grained soils given in the report is based on visual inspection of the samples and the strength is based on results of in situ and/or laboratory undrained shear strength tests when carried out.

The consistency is determined on the following basis:

Consistency	**Manual Test**
Very Soft	Soil exudes between fingers when squeezed in hand
Soft	Soils can be moulded by light finger pressure
Firm	Cannot be moulded by finger but rolled to 3mm threads without breaking/crumbling
Stiff	Crumbles/breaks when rolled to 3mm thick threads but can be moulded into a lump again
Very Stiff	Cannot be moulded and crumbles under pressure, can be indented by thumbnail

The terms used for the designation of the undrained shear strength are as follows:

Undrained Shear Strength	
Extremely to Very Low	<20 kPa
Low	20-40 kPa
Medium	40-75 kPa
High	75-150 kPa
Very High	150-300 kPa
Extremely high	300-600 kPa

Note: The undrained shear strength of the soils is measured either by laboratory testing or in the field using hand shear vane.

It is recognised that any coarse grained soil that has in excess of approximately 35% fine grained soil (clay and silt) can often be expected to behave as a fine grained soil despite the dominance of coarse grained material within the soil mass. To reflect this, it is the soil type that dominates the behaviour of the soil mass that appears on the exploratory hole records.

Coarse Grained Soils

The relative densities of coarse grained soils (sand and gravel) given in the report are based on field estimations and the results of the Standard Penetration Test (SPT) and equivalent correlation from other testing. The classification in terms of "N" Values is as follows:

SPT 'N' Value	**Relative Density**
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Greater than 50	Very Dense

3 Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1:2003) as well as the BS5930:2015 code of Practice for Ground Investigations.

The description of rock mass includes the type of rock, structure, discontinuities and weathering.

The unconfined compressive strength of rock material is determined on the following basis:

Term	**Field Identification**	**Unconfined Compressive Strength (MPa)**
Extremely Weak	Indented by thumbnail	Less than 1
Very Weak	Crumbles under firm blows with point of geological hammer, peeled by pocket knife	1 to 5
Weak	Peeled by pocket knife with difficulty, shallow indentations made by firm blow with geological hammer	5 to 25
Medium Strong	Cannot be peeled or scraped with knife, can be fractured with single firm blow of geological hammer	25 to 50
Strong	Requires more than one blow of geological hammer to fracture	50 to 100
Very Strong	Requires may blows of geological hammer to fracture it	100 to 250
Extremely Strong	Can only be chipped with geological hammer	Greater and 250

The terms describing discontinuity and bedding spacing are as follows:

Bedding Thickness	
Very Thick	>2000mm
Thick	2000-600mm
Medium	600-200mm
Thin	200-60mm
Very Thin	60-20mm
Thickly Laminated	20-6mm
Thinly Laminated	<6mm

Discontinuity Spacing	
Very Wide	>2000mm
Wide	2000-600mm
Medium	600-200mm
Close	200-60mm
Very Close	60-20mm
Extremely Close	<20mm

Chalk

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk. See additional chalk classification notes.

CHALK CLASSIFICATION NOTES

Classification of chalk based from Construction Industry Research and Information Association (CIRIA) Report C574 'Engineering in Chalk' (2002). Description of chalk based on BS EN 1SO 14688, BS EN 1SO 14689 and BS5930.

1 Engineering classification of chalk

Structure			***Grades***	***Suffix***
Structureless	Melange of fines and intact chalk lumps		Grade D	c <35% fines m >35% fines
Structured	Intact chalk with bedding, discontinuity.	Density Scale see below	Grade A, B or C see below	1, 2, 3, 4 or 5 see below

2 Density Scale

Field Identification	***Density Scale***	***Intact Dry Density (Mg/m^3)***	***Porosity (n) (G_s of calcite 2.7)***	***Saturation Moisture Content***
30-40mm fragments crushed by finger pressure and remould to putty	Low density	<1.55	>0.43	>27.5%
30-40mm fragments break with both hands, will not crush with finger pressure.	Medium density	1.55 to 1.70	0.43 to 0.37	27.5% to 21.8%
Cannot break 30-40mm fragments in two, difficult to break slabs, <10mm thick corners/edges broken of lumps.	High density	1.70 to 1.95	0.37 to 0.28	21.8% to 14.3%
Unable to break by hand, 100mm lump held in hand broken by single hammer blow.	Very high density	>1.95	<0.28	<14.3

3 Discontinuities

Typical discontinuity aperture

Grade A	No infill, closed
Grade B	Open, infilled <3mm
Grade C	Open, infilled >3mm

Typical discontinuity spacing

Suffix	Typical Spacing (t)
1	t > 600mm
2	200mm <t < 600mm
3	60mm < t < 200mm
4	20mm < t < 60mm
5	t < 20mm

Notes: Chalk classifications will be made where possible. Within boreholes chalk will be described recovered as.

Examples: Structureless CHALK composed of off white silty gravel. Clasts are weak medium density. Matrix is pale brown. (White Chalk Subgroup, Grade Dc)

Structured weak high density off white with black speckling CHALK. Fractures are closely spaced (50/100/200), infilled (0/1/3) with comminuted chalk. With occasional flints. (White Chalk Subgroup, Grade B3)

IN SITU TESTING NOTES

1 Standard Penetration Testing

Standard penetration testing (SPT) is carried out within a cased cable percussion borehole. The test is performed using a either a split spoon (barrel) sampler in finer grained deposits, or, in coarser grained soils or weak rocks, using a 50mm diameter, 60º apex solid cone fitted in place of the sampler.

The sampler is driven into the deposits at the base of the borehole by means of a 63.5kg hammer falling freely through 760mm.

In the borehole record the depth of the test is that at the start of the normal 450mm penetration, the number of blows to achieve the standard penetration of 300mm (the "N" value) is shown after the test index letter, but the seating blows through the initial 150mm penetration are not reported unless the full penetration of 450mm cannot be achieved.

(BS EN ISO 22476-3:2005+A1:2011, Geotechnical investigation and testing – Field Testing, Part 3 and BS5930:2015 code of practice of for ground investigations)

2 Dynamic Probe Testing

The DPH (heavy) dynamic probing rig drives a 32mm diameter rod with a 15cm^2 area, 90º end cone into the ground by means of a 50kg hammer which falls freely through a distance of 0.5m. The number of blows per 100mm penetration (N_{100}) is recorded.

The DPSH (super heavy) dynamic probing rig drives a 35mm diameter rod with a 20cm^2 area, 90º end cone into the ground by means of a 63.5kg hammer that falls freely through a distance of 0.75m. The number of blows per 100mm penetration (N_{100}) is recorded. The results can provide a useful indication of the relative strength of the material. The dynamic probing is carried out in accordance with BS EN ISO 22476-2:2005+A1:2011 and BS5930.

3 Perth Penetrometer Test

In this test a hardened stainless steel rod is driven into the deposit by a 9.5kg sliding hammer falling freely through 600mm. After an initial penetration of 150mm the number of blows required to drive the rod a further 300mm is recorded. In sand the Perth blow count gives a close correlation to the "N-value" that could be expected from a standard penetration test (SPT) made in similar materials. The results are less reliable in coarser grained materials but can give an indication of their engineering properties. The perth penetrometer test is carried out in accordance with the Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes, there is no European equivalent code.

4 Undrained Shear Strength

Undrained shear strength determinations are made in situ within the fine grained soils using a Geonor hand shear vane or (usually in the case of window sampler boreholes) a hand penetrometer. The test records the undrained shear strength (cohesion) in kN/m^2. The shear vane records a maximum shear strength of 130kN/m^2 and the hand penetrometer records a maximum shear strength of 250kN/m^2.

3 California Bearing Ratio Test

In this test a hand held Farnell cone penetrometer apparatus is pushed into the deposits for the estimation of the California bearing ratio of the subgrade (for use in pavement design). The test equipment is design for the estimation of the bearing ratio of fine grained soils (clay and silt) only and is unsuitable for use in coarse grained soils and rock.

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Site Name: Site at Britannia House, High Street, Shoreham, West Sussex

Job Number: R18-12694

Start Date: 26/01/2018

End Date: 26/01/2018

Borehole Number: **BH01**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe Blows/100mm 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Concrete.
	J T	0.20					0.15	MADE GROUND: Dark brown/ black sandy gravelly clay. Gravel is angular to subrounded fine to coarse concrete, brick, mortar, flint and charcoal-like material. Sand is fine to coarse.
	J T	0.50						
	D	0.60						
							1.00	Firm to stiff orange and light brown slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse flint. Sand is fine to medium. (Head)
	D	1.50						
	J T	1.50						
	H	2.10		115				
	D	2.50						
							2.70	Firm to stiff light brown, yellow and orange slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to medium flint and chalk. Sand is fine to medium. (Head)
	H	2.80		115				
	J T	2.90						
	H	3.10		115				
	D	3.40						
	H	3.80		140				
	D	4.70						
	U	4.80	5.00					
							5.00	Continued on next sheet

Remarks

Groundwater: Groundwater recorded at 4.30m depth on completion.

Stability: Borehole unstable below 4.10m depth.

Notes: No further progress below 9.00m depth - too hard/ dense.

Excavation Method: WLS

Borehole Diameter: Various

Made By: PC

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Tel: 01273 483119

Site Name: Site at Britannia House, High Street, Shoreham, West Sussex

Job Number: R18-12694

Start Date: 26/01/2018

End Date: 26/01/2018

Borehole Number: **BH01** Sheet 2 of 2

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe Blows/100mm 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
	H	5.30		140				Firm to stiff light brown, yellow and orange slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to medium flint and chalk. Sand is fine to medium. (Head)
	J T	5.50						
	D	5.70						
	H	5.80		170				
							6.20	
	J T	6.50						CHALK recovered as gravelly silt. Gravel is very weak low density off white with frequent black specking. Matrix is off white. (White Chalk Subgroup)
	D	6.70						
								with poor recovery of soil samples below 7.00m depth.
	D	7.50						
	D	8.50						
							9.00	End of borehole at 9.00m

Remarks

Groundwater: Groundwater recorded at 4.30m depth on completion.

Stability: Borehole unstable below 4.10m depth.

Notes: No further progress below 9.00m depth - too hard/ dense.

Excavation Method: WLS

Borehole Diameter: Various

Made By: PC

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Site Name: Site at Britannia House, High Street, Shoreham, West Sussex

Job Number: R18-12694

Start Date: 15/01/2018

End Date: 15/01/2018

Borehole Number: **WS01**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe Blows/100mm 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Asphalt over, Concrete.
							0.15	MADE GROUND: Dark grey brown slightly sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick, charcoal-like material, concrete, chalk and flint.
	J T	0.40						
	D	0.50						
	J T	0.90					0.90	Firm light brown mottled light orange brown and light grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium flint. (Head)
	D	1.00						
	V	1.00		80				
	H	1.30		50				
	J T	1.40						
	D	1.80					1.70	Firm light brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to medium flint. (Head)
	H	1.90		50				
	J T	2.20						
	H	2.50		60				
	D	2.60						
	H	2.70		50				
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 3.00m depth; 1.00m to 3.00m slotted pipe with gravel surround; 0.00m to 1.00m plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

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Site Name: Site at Britannia House, High Street, Shoreham, West Sussex

Job Number: R18-12694

Start Date: 15/01/2018

End Date: 15/01/2018

Borehole Number: **WS02** Sheet 1 of 1

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result (Dynamic Probe Blows/100mm)	Depth	Stratum Description
					0.00	Concrete.
					0.15	MADE GROUND: Light orange brown slightly sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick, concrete and flint.
	J T	0.30				
	D	0.40			0.50	Soft light orange brown mottled light grey sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium flint. (Head)
	H	0.70		25		
	T	0.70				
	D	0.80				
					1.10	Soft light brown mottled dark brown slightly gravelly CLAY. Gravel is subangular to rounded fine to medium flint. (Head)
	T	1.20				
	D	1.40				
	H	1.60		<25		
	H	1.90		50		
	T	1.90				becoming firm below 1.90m depth.
	D	2.20				becoming gravelly between 2.00m and 3.00m depth.
	H	2.20		60		
	H	2.70		60		
	H	3.20		60		
	T	3.20				
	D	3.30				
	H	3.60		50		
	H	4.20		50		
	T	4.30				becoming stiff to very stiff towards base.
	D	4.40				
					4.50	End of borehole at 4.50m

Dynamic Probe: Blows/100mm 0 5 10 15 20 25 30

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: No further progress below 4.50m depth - too hard.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

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Site Name: Site at Britannia House, High Street, Shoreham, West Sussex

Job Number: R18-12694

Start Date: 15/01/2018

End Date: 15/01/2018

Borehole Number: **WS03**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe Blows/100mm (0 5 10 15 20 25 30)	Legend	Depth	Stratum Description
	J T	0.20					0.00	MADE GROUND: Dark grey sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse brick, concrete and flint.
	D	0.40						
	J T	0.60						
	D	0.80					0.70	Soft to firm light orange brown slightly sandy gravelly silty CLAY. Sand is fine to medium. Gravel is subangular to rounded fine to medium flint. (Head)
	H	0.80		35				
	H	1.20		35				
	H	1.50		60				
	J T	1.50					1.60	Firm to stiff light orange brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to rounded fine to coarse flint. (Head)
	H	1.70		35				
	D	1.90						
	H	2.30		50				
	J T	2.30						
	H	2.60		50				
	D	2.70						
							3.00	End of borehole at 3.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 3.00m depth; 1.00m to 3.00m slotted pipe with gravel surround; 0.00m to 1.00m plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

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Job Number: R18-12694

Start Date: 15/01/2018

End Date: 15/01/2018

Borehole Number: **WS04**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe Blows/100mm 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Concrete.
							0.15	MADE GROUND: Light grey mottled off white gravelly clayey silt. Gravel is angular to subrounded fine to coarse brick, flint and chalk.
	J T	0.30						
	D	0.40						
	J T	0.80						
	D	0.90						
							1.50	Firm light orange brown sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. (Head)
	J T	1.60						
	H	1.70		50				
	D	1.90						
	H	2.30		75				
	J T	2.60						
	D	2.70						
	H	2.70		40				
	H	3.10		40				
							3.30	Firm light grey brown mottled off white gravelly CLAY. Gravel is angular to subrounded fine to coarse flint and chalk. (Head)
	D	3.40						
	J T	3.60						
								possibly grading into CHALK below 4.50m depth.
							5.00	End of borehole at 5.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: n/a

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

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Site Name: Site at Britannia House, High Street, Shoreham, West Sussex

Job Number: R18-12694

Start Date: 15/01/2018

End Date: 15/01/2018

Borehole Number: **WS05**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe Blows/100mm 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	MADE GROUND: Light brown grey slightly clayey sandy angular to rounded fine to medium gravel of flint, concrete and brick.
	J T	0.20						
	D	0.25					0.30	MADE GROUND: Dark grey slightly sandy gravelly silty clay. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse flint, brick, charcoal-like material and shell fragments.
	J T	0.60						
	D	0.70						
	J T	1.20						
	D	1.40					1.30	MADE GROUND: Light grey brown mottled off white slightly sandy gravelly silty clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium flint and chalk.
	J T	1.70						
	D	2.10					1.90	Soft to firm dark brown gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse flint. (Head)
	H	2.10		40				
	J T	2.40						
	H	2.50		40				
	H	2.90		40			3.00	End of borehole at 3.00m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: Standpipe installed to 3.00m depth; 2.00m to 3.00m slotted pipe with gravel surround; 0.00m to 2.00m plain pipe with bentonite seal; completed with gas tap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: ML

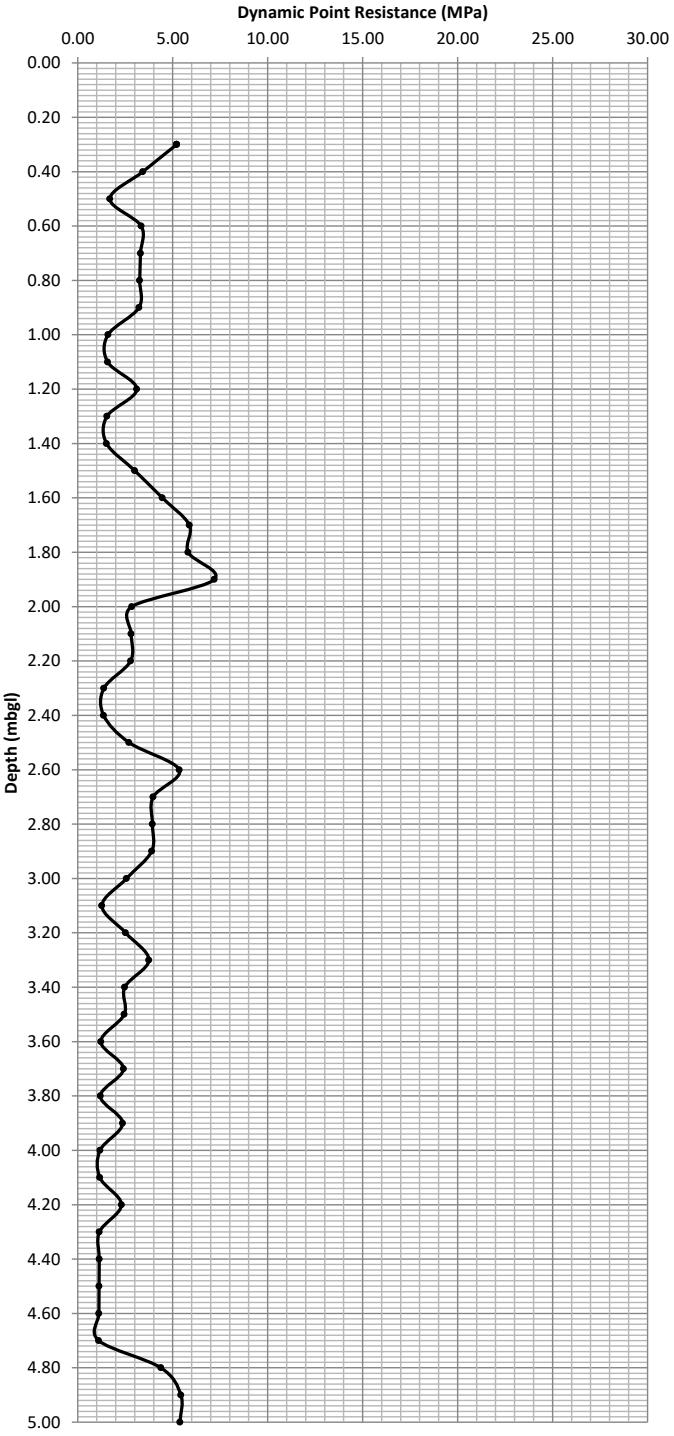
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	BH01

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20				
0.30	3	0.03	5.53	5.21
0.40	2	0.05	3.69	3.43
0.50	1	0.10	1.84	1.69
0.60	2	0.05	3.69	3.34
0.70	2	0.05	3.69	3.30
0.80	2	0.05	3.69	3.26
0.90	2	0.05	3.69	3.22
1.00	1	0.10	1.84	1.59
1.10	1	0.10	1.84	1.57
1.20	2	0.05	3.69	3.11
1.30	1	0.10	1.84	1.54
1.40	1	0.10	1.84	1.52
1.50	2	0.05	3.69	3.01
1.60	3	0.03	5.53	4.46
1.70	4	0.03	7.38	5.88
1.80	4	0.03	7.38	5.81
1.90	5	0.02	9.22	7.19
2.00	2	0.05	3.69	2.84
2.10	2	0.05	3.69	2.81
2.20	2	0.05	3.69	2.79
2.30	1	0.10	1.84	1.38
2.40	1	0.10	1.84	1.36
2.50	2	0.05	3.69	2.70
2.60	4	0.03	7.38	5.35
2.70	3	0.03	5.53	3.97
2.80	3	0.03	5.53	3.93
2.90	3	0.03	5.53	3.89
3.00	2	0.05	3.69	2.57
3.10	1	0.10	1.84	1.27
3.20	2	0.05	3.69	2.52
3.30	3	0.03	5.53	3.75
3.40	2	0.05	3.69	2.47
3.50	2	0.05	3.69	2.45
3.60	1	0.10	1.84	1.21
3.70	2	0.05	3.69	2.41
3.80	1	0.10	1.84	1.19
3.90	2	0.05	3.69	2.37
4.00	1	0.10	1.84	1.17
4.10	1	0.10	1.84	1.16
4.20	2	0.05	3.69	2.30
4.30	1	0.10	1.84	1.14
4.40	1	0.10	1.84	1.13
4.50	1	0.10	1.84	1.12
4.60	1	0.10	1.84	1.11
4.70	1	0.10	1.84	1.10
4.80	4	0.03	7.38	4.38
4.90	5	0.02	9.22	5.43
5.00	5	0.02	9.22	5.39



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.74	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

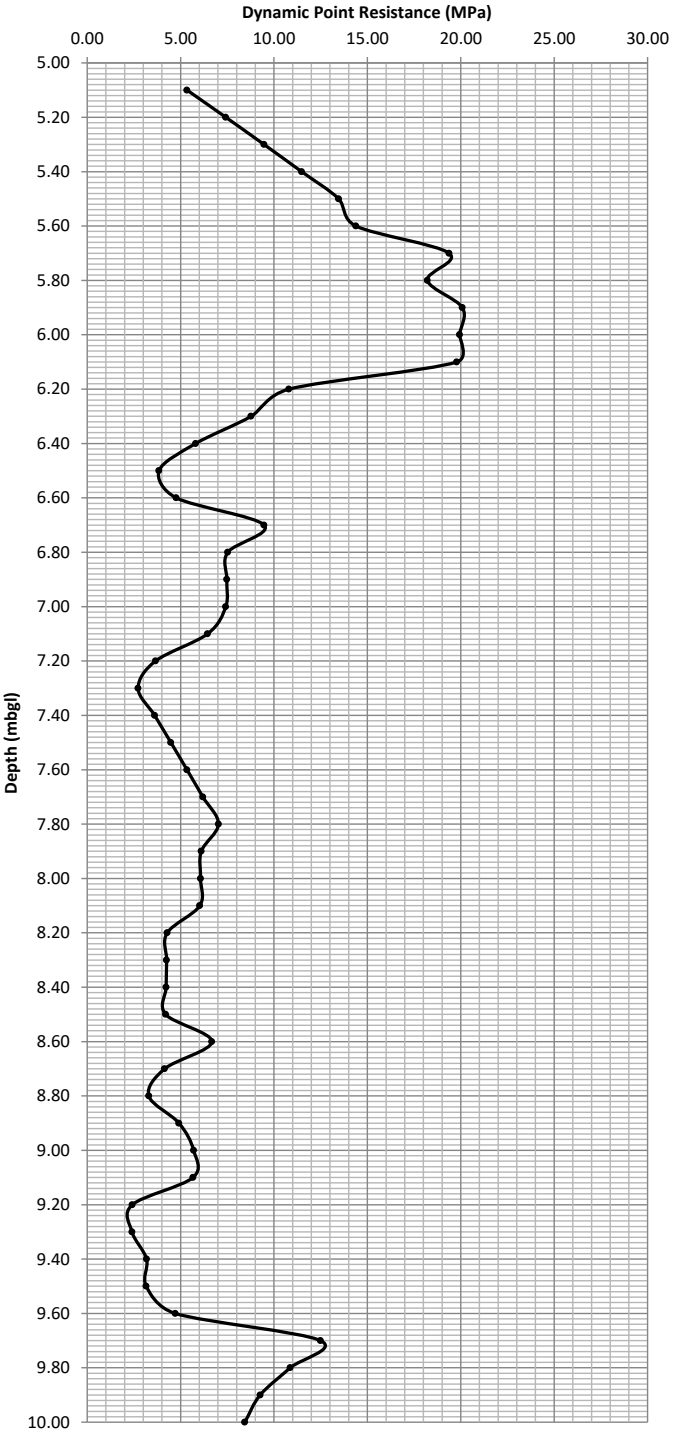
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	BH01

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
5.10	5	0.02	9.22	5.34
5.20	7	0.01	12.91	7.42
5.30	9	0.01	16.59	9.47
5.40	11	0.01	20.28	11.48
5.50	13	0.01	23.97	13.46
5.60	14	0.01	25.81	14.39
5.70	19	0.01	35.03	19.37
5.80	18	0.01	33.19	18.22
5.90	20	0.01	36.88	20.09
6.00	20	0.01	36.88	19.94
6.10	20	0.01	36.88	19.79
6.20	11	0.01	20.28	10.80
6.30	9	0.01	16.59	8.77
6.40	6	0.02	11.06	5.81
6.50	4	0.03	7.38	3.84
6.60	5	0.02	9.22	4.77
6.70	10	0.01	18.44	9.47
6.80	8	0.01	14.75	7.52
6.90	8	0.01	14.75	7.47
7.00	8	0.01	14.75	7.42
7.10	7	0.01	12.91	6.45
7.20	4	0.03	7.38	3.66
7.30	3	0.03	5.53	2.73
7.40	4	0.03	7.38	3.61
7.50	5	0.02	9.22	4.48
7.60	6	0.02	11.06	5.34
7.70	7	0.01	12.91	6.19
7.80	8	0.01	14.75	7.03
7.90	7	0.01	12.91	6.11
8.00	7	0.01	12.91	6.07
8.10	7	0.01	12.91	6.03
8.20	5	0.02	9.22	4.28
8.30	5	0.02	9.22	4.25
8.40	5	0.02	9.22	4.23
8.50	5	0.02	9.22	4.20
8.60	8	0.01	14.75	6.68
8.70	5	0.02	9.22	4.15
8.80	4	0.03	7.38	3.30
8.90	6	0.02	11.06	4.91
9.00	7	0.01	12.91	5.70
9.10	7	0.01	12.91	5.66
9.20	3	0.03	5.53	2.41
9.30	3	0.03	5.53	2.40
9.40	4	0.03	7.38	3.18
9.50	4	0.03	7.38	3.16
9.60	6	0.02	11.06	4.71
9.70	16	0.01	29.50	12.49
9.80	14	0.01	25.81	10.87
9.90	12	0.01	22.13	9.26
10.00	11	0.01	20.28	8.44



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.74	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

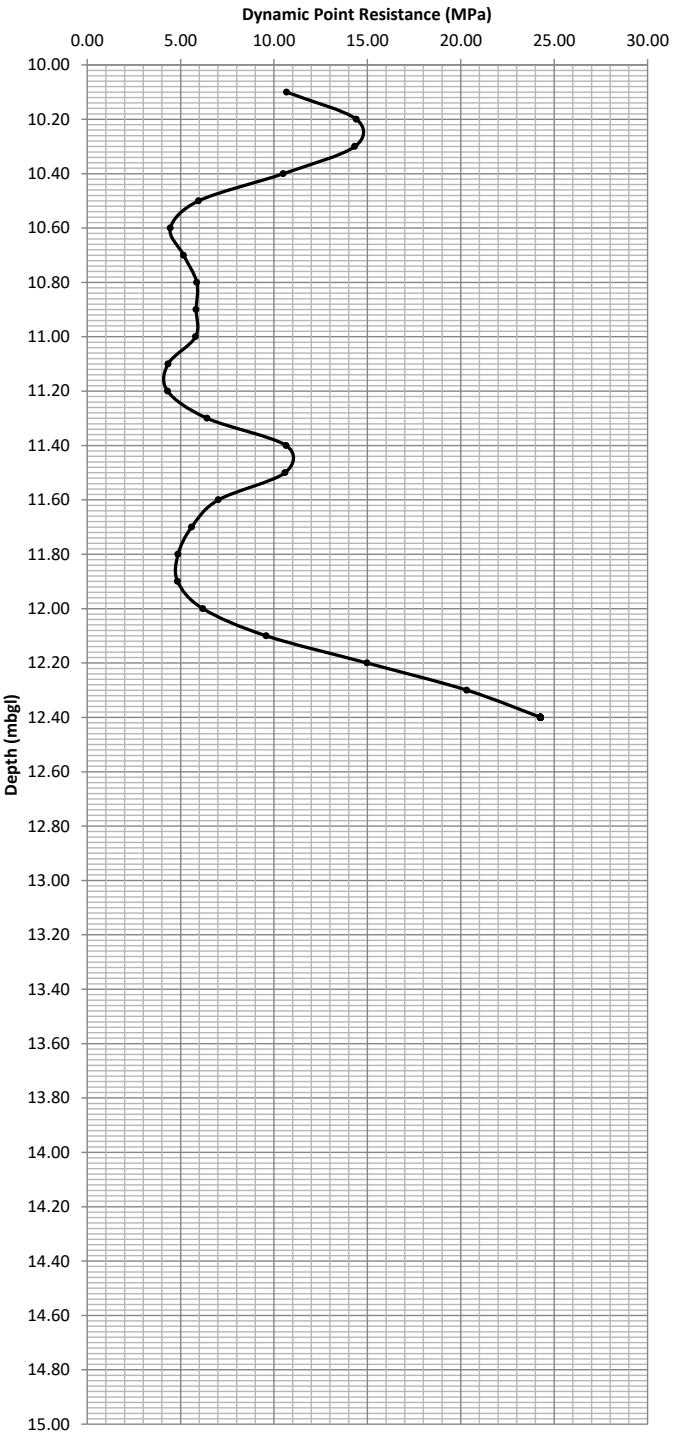
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	BH01

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
10.10	14	0.01	25.81	10.68
10.20	19	0.01	35.03	14.41
10.30	19	0.01	35.03	14.33
10.40	14	0.01	25.81	10.50
10.50	8	0.01	14.75	5.97
10.60	6	0.02	11.06	4.45
10.70	7	0.01	12.91	5.16
10.80	8	0.01	14.75	5.87
10.90	8	0.01	14.75	5.84
11.00	8	0.01	14.75	5.80
11.10	6	0.02	11.06	4.33
11.20	6	0.02	11.06	4.31
11.30	9	0.01	16.59	6.42
11.40	15	0.01	27.66	10.65
11.50	15	0.01	27.66	10.59
11.60	10	0.01	18.44	7.03
11.70	8	0.01	14.75	5.59
11.80	7	0.01	12.91	4.87
11.90	7	0.01	12.91	4.84
12.00	9	0.01	16.59	6.19
12.10	14	0.01	25.81	9.58
12.20	22	0.00	40.57	14.98
12.30	30	0.00	55.32	20.33
12.40	36	0.00	66.38	24.27
12.50				
12.60				
12.70				
12.80				
12.90				
13.00				
13.10				
13.20				
13.30				
13.40				
13.50				
13.60				
13.70				
13.80				
13.90				
14.00				
14.10				
14.20				
14.30				
14.40				
14.50				
14.60				
14.70				
14.80				
14.90				
15.00				



Notes:
No further progress below 12.40m - hammer bouncing.

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.74	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

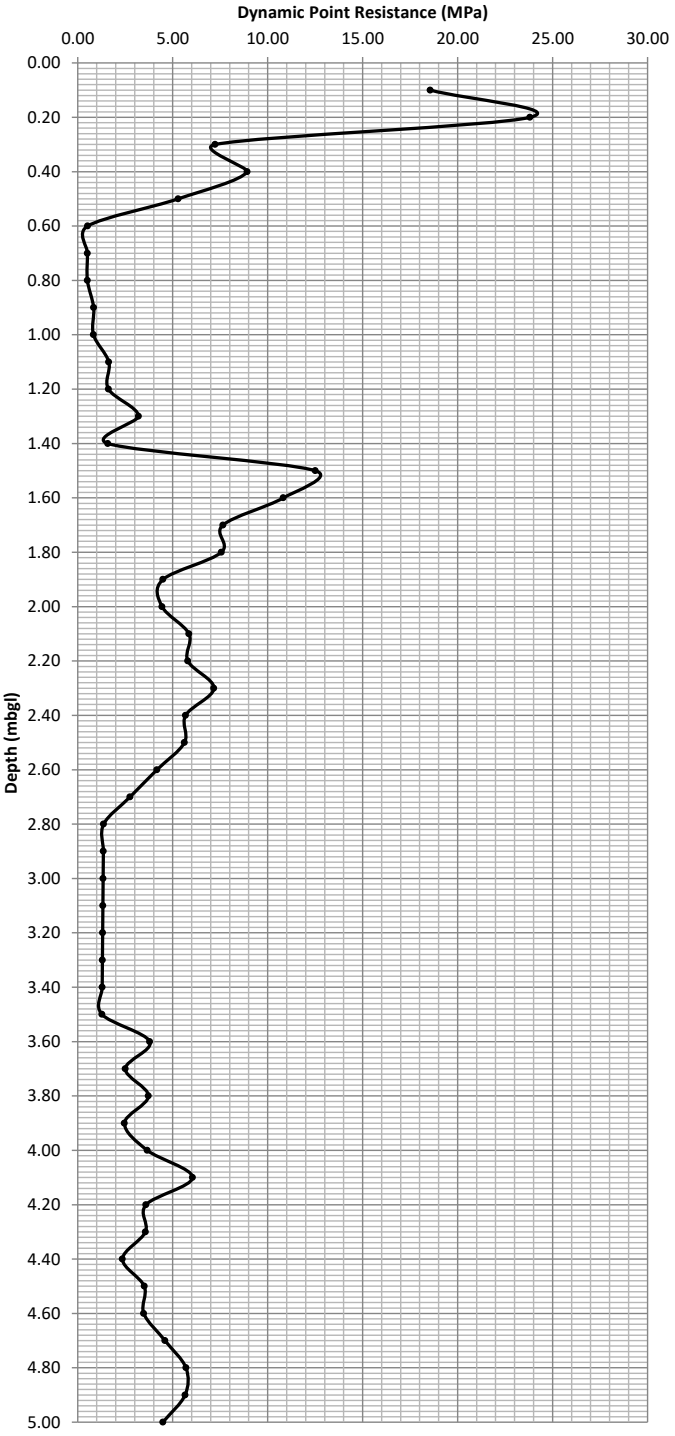
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	WS01

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10	10	0.01	19.19	18.56
0.20	13	0.01	24.94	23.81
0.30	4	0.03	7.67	7.23
0.40	5	0.02	9.59	8.92
0.50	3	0.03	5.76	5.29
0.60	0.3	0.33	0.58	0.52
0.70	0.3	0.33	0.58	0.52
0.80	0.3	0.33	0.58	0.51
0.90	0.5	0.20	0.96	0.84
1.00	0.5	0.20	0.96	0.83
1.10	1	0.10	1.92	1.64
1.20	1	0.10	1.92	1.62
1.30	2	0.05	3.84	3.20
1.40	1	0.10	1.92	1.58
1.50	8	0.01	15.35	12.51
1.60	7	0.01	13.43	10.82
1.70	5	0.02	9.59	7.64
1.80	5	0.02	9.59	7.56
1.90	3	0.03	5.76	4.49
2.00	3	0.03	5.76	4.44
2.10	4	0.03	7.67	5.86
2.20	4	0.03	7.67	5.80
2.30	5	0.02	9.59	7.17
2.40	4	0.03	7.67	5.68
2.50	4	0.03	7.67	5.62
2.60	3	0.03	5.76	4.17
2.70	2	0.05	3.84	2.75
2.80	1	0.10	1.92	1.36
2.90	1	0.10	1.92	1.35
3.00	1	0.10	1.92	1.34
3.10	1	0.10	1.92	1.32
3.20	1	0.10	1.92	1.31
3.30	1	0.10	1.92	1.30
3.40	1	0.10	1.92	1.29
3.50	1	0.10	1.92	1.28
3.60	3	0.03	5.76	3.79
3.70	2	0.05	3.84	2.51
3.80	3	0.03	5.76	3.72
3.90	2	0.05	3.84	2.46
4.00	3	0.03	5.76	3.66
4.10	5	0.02	9.59	6.05
4.20	3	0.03	5.76	3.60
4.30	3	0.03	5.76	3.56
4.40	2	0.05	3.84	2.36
4.50	3	0.03	5.76	3.50
4.60	3	0.03	5.76	3.48
4.70	4	0.03	7.67	4.60
4.80	5	0.02	9.59	5.70
4.90	5	0.02	9.59	5.65
5.00	4	0.03	7.67	4.48



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

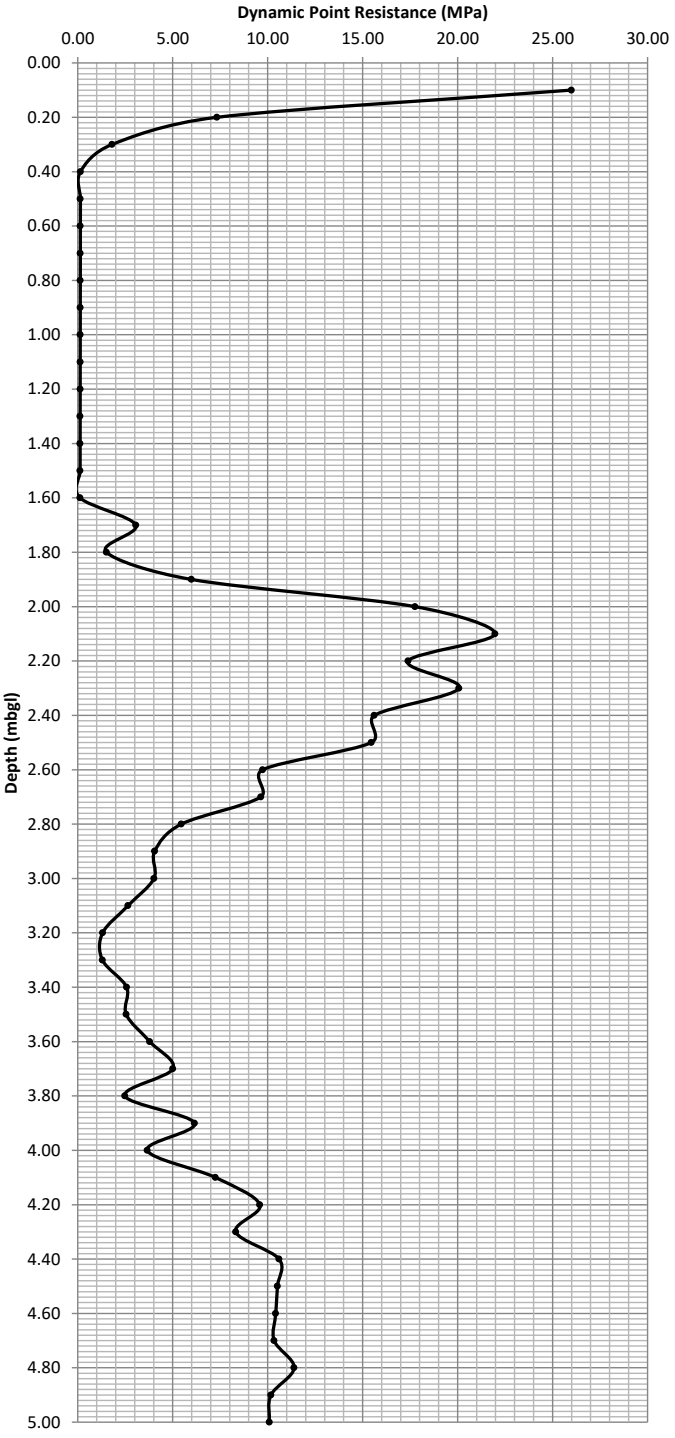
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	WS02

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10	14	0.01	26.86	25.99
0.20	4	0.03	7.67	7.33
0.30	1	0.10	1.92	1.81
0.40	0.08	1.25	0.15	0.14
0.50	0.08	1.25	0.15	0.14
0.60	0.08	1.25	0.15	0.14
0.70	0.08	1.25	0.15	0.14
0.80	0.08	1.25	0.15	0.14
0.90	0.08	1.25	0.15	0.13
1.00	0.08	1.25	0.15	0.13
1.10	0.08	1.25	0.15	0.13
1.20	0.08	1.25	0.15	0.13
1.30	0.08	1.25	0.15	0.13
1.40	0.08	1.25	0.15	0.13
1.50	0.08	1.25	0.15	0.13
1.60	0.08	1.25	0.15	0.12
1.70	2	0.05	3.84	3.06
1.80	1	0.10	1.92	1.51
1.90	4	0.03	7.67	5.98
2.00	12	0.01	23.02	17.76
2.10	15	0.01	28.78	21.97
2.20	12	0.01	23.02	17.39
2.30	14	0.01	26.86	20.08
2.40	11	0.01	21.11	15.61
2.50	11	0.01	21.11	15.46
2.60	7	0.01	13.43	9.74
2.70	7	0.01	13.43	9.64
2.80	4	0.03	7.67	5.45
2.90	3	0.03	5.76	4.05
3.00	3	0.03	5.76	4.01
3.10	2	0.05	3.84	2.65
3.20	1	0.10	1.92	1.31
3.30	1	0.10	1.92	1.30
3.40	2	0.05	3.84	2.58
3.50	2	0.05	3.84	2.55
3.60	3	0.03	5.76	3.79
3.70	4	0.03	7.67	5.01
3.80	2	0.05	3.84	2.48
3.90	5	0.02	9.59	6.15
4.00	3	0.03	5.76	3.66
4.10	6	0.02	11.51	7.25
4.20	8	0.01	15.35	9.59
4.30	7	0.01	13.43	8.32
4.40	9	0.01	17.27	10.60
4.50	9	0.01	17.27	10.51
4.60	9	0.01	17.27	10.43
4.70	9	0.01	17.27	10.34
4.80	10	0.01	19.19	11.40
4.90	9	0.01	17.27	10.17
5.00	9	0.01	17.27	10.09



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

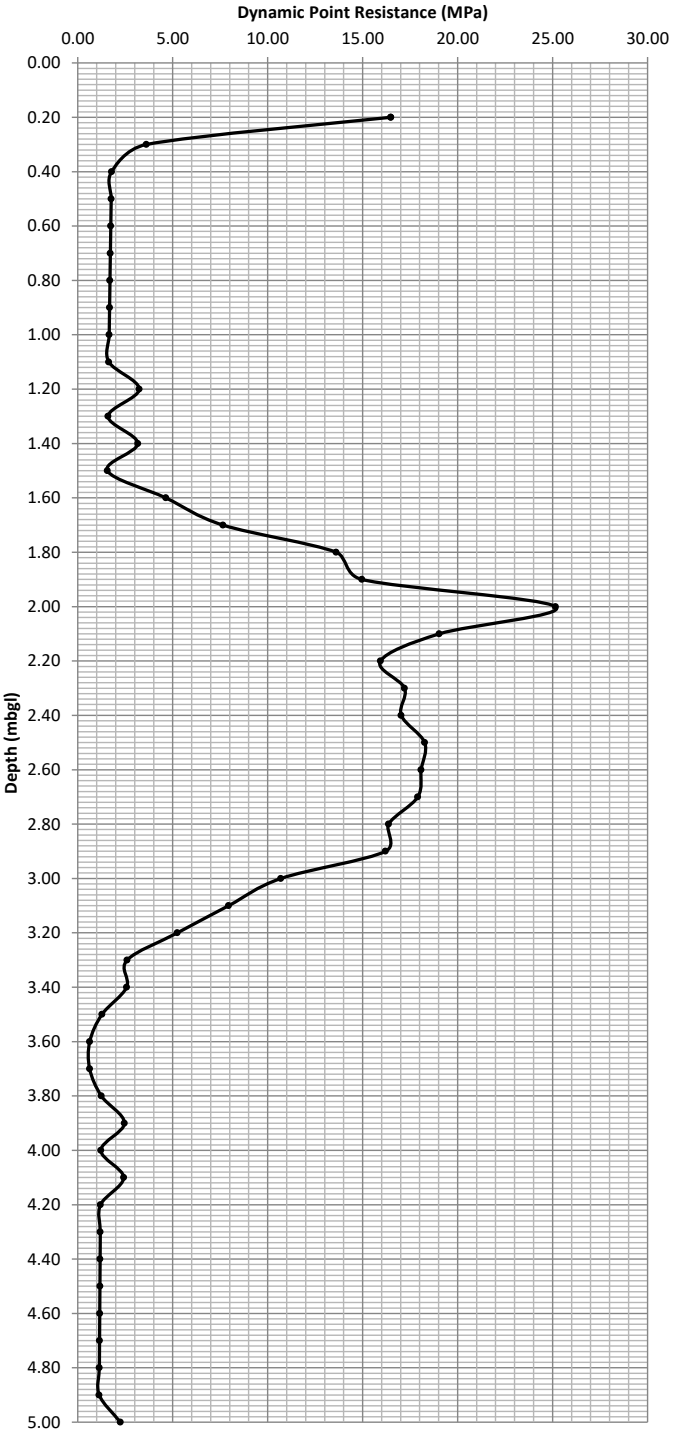
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	WS03

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	9	0.01	17.27	16.49
0.30	2	0.05	3.84	3.62
0.40	1	0.10	1.92	1.78
0.50	1	0.10	1.92	1.76
0.60	1	0.10	1.92	1.74
0.70	1	0.10	1.92	1.72
0.80	1	0.10	1.92	1.70
0.90	1	0.10	1.92	1.68
1.00	1	0.10	1.92	1.66
1.10	1	0.10	1.92	1.64
1.20	2	0.05	3.84	3.24
1.30	1	0.10	1.92	1.60
1.40	2	0.05	3.84	3.16
1.50	1	0.10	1.92	1.56
1.60	3	0.03	5.76	4.64
1.70	5	0.02	9.59	7.64
1.80	9	0.01	17.27	13.61
1.90	10	0.01	19.19	14.96
2.00	17	0.01	32.62	25.16
2.10	13	0.01	24.94	19.04
2.20	11	0.01	21.11	15.94
2.30	12	0.01	23.02	17.21
2.40	12	0.01	23.02	17.03
2.50	13	0.01	24.94	18.27
2.60	13	0.01	24.94	18.08
2.70	13	0.01	24.94	17.90
2.80	12	0.01	23.02	16.36
2.90	12	0.01	23.02	16.20
3.00	8	0.01	15.35	10.70
3.10	6	0.02	11.51	7.95
3.20	4	0.03	7.67	5.25
3.30	2	0.05	3.84	2.60
3.40	2	0.05	3.84	2.58
3.50	1	0.10	1.92	1.28
3.60	0.5	0.20	0.96	0.63
3.70	0.5	0.20	0.96	0.63
3.80	1	0.10	1.92	1.24
3.90	2	0.05	3.84	2.46
4.00	1	0.10	1.92	1.22
4.10	2	0.05	3.84	2.42
4.20	1	0.10	1.92	1.20
4.30	1	0.10	1.92	1.19
4.40	1	0.10	1.92	1.18
4.50	1	0.10	1.92	1.17
4.60	1	0.10	1.92	1.16
4.70	1	0.10	1.92	1.15
4.80	1	0.10	1.92	1.14
4.90	1	0.10	1.92	1.13
5.00	2	0.05	3.84	2.24



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	WS03

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
5.10	2	0.05	3.84	2.22
5.20	3	0.03	5.76	3.31
5.30	7	0.01	13.43	7.66
5.40	7	0.01	13.43	7.60
5.50	7	0.01	13.43	7.54
5.60	6	0.02	11.51	6.42
5.70	8	0.01	15.35	8.49
5.80	9	0.01	17.27	9.48
5.90	9	0.01	17.27	9.41
6.00	9	0.01	17.27	9.34
6.10	5	0.02	9.59	5.15
6.20	4	0.03	7.67	4.09
6.30	4	0.03	7.67	4.06
6.40	4	0.03	7.67	4.03
6.50	3	0.03	5.76	3.00
6.60	4	0.03	7.67	3.97
6.70	4	0.03	7.67	3.94
6.80	5	0.02	9.59	4.89
6.90	3	0.03	5.76	2.92
7.00				
7.10				
7.20				
7.30				
7.40				
7.50				
7.60				
7.70				
7.80				
7.90				
8.00				
8.10				
8.20				
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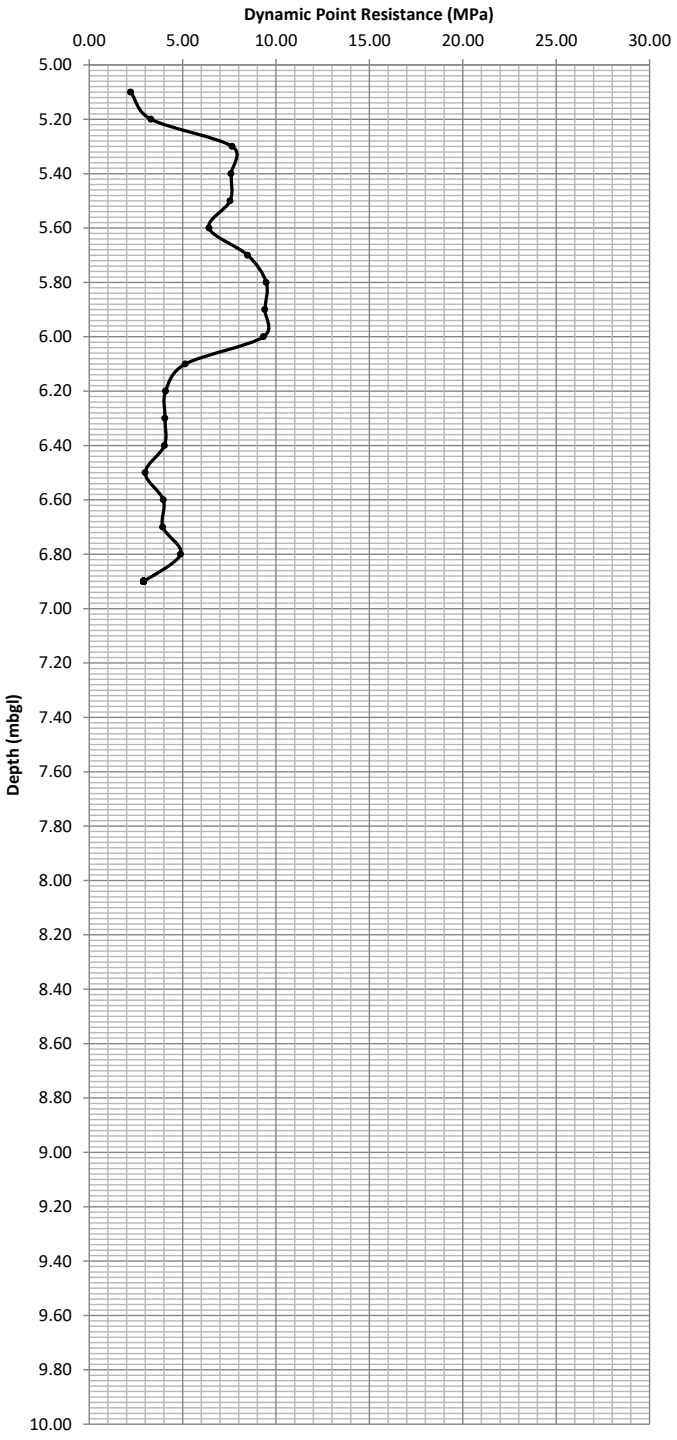


Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

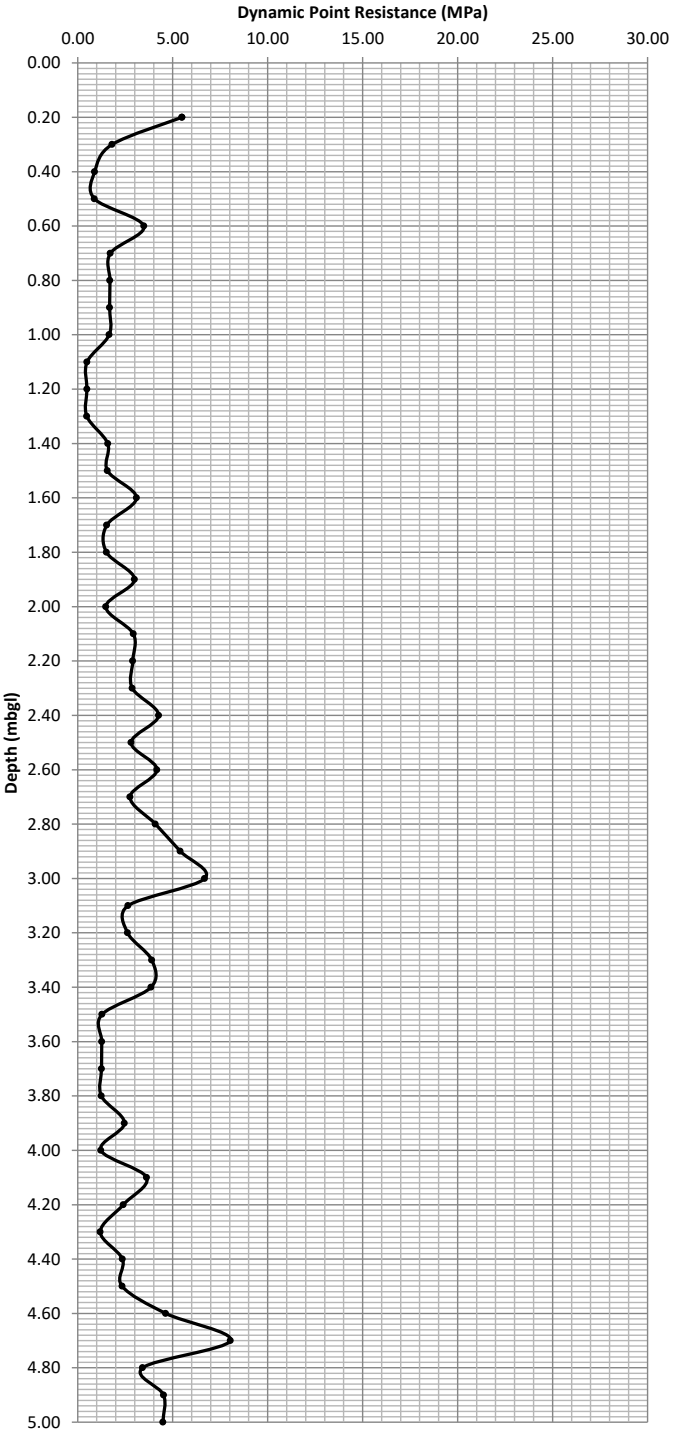
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	WS04

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	3	0.03	5.76	5.50
0.30	1	0.10	1.92	1.81
0.40	0.5	0.20	0.96	0.89
0.50	0.5	0.20	0.96	0.88
0.60	2	0.05	3.84	3.48
0.70	1	0.10	1.92	1.72
0.80	1	0.10	1.92	1.70
0.90	1	0.10	1.92	1.68
1.00	1	0.10	1.92	1.66
1.10	0.3	0.33	0.58	0.49
1.20	0.3	0.33	0.58	0.49
1.30	0.3	0.33	0.58	0.48
1.40	1	0.10	1.92	1.58
1.50	1	0.10	1.92	1.56
1.60	2	0.05	3.84	3.09
1.70	1	0.10	1.92	1.53
1.80	1	0.10	1.92	1.51
1.90	2	0.05	3.84	2.99
2.00	1	0.10	1.92	1.48
2.10	2	0.05	3.84	2.93
2.20	2	0.05	3.84	2.90
2.30	2	0.05	3.84	2.87
2.40	3	0.03	5.76	4.26
2.50	2	0.05	3.84	2.81
2.60	3	0.03	5.76	4.17
2.70	2	0.05	3.84	2.75
2.80	3	0.03	5.76	4.09
2.90	4	0.03	7.67	5.40
3.00	5	0.02	9.59	6.69
3.10	2	0.05	3.84	2.65
3.20	2	0.05	3.84	2.62
3.30	3	0.03	5.76	3.90
3.40	3	0.03	5.76	3.86
3.50	1	0.10	1.92	1.28
3.60	1	0.10	1.92	1.26
3.70	1	0.10	1.92	1.25
3.80	1	0.10	1.92	1.24
3.90	2	0.05	3.84	2.46
4.00	1	0.10	1.92	1.22
4.10	3	0.03	5.76	3.63
4.20	2	0.05	3.84	2.40
4.30	1	0.10	1.92	1.19
4.40	2	0.05	3.84	2.36
4.50	2	0.05	3.84	2.34
4.60	4	0.03	7.67	4.63
4.70	7	0.01	13.43	8.04
4.80	3	0.03	5.76	3.42
4.90	4	0.03	7.67	4.52
5.00	4	0.03	7.67	4.48



Notes:

Hammer Mass	63.5	kg
Fall Height	0.76	m
Cone Area	0.0019	m^2
E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

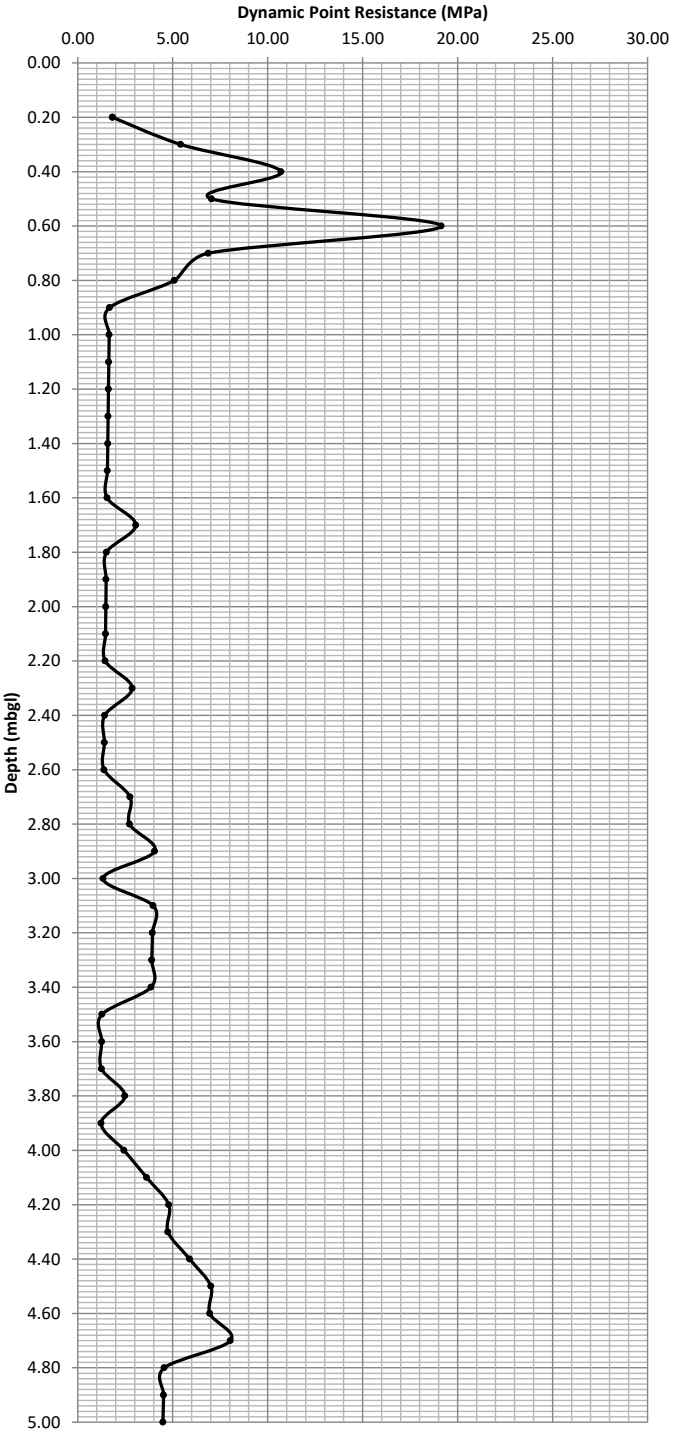
ASHDOWN SITE INVESTIGATION LTD

Dynamic Probe Record

SITE Site at Britannia House, High Street, Shoreham, West Sussex **Report Ref.** R18-12694

Test Location Reference	WS05

Depth (mbgl)	Blows (per 100mm)	Average Penetration per Blow (m)	Unit Point Resistance (MPa)	Dynamic Point Resistance (MPa)
0.10				
0.20	1	0.10	1.92	1.83
0.30	3	0.03	5.76	5.42
0.40	6	0.02	11.51	10.71
0.50	4	0.03	7.67	7.05
0.60	11	0.01	21.11	19.14
0.70	4	0.03	7.67	6.87
0.80	3	0.03	5.76	5.09
0.90	1	0.10	1.92	1.68
1.00	1	0.10	1.92	1.66
1.10	1	0.10	1.92	1.64
1.20	1	0.10	1.92	1.62
1.30	1	0.10	1.92	1.60
1.40	1	0.10	1.92	1.58
1.50	1	0.10	1.92	1.56
1.60	1	0.10	1.92	1.55
1.70	2	0.05	3.84	3.06
1.80	1	0.10	1.92	1.51
1.90	1	0.10	1.92	1.50
2.00	1	0.10	1.92	1.48
2.10	1	0.10	1.92	1.46
2.20	1	0.10	1.92	1.45
2.30	2	0.05	3.84	2.87
2.40	1	0.10	1.92	1.42
2.50	1	0.10	1.92	1.41
2.60	1	0.10	1.92	1.39
2.70	2	0.05	3.84	2.75
2.80	2	0.05	3.84	2.73
2.90	3	0.03	5.76	4.05
3.00	1	0.10	1.92	1.34
3.10	3	0.03	5.76	3.97
3.20	3	0.03	5.76	3.94
3.30	3	0.03	5.76	3.90
3.40	3	0.03	5.76	3.86
3.50	1	0.10	1.92	1.28
3.60	1	0.10	1.92	1.26
3.70	1	0.10	1.92	1.25
3.80	2	0.05	3.84	2.48
3.90	1	0.10	1.92	1.23
4.00	2	0.05	3.84	2.44
4.10	3	0.03	5.76	3.63
4.20	4	0.03	7.67	4.79
4.30	4	0.03	7.67	4.75
4.40	5	0.02	9.59	5.89
4.50	6	0.02	11.51	7.01
4.60	6	0.02	11.51	6.95
4.70	7	0.01	13.43	8.04
4.80	4	0.03	7.67	4.56
4.90	4	0.03	7.67	4.52
5.00	4	0.03	7.67	4.48



Notes:

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E_{theor}	473	J
Energy Ratio	0.77	
Anvil Mass	1.25	kg
Rod Mass	8.79	kg/m

Gas Concentrations and Groundwater Monitoring Results

Site Name:	Brittania House, Shoreham
Report Ref:	R18-12694

Position	Date	Time	Gas Pressure (mb)	Emission Rate (l/hr)	Atmospheric Pressure	Atmospheric Trend	Standpipe Depth (m)	Standing Water Depth (m bgl)	Methane (%)				Carbon Dioxide (%)				Oxygen (%)				H_2S (ppm)	CO (ppm)
									Seconds				Seconds				Seconds					
									15	30	45	60	15	30	45	60	15	30	45	60		
WS01	24/01/18	14:40	0	0.0	1006	Falling	3.03	Dry	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.3	20.5	20.4	20.3	20.3	0	0
WS03	24/01/18	14:49	0	0.0	1007	Falling	3.10	Dry	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	20.2	20.1	20.1	20.0	0	0
WS05	24/01/18	14:56	n/a	n/a	n/a	Falling	3.10	2.85														

APPENDIX C

Geotechnical Laboratory Testing Notes
Geotechnical Test Results
Contamination Test Results

GEOTECHNICAL LABORATORY TESTING NOTES

1 Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1:2002+A1:2013) and Part 2 Principles of classification (BS EN 14688-2:2004 +A1:2013) as well as the BS5930:2015 code of Practice for Ground Investigations.

2 Index Tests

Index (Atterberg Limit) tests are undertaken on samples of fine grained soils provide the primary information for the classification of fine grained soils.

Fine grained soil is tested to determine its liquid and plastic limits, which are moisture contents that define boundaries between material consistency states. These tests are used to evaluate indices used for soil identification and to help determine the shrinkage and swelling characteristics of the soil under conditions of changing moisture content. The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

The consistency index is derived from the Index Tests and is summarized in the following table. These divisions may be approximate, particularly for low plasticity soils. The consistency recorded on the soil classification summary is derived from the consistency index.

Consistency	Consistency Index
Very Soft	<0.25
Soft	0.25 to 0.50
Firm	0.50 to 0.75
Stiff	0.75 to 1.00
Very Stiff	>1.00

3 Particle Size Distribution Tests

Sieve analyses are carried out soil samples to establish their particle size distribution that can assist in the assessment of the permeability and classification of granular soils.

The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

4 Natural Moisture/ Saturated Moisture Content Determination of Chalk

The results of natural moisture or saturated moisture content tests of disturbed samples of chalk are used to assist in the classification of the chalk to determine key geotechnical parameters of strength, density and crushing properties.

The tests are carried out in accordance with BS1377: Part 2: 1990 + A1:1996 Classification tests.

5 Soil Suction Testing

Soil suction tests are undertaken for the determination of the state of desiccation in clay soils.

The testing is carried out in accordance with the Building Research Establishment Information Paper IP4/93, dated February 1993.

6 Triaxial Compression Tests

Undrained triaxial compression tests are carried out on undisturbed samples of cohesive soil in order to assist in the determination of the undrained shear strength of the soil. The results of moisture content and density determinations are also included.

The tests are carried out in accordance with BS1377: Part 7: 1990 + A1:1994 Shear strength tests (total stress).

7 Shear Vane and Hand Penetrometer Testing

Undisturbed samples are tested in the laboratory using a Geonor Hand Shear Vane for the determination of their undrained shear strength.

The vane tests are carried out in general accordance with BS1377: Part 7: 1990 + A1:1994 Shear strength tests (total stress).

8 One Dimensional Consolidation Tests

One-dimensional consolidation tests are performed on undisturbed soil samples to ascertain their settlement characteristics.

The tests are carried out in accordance with BS1377: Part 5: 1990 + A1:1994 Compressibility, Permeability and Durability tests.

9 Dry Density / Moisture Content Relationship (Compaction) Testing

Compaction testing for the determination of the dry density / moisture content relationship is carried out on using either a 2.5kg, 4.5kg hammer or a vibrating hammer.

The tests are carried out in accordance with the British Standard BS1377: Part 4: 1990 + A1 & A2:2002 Compaction-related tests.

10 California Bearing Ratio

The soil is usually compacted at the as dug “natural” moisture content and often at moisture contents around the natural moisture content.

The California bearing ratio is determined in accordance with the British Standard BS1377: Part 4: 1990 + A1 & A2:2002 Compaction related tests.

11 Chemical Testing

Soil samples are tested for their concentration of water soluble sulphate and pH for use in concrete mix design.

Water samples are tested for total sulphate concentration and pH value.

Where a water soluble sulphate content in soils or a total sulphate content in groundwater exceeds 3000mg/l SO_4 the magnesium sulphate content of the samples is required to be determined (BRE Special Digest 1:2005).

ASHDOWN SITE INVESTIGATION LIMITED

Soil Classification Summary

Site Name:	Site at Britannia House, High Street, Shoreham, West Sussex	Job No:	R18-12694

BH/TP No.	Depth (m)	Nat. Moist. Cont. (w %)	Equiv. Moist. Cont. (wa %)	Atterberg Limits			Class'n	Cons. Index (Ic)	% passing 425 µm sieve	Visual Description of Sample
				Wl %	Wp %	Ip %				
WS01	2.60	13		40	18	22	CI	1.23*	71	Very stiff brown slightly gravelly CLAY. Gravel is fine to coarse flint.
WS02	1.40	23		47	18	29	CI	0.83*	84	Stiff brown slightly gravelly CLAY. Gravel is fine to medium flint.
WS04	1.70	15		56	20	36	CH	1.14*	32	Very stiff brown gravelly sandy CLAY. Gravel is fine to coarse flint.
WS05	2.30	17		61	23	38	CH	1.16*	24	Very stiff brown gravelly sandy CLAY. Gravel is fine to coarse flint.

Test Method: Classification Tests BS1377: Part 2: 1990: Method 4.4, 5.3 and 5.4	Sheet No. 1
* Consistency index based on natural moisture content and not the equivalent moisture content.	

ASHDOWN SITE INVESTIGATION LIMITED

Moisture Content Summary

Site Name:	Site at Britannia House, High Street, Shoreham, West Sussex	Job No:	R18-12694

BH/TP No.	Depth (m)	Natural Moisture Content (w %)	Visual Description of Sample	Remarks
BH1	7.50	22	Comminuted CHALK	
BH1	8.50	18	Comminuted CHALK with clay and flint	

Test Method: Moisture Content BS1377: Part 2: 1990 3.2

Sheet No: 1

Alex Bewick
Ashdown Site Investigations Ltd
Unit 3 The Grain Store
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Ditchling Common
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QTS Environmental Report No: 18-69551

Site Reference:	Site at Britannia House, High Street, Shoreham, West Sussex
Project / Job Ref:	R18-12694
Order No:	P18-5614
Sample Receipt Date:	19/01/2018
Sample Scheduled Date:	19/01/2018
Report Issue Number:	1
Reporting Date:	25/01/2018

Authorised by:

Kevin Old
Associate Director of Laboratory

Authorised by:

Russell Jarvis
Associate Director of Client Services

QTSE is the trading name of DETS Ltd, company registration number 03705645

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

Soil Analysis Certificate						
QTS Environmental Report No: 18-69551	**Date Sampled**	15/01/18	15/01/18	15/01/18	15/01/18	
Ashdown Site Investigations Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Site at Britannia House, High Street, Shoreham, West Sussex	**TP / BH No**	WS01	WS02	WS03	WS05	
Project / Job Ref: R18-12694	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: P18-5614	**Depth (m)**	0.50	4.40	0.80	2.40	
Reporting Date: 25/01/2018	**QTSE Sample No**	311626	311627	311628	311629	

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	7.8	8.6	8.2	8.3	
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	229	17	37	128	
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.23	0.02	0.04	0.13	

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

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
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Lenham Heath
Maidstone
Kent ME17 2JN
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Soil Analysis Certificate - Sample Descriptions
QTS Environmental Report No: 18-69551
Ashdown Site Investigations Ltd
Site Reference: Site at Britannia House, High Street, Shoreham, West Sussex
Project / Job Ref: R18-12694
Order No: P18-5614
Reporting Date: 25/01/2018

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
311626	WS01	None Supplied	0.50	16.4	Black sandy clay with stones
311627	WS02	None Supplied	4.40	7	Brown sandy clay with stones
311628	WS03	None Supplied	0.80	16.4	Light brown sandy clay
311629	WS05	None Supplied	2.40	7.7	Brown sandy clay with stones

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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

4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 18-69551
Ashdown Site Investigations Ltd
Site Reference: Site at Britannia House, High Street, Shoreham, West Sussex
Project / Job Ref: R18-12694
Order No: P18-5614
Reporting Date: 25/01/2018

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

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QTS Environmental Report No: 18-70168

Site Reference:	Site at Britannia House, High Street, Shoreham
Project / Job Ref:	R18-12694
Order No:	P185650
Sample Receipt Date:	31/01/2018
Sample Scheduled Date:	31/01/2018
Report Issue Number:	1
Reporting Date:	05/02/2018

Authorised by:

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Authorised by:

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QTSE is the trading name of DETS Ltd, company registration number 03705645

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4480

Soil Analysis Certificate						
QTS Environmental Report No: 18-70168	**Date Sampled**	26/01/18				
Ashdown Site Investigations Ltd	**Time Sampled**	None Supplied				
Site Reference: Site at Britannia House, High Street, Shoreham	**TP / BH No**	BH1				
Project / Job Ref: R18-12694	**Additional Refs**	None Supplied				
Order No: P185650	**Depth (m)**	5.70				
Reporting Date: 05/02/2018	**QTSE Sample No**	314116				

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	8.8				
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	31				
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.03				

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

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Soil Analysis Certificate - Sample Descriptions
QTS Environmental Report No: 18-70168
Ashdown Site Investigations Ltd
Site Reference: Site at Britannia House, High Street, Shoreham
Project / Job Ref: R18-12694
Order No: P185650
Reporting Date: 05/02/2018

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
314116	BH1	None Supplied	5.70	9.7	Brown sandy clay with stones

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 18-70168
Ashdown Site Investigations Ltd
Site Reference: Site at Britannia House, High Street, Shoreham
Project / Job Ref: R18-12694
Order No: P185650
Reporting Date: 05/02/2018

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

Alex Bewick
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QTS Environmental Report No: 18-69425

Site Reference:	Site at Britannia House, High Street, Shoreham
Project / Job Ref:	R18-12694
Order No:	P18-5611
Sample Receipt Date:	16/01/2018
Sample Scheduled Date:	17/01/2018
Report Issue Number:	1
Reporting Date:	23/01/2018

Authorised by:

Russell Jarvis
Associate Director of Client Services

Authorised by:

Dave Ashworth
Deputy Quality Manager

QTSE is the trading name of DETS Ltd, company registration number 03705645

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Soil Analysis Certificate - EPH Texas Banded						
QTS Environmental Report No: 18-69425	**Date Sampled**	15/01/18	15/01/18	15/01/18	15/01/18	15/01/18
Ashdown Site Investigations Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Site at Britannia House, High Street, Shoreham	**TP / BH No**	WS01	WS01	WS03	WS03	WS04
Project / Job Ref: R18-12694	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: P18-5611	**Depth (m)**	0.40	1.40	0.60	2.30	0.80
Reporting Date: 23/01/2018	**QTSE Sample No**	311108	311109	311110	311111	311112

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10)	mg/kg	< 1	**MCERTS**	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C10 - C12)	mg/kg	< 1	**MCERTS**	2	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16)	mg/kg	< 1	**MCERTS**	5	< 1	< 1	< 1	< 1
EPH Texas (>C16 - C21)	mg/kg	< 1	**MCERTS**	31	< 1	< 1	< 1	5
EPH Texas (>C21 - C40)	mg/kg	< 6	**MCERTS**	224	< 6	< 6	< 6	25
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	261	< 6	< 6	< 6	29

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

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Soil Analysis Certificate - EPH Texas Banded						
QTS Environmental Report No: 18-69425	**Date Sampled**	15/01/18	15/01/18	15/01/18		
Ashdown Site Investigations Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Site at Britannia House, High Street, Shoreham	**TP / BH No**	WS04	WS05	WS05		
Project / Job Ref: R18-12694	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: P18-5611	**Depth (m)**	1.60	0.60	1.20		
Reporting Date: 23/01/2018	**QTSE Sample No**	311113	311114	311115		

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
EPH Texas (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	12	< 1		
EPH Texas (>C21 - C40)	mg/kg	< 6	MCERTS	< 6	49	< 6		
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	< 6	62	< 6		

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

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Soil Analysis Certificate - Volatile Organic Compounds (VOC)						
QTS Environmental Report No: 18-69425	**Date Sampled**	15/01/18	15/01/18	15/01/18	15/01/18	
Ashdown Site Investigations Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Site at Britannia House, High Street, Shoreham	**TP / BH No**	WS01	WS03	WS04	WS05	
Project / Job Ref: R18-12694	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: P18-5611	**Depth (m)**	0.40	0.60	1.60	0.60	
Reporting Date: 23/01/2018	**QTSE Sample No**	311108	311110	311113	311114	

Determinand	Unit	RL	Accreditation					
Dichlorodifluoromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Vinyl Chloride	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Chloromethane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Chloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Bromomethane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Trichlorofluoromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,1-Dichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
trans-1,2-Dichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,1-Dichloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
cis-1,2-Dichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
2,2-Dichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Chloroform	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Bromochloromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,1,1-Trichloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,1-Dichloropropene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Carbon Tetrachloride	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,2-Dichloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
1,2-Dichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Trichloroethene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Bromodichloromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Dibromomethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
TAME	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
cis-1,3-Dichloropropene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
trans-1,3-Dichloropropene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,1,2-Trichloroethane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
1,3-Dichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Tetrachloroethene	ug/kg	< 5	MCERTS	59	< 5	< 5	13	
Dibromochloromethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,2-Dibromoethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Chlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,1,1,2-Tetrachloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Ethyl Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
m,p-Xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
o-Xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	
Styrene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Bromoform	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Isopropylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,1,2,2-Tetrachloroethane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,2,3-Trichloropropane	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
n-Propylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
Bromobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
2-Chlorotoluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,3,5-Trimethylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
4-Chlorotoluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
tert-Butylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,2,4-Trimethylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
sec-Butylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
p-Isopropyltoluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,3-Dichlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,4-Dichlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
n-Butylbenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
1,2-Dichlorobenzene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	
,2-Dibromo-3-chloropropane	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	
Hexachlorobutadiene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	

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

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Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 18-69425	
Ashdown Site Investigations Ltd	
Site Reference: Site at Britannia House, High Street, Shoreham	
Project / Job Ref: R18-12694	
Order No: P18-5611	
Reporting Date: 23/01/2018	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
311108	WS01	None Supplied	0.40	16.1	Black sandy clay with brick
311109	WS01	None Supplied	1.40	8.8	Light brown sandy clay with stones
311110	WS03	None Supplied	0.60	8.9	Brown sandy clay with stones
311111	WS03	None Supplied	2.30	8.5	Brown sandy clay with stones
311112	WS04	None Supplied	0.80	13.3	Brown sandy clay with concrete
311113	WS04	None Supplied	1.60	9.2	Orange sandy clay with stones
311114	WS05	None Supplied	0.60	10.2	Brown sandy clay with stones
311115	WS05	None Supplied	1.20	11	Brown sandy clay with stones and brick

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 18-69425
Ashdown Site Investigations Ltd
Site Reference: Site at Britannia House, High Street, Shoreham
Project / Job Ref: R18-12694
Order No: P18-5611
Reporting Date: 23/01/2018

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

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QTS Environmental Report No: 18-69552

Site Reference:	Site at Britannia House, High Street, Shoreham
Project / Job Ref:	R18-12694
Order No:	P18-5615
Sample Receipt Date:	19/01/2018
Sample Scheduled Date:	19/01/2018
Report Issue Number:	1
Reporting Date:	25/01/2018

Authorised by:

Kevin Old
Associate Director of Laboratory

Authorised by:

Russell Jarvis
Associate Director of Client Services

QTSE is the trading name of DETS Ltd, company registration number 03705645

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4480

Soil Analysis Certificate - EPH Texas Banded						
QTS Environmental Report No: 18-69552	**Date Sampled**	15/01/18				
Ashdown Site Investigations Ltd	**Time Sampled**	None Supplied				
Site Reference: Site at Britannia House, High Street, Shoreham	**TP / BH No**	WS02				
Project / Job Ref: R18-12694	**Additional Refs**	None Supplied				
Order No: P18-5615	**Depth (m)**	0.30				
Reporting Date: 25/01/2018	**QTSE Sample No**	311630				

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8)	mg/kg	< 0.05	NONE	< 0.05				
EPH Texas (>C8 - C10)	mg/kg	< 1	**MCERTS**	< 1				
EPH Texas (>C10 - C12)	mg/kg	< 1	**MCERTS**	< 1				
EPH Texas (>C12 - C16)	mg/kg	< 1	**MCERTS**	< 1				
EPH Texas (>C16 - C21)	mg/kg	< 1	**MCERTS**	< 1				
EPH Texas (>C21 - C40)	mg/kg	< 6	**MCERTS**	10				
EPH Texas (C6 - C40)	mg/kg	< 6	NONE	10				

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

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Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 18-69552	
Ashdown Site Investigations Ltd	
Site Reference: Site at Britannia House, High Street, Shoreham	
Project / Job Ref: R18-12694	
Order No: P18-5615	
Reporting Date: 25/01/2018	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
311630	WS02	None Supplied	0.30	3.8	Brown sandy gravel with stones and concrete

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 18-69552
Ashdown Site Investigations Ltd
Site Reference: Site at Britannia House, High Street, Shoreham
Project / Job Ref: R18-12694
Order No: P18-5615
Reporting Date: 25/01/2018

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
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APPENDIX D

Classification of Probability, Consequence and Risk

Probability of risk being realised	
Classification	Definition
High	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Moderate	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Very Low	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Consequence of risk being realised		
Classification	Category	Definition
Severe	Human Health	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA.
	Controlled Waters	Short term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource.
	Property	Catastrophic damage to buildings/property.
	Ecological Systems	A short term risk to a particular ecosystem or organisation forming part of such ecosystem.
Moderate	Human Health	Chronic damage to Human Health.
	Controlled Waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution).
	Ecological System	A significant change in a particular ecosystem or organism forming part of such ecosystem.
Minor	Controlled Waters	Pollution of non-sensitive water resources.
	Property	Significant damage to crops, buildings, structures and services.
	Ecological Systems	Damage to sensitive buildings/structures/services or the environment.
Very Minor	Human Health	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc).
	Property	Easily repairable effects of damage to buildings, structures and services.
	Project	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve.

Risk classification definitions	
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

APPENDIX E

Preliminary Conceptual Model

Site at Britannia House, High Street, Shoreham				Preliminary Conceptual Model		R18-12694	
Potential Source	**Potential Receptor**	**Potential Contaminants**	**Potential Pathway**	**Complete Linkage Present?**	**Probability**	**Consequence**	**Risk**
Historical site use as Shipbuilders Yard and private garages	End Users	Heavy Metals, PAH Compounds, Petroleum Hydrocarbons, VOC Compounds, SVOC Compounds, Asbestos and PCB Compounds	Dermal contact with soil and dust (indoor & outdoor)	Pathway severed by hard surfacing			N/A
			Ingestion of soil and indoor dust	Pathway severed by hard surfacing			N/A
			Consumption of home-grown produce and attached soil	No private gardens proposed			N/A
			Inhalation of soil dust (indoor and outdoor)	Pathway severed by hard surfacing			N/A
			Inhalation of soil vapours	Yes	P3: Moderate	C3: Moderate	Moderate
			Inhalation of soil gases/ Risk of explosion	No potential gas source identified			N/A
	End Users (via Water Supply Pipework)	Petroleum Hydrocarbons and VOC Compounds	Contamination of incoming services	Yes	P2: Low	C3: Moderate	Low/Moderate
	Groundwater	Heavy Metals, PAH Compounds, Petroleum Hydrocarbons, VOC Compounds, SVOC Compounds and PCB Compounds	Migration to groundwater	Yes	P2: Low	C2: Minor	Low
Historical landfill to NW of site	End Users	Land Gases	Dermal contact with soil and dust (indoor & outdoor)	Identified contaminant(s) do not pose a risk via this			N/A
			Ingestion of soil and indoor dust	Identified contaminant(s) do not pose a risk via this			N/A
			Consumption of home-grown produce and attached soil	Identified contaminant(s) do not pose a risk via this			N/A
			Inhalation of soil dust (indoor and outdoor)	Identified contaminant(s) do not pose a risk via this			N/A
			Inhalation of soil vapours	Identified contaminant(s) do not pose a risk via this			N/A
			Inhalation of soil gases/ Risk of explosion	Yes	P2: Low	C3: Moderate	Low/Moderate
	End Users (via Water Supply Pipework)		Contamination of incoming services	Identified contaminant(s) do not pose a risk via this pathway			N/A
	Groundwater		Migration to groundwater	Identified contaminant(s) do not pose a risk via this pathway			N/A

Site at Britannia House, High Street, Shoreham				Preliminary Conceptual Model		R18-12694	
Potential Source	**Potential Receptor**	**Potential Contaminants**	**Potential Pathway**	**Complete Linkage Present?**	**Probability**	**Consequence**	**Risk**
Made ground associated with demolition and site development	End Users	Heavy Metals, PAH Compounds and Asbestos	Dermal contact with soil and dust (indoor & outdoor)	Pathway severed by hard surfacing			N/A
			Ingestion of soil and indoor dust	Pathway severed by hard surfacing			N/A
			Consumption of home-grown produce and attached soil	No private gardens proposed			N/A
			Inhalation of soil dust (indoor and outdoor)	Pathway severed by hard surfacing			N/A
			Inhalation of soil vapours	No potential contaminants identified			N/A
			Inhalation of soil gases/ Risk of explosion	No potential gas source identified			N/A
	End Users (via Water Supply Pipework)		Contamination of incoming services	No potential contaminants identified			N/A
	Groundwater	Heavy Metals and PAH Compounds	Migration to groundwater	Yes	P1: Very Low	C2: Minor	Very Low

APPENDIX F

Quantitative Conceptual Model

Site at Britannia House, High Street, Shoreham				Quantitative Conceptual Model		R18-12694	
Source	**Receptor**	**Contaminants**	**Pathway**	**Complete Linkage Present?**	**Probability**	**Consequence**	**Risk**
Historical landfill to NW of site	End Users	Land Gases	Dermal contact with soil and dust (indoor & outdoor)	Identified contaminant(s) do not pose a risk via this pathway			N/A
			Ingestion of soil and indoor dust	Identified contaminant(s) do not pose a risk via this pathway			N/A
			Consumption of home-grown produce and attached soil	Identified contaminant(s) do not pose a risk via this pathway			N/A
			Inhalation of soil dust (indoor and outdoor)	Identified contaminant(s) do not pose a risk via this pathway			N/A
			Inhalation of soil vapours	Identified contaminant(s) do not pose a risk via this pathway			N/A
			Inhalation of soil gases/ Risk of explosion	Yes	P1: Very Low	C3: Moderate	Low
	End Users (via Water Supply Pipework)		Contamination of incoming services	Identified contaminant(s) do not pose a risk via this pathway			N/A
	Groundwater		Migration to groundwater	Identified contaminant(s) do not pose a risk via this pathway			N/A